AVC, Application View Controller

User Manual

version 0.7.0

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AVC outline

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The AVC web site is hosted at **http://avc.inrim.it**

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Author note

The author will be happy to ear about any usage of AVC. Please, feel free to send questions, corrections and suggestions to the author. The poor English of this manual requires special indulgence.

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1 Introduction

1.1 What is

AVC, the Application View Controller is a multiplatform, fully automatic, live connection among graphical interface widgets and application variables for the python [1] language.

AVC supports in a uniform way the most popular widget toolkits: GTK+ [2], Qt3 [3], Qt4 [4], Tk [5], wxWidgets [6].

AVC is a normal python package that can be imported by any python application.

Graphical User Interfaces (GUIs) are the easy way to input data to an application software and to view the data produced by the application. The management of data exchanges between the GUI and the application is a central problem in GUI programming, it absorbs a relevant part of the programming effort. AVC makes the programming of this data exchanges very easy.

AVC is a fully transparent and automatic connection between the values displayed and entered by GUI widgets and the variables of an application using the GUI. The connection is bidirectional. If the application sets a new value into a connected variable, AVC copies the new value into all the widgets connected to the variable. If a new value is entered by a widget, AVC copies the new value into all other widgets connected the variable, into the variable and optionally notifies the change to the application. The connections are autogenerated by looking for matching names between widget names and variable names.

The application is completely unaware of the presence of the connected variables, it reads and writes them as normal variables. Only if the application requires to be immediately notified when a connected variable changes value, a notify handler must be added to the application.

1.2 Features

- Fully transparent widget-variable connections
- Automatic connection by matching widgets and variables names
- Multiple matching namespaces
- Dynamic connections
- No design pattern, no application redesign, no widget toolkit dependent code, separation between application logic and GUI.
- Multiple widget toolkits support: GTK+, Qt3, Qt4, Tk, wxWidgets.
- Full compatibility and support for Glade, Qt Designer, Visual Tcl and wxGlade interface design tools.
- Normal widgets: button, check button, combo box, entry, label, progress bar, radio button, slider, spin button, status bar, text view/edit, toggle button.
- Advanced widgets: list view, tree view.
- Normal variable types: boolean, integer, float, string, list, tuple.
- Advanced variable types: 2D table (list of lists), hierarchical tree (dictionary with paths of values inside tree as keys)
- Multiple widgets to one variable connection
- Dual update timing of variable value views: immediate or periodic.
- Testing printout logging activity with selectable verbosity
- Python package written in pure python
- Free software (GNU GPL license version 3 [15])

1.3 Quick start

Essential instructions to get started with AVC. This instructions are valid for all supported toolkits. The AVC package is supposed already installed. For a simple example, see further along the section “Spinbutton/Spinbox/SpinCtrl Example” of the widget toolkit of interest.

Import the python binding of the widget toolkit of choice, then Import the AVC package.

```
from avc import *
```

Derive the application class from the AVC class. Let suppose that the application class name is "theApp".

```
class theApp(AVC):
```

In the class __init__ method create the GUI previously designed with your preferred interface designer or create it statement by statement, naming the widgets with the rule described below.

Define all variables to be connected in the application. Each variable must have a name equal to the matching name of the widgets that are to be connected to the variable. A widget matching name is the widget name itself, if it does not contain a double underscore '__', otherwise is the name part before the double underscore.

In the application, after the creation of the GUI and after the instantiation of all the variables to be connected, call the instance method 'avc_init'. Let suppose that the application instance name is "the_app".

```
the_app.avc_init()
```

All is done for AVC. When the application enters the toolkit event loop, AVC takes full control over data exchange between the connected variables and widgets.

1.4 Installation

To run **AVC**, **Python 2.2 or later** must already be installed. The latest release is recommended. Python is available from http://www.python.org/.

The first step is to download the AVC tarball from http://avc.inrim.it/dist/.

Expand the `tar` archive in a temporary directory (**not** directly in Python's `site-packages`). It contains a distutils setup file "setup.py".

Open a shell. Unpack the tarball in a temporary directory (**not** directly in Python's `site-packages`). Commands:

```
tar zxf avc-X.Y.Z.tar.gz
```

X, Y and Z are the major and minor version numbers of the tarball.

Go to the directory created by expanding the tarball:

```
cd avc-X.Y.Z
```

Get root privileges and install the package:

```
su
(enter root password)
python setup.py install
```

If the python executable isn't on your path, you'll have to specify the complete path, such as /usr/local/bin/python.

2 Common reference

This is the part of the user manual common to all supported widget toolkits: GTK+, Qt3, Qt4, Tk and wxWidgets.

2.1 Supported widgets

The following table shows the correspondences between the AVC abstract widget types and the names of the real widgets in the supported toolkits.

Table 1: Map of supported widget

AVC abstract widget type	**real widgets by supported toolkits**				
	GTK+	**Qt3**	**Qt4**	**Tk**	**wxWidgets**
Button	Button	QPushButton(1)	QPushButton(1)	Button	Button BitmapButton
Check Button	CheckButton	QCheckBox	QCheckBox	Checkbutton	CheckBox
Combo Box	ComboBox	QComboBox(2)	QComboBox(2)	-	Choice ComboBox
Entry	Entry	QLineEdit	QLineEdit	Entry	TextCtrl
Label	Label	QLabel	QLabel	Label	StaticText
List View	TreeView	QListView	QTreeWidget	-	ListCtrl(3)
Progress Bar	ProgressBar	QProgressBar	QProgressBar	-	Gauge
Radio Button	RadioButton	QRadioButton	QRadioButton	Radiobutton	RadioBox
Slider	Hscale VScale	QSlider(4)	QSlider(4)	Scale	Slider
Spin Button	SpinButton	QSpinBox(5)	QSpinBox(5) QdoubleSpinbox	Spinbox	SpinCtrl
Status Bar	StatusBar(6)	-	-	-	StatusBar(6)
Text View	TextView	QTextEdit	QTextEdit	Text	TextCtrl
Toggle Button	ToggleButton	QPushButton(7)	QPushButton(7)	Togglebutton	ToggleButton
Tree View	TreeView	QListView	QTreeWidget	-	TreeCtrl(8)

Notes
(1) QPushButton with "toggleButton" property set to "False" (the default).
(2) QComboBox with "editable" property set to "False" (the default).
(3) ListCtrl with property “style” set to “report”.
(4) QSlider manages interger values only.
(5) QSpinBox manages interger values only.
(6) StatusBar is used as a simple output label.
(7) QPushButton with "toggleButton" property set to "True". Set it with QPushButton method `setToggleButton(True)` .
(8) TreeCtrl do not support columns and header.

2.2 Widgets-variables names matching

AVC connects widgets and variables using a names matching procedure with the following rules.

The matching name for a variable is the variable name itself.

The matching name for a widget is the widget name itself, if the name does not contain a double underscore ('__'), otherwise the matching name is the part of the widget name before the double underscore. This allow to differentiate widget names for widgets that are to be connected to the same variable.

Each widget having a matching name equal to a variable matching name is connected to that variable.

widget name	**matching name**
button_ok	button_ok
toggle__button	toggle
check_button_1	check_button_1
radio_button__2	radio_button

Table 2: Examples of matching names

A widget can be connected to one variable. A variable can be connected to one or more widgets.

2.3 Matching namespaces

The name matching process of AVC works on two sides. One is the application program where AVC search for matching names of variables. The other is the GUI where AVC search for matching names of widgets. The matching process can be performed any number of times and at any moment during application run time by a simple call to the proper AVC method ("avc_init" or "avc_connect"). For each call, the name search in the application is bounded to the attributes of the python object calling the AVC method. While the name search in the widgets is bounded to a widgets subtree, if the subtree root widget is specified in the call. If no root widget is specified, the whole GUI widget tree is searched. In other words, the search namespace of the application variables is the scope (the directly accessible namespace or the set of local symbols) of the object calling the AVC method. See the "countdown" example.

2.4 Connected objects

Each python object calling one of the connecting methods of AVC ("avc_init" or "avc_connect") is a "connected" object. All connected objects must be instances of classes derived from the `AVC` class. Let suppose that the class name is "myConnectedClass", the class definition statement will be

```
class myConnectedClass(AVC):
```

The `AVC` class is derived from the builtin `object` class that is the base of all new style classes introduced with python 2.2. So, also the derived class becomes a new style class.

2.5 Static and dynamic connections

Any widget-variable connection created by AVC is dynamic, in the sense that it can be created or deleted at any moment during the application run time. The simplest usage of AVC as outlined in 1.3 uses the connections in a "static" mode: the connections are setup only one time at the application init (call to avc_init) and they stay alive and unchanged until application termination. In a more flexible usage, AVC creates some connections at application init time, then during run time new GUIs or parts of GUI come up as connected objects and when the application destroy some part of this GUIs, the corresponding connections are automatically deleted. When the application deletes a widget that belongs to a connection, AVC automatically removes it from the connection and if the connection has no more widgets, the connection is also removed (see "countdown" example).

2.6 Uniform separation between application logic and GUI

AVC allows to structure the application with program logic separated from GUI statements for all supported toolkits. For example, program logic can be put in one class and GUI management in another class (see "counter" example).

2.7 AVC initialization

AVC start its job just after it is initialized. AVC initialization can take place in the application after the creation of the GUI and after the instantiation of all variables to be connected. AVC initialization is done by calling the instance method `avc_init`. Let suppose that the application instance name is "the_app", the AVC init statement will be

```
the_app.avc_init()
```

When the value of a connected variable is changed, the values displayed by the widgets connected to it are updated by AVC in one of two allowed modes: immediate or periodic. Mode selection is done at AVC initialization specifying the "view_period" argument. If the argument is omitted, like in `the_app.avc_init()`, it is assigned a default value of 0.1 seconds, selecting a periodic views update with that period. If the argument is assigned a value, like in `the_app.avc_init(view_period=0.2)`, views will be updated every "view_period" seconds. If the argument is assigned to zero or to "None" value, like in `the_app.avc_init(view_period=0)`, views will be updated immediately after each change of the variable value.

2.8 Connecting widgets with variables

Two AVC methods can be called to perform widgets-variables connections: “avc_init” and “avc_connect”. As detailed in 2.7, any application using AVC must call the “avc_init” method at init time. This call is normally performed by the application object that implements the “main” function of the application. avc_init initializes all the internal logic of AVC and makes any required connection of the “main” object between its attributes and the whole widget tree of the GUI. In many cases this is enough, so no more AVC calls are required. If other application objects needs to perform connections, they must call the “avc_connect” method. This method makes any required connection of the calling object between its attributes and the widget tree whose root widget is given as argument. Let suppose that the object name is “object1”, the call statement will be

```
object1.avc_connect(tree_root_widget)
```

If the argument is omitted, the widget tree defaults to the whole GUI widget tree. The following rules apply to avc_connect operations: widget trees can overlap, a connected widget can not be reconnected in another way. See "countdown" example.

2.9 Normal abstract widget collection

All supported widgets are divided into two groups: normal and advanced. Normal widgets embed simple data that can be connected to a basic python type, I.e. the button widget can be connected to a boolean variable. Advanced widgets embed complex data that needs to be connected to a more complex python type.

The normal real widgets of the supported toolkits are mapped to the following set of abstract widgets. The detailed python data corresponding at each abstract widget is given.

Button

The memoryless press button, its connected variable must be a boolean. In normal state (button not pressed) the variable is "False", in pressed state (mouse pointer over button and mouse button 1 pressed) the variable is "True".

Names for button widget in supported toolkits: GTK+ "Button", Qt3 and Qt4 "QPushButton" with toggle attribute off, Tk “Button”, wxWidgets “Button”.

Check button

The behavior of the check button widget is the same of the toggle button widget. See toggle button.

Names for check button widget in supported toolkits: GTK + "CheckButton", Qt3 and Qt4 "QCheckBox", Tk “Checkbutton”, wxWidgets “CheckBox”.

Combo box

The combo box, an item selector. The connected variable must be of type integer, its value is the index of the selected item. When no item is selected index is -1.

Names for combo box widget in supported toolkits: GTK+ “ComboBox”, Qt3 and Qt4 "QComboBox", not available in Tk, wxWidgets “Choice” “ComboBox”.

Entry

The text entry, its connected variable can be integer, float or string. Text input must conform to the type of the connected variable. If the connected variable is of type string, its value is copied to the entry widget "as is", if type is integer or float, the value is converted to string before copy.

Names for text entry widget in supported toolkits: GTK+ "Entry", Qt3 and Qt4 "QLineEdit", Tk “Entry”, wxWidgets “TextCtrl”.

Label

The text label, its connected variable can be boolean, integer, float, string, list, tuple or object. If the label is created with a default text, AVC tests it against the connected variable to be a valid python formatting string. If the test is successful, the default text is saved by AVC and used to format the label text updates when the connected variable value changes. If the connected variable is a generic python object, the formatting string is applied to the dictionary of the object. If the test is not successful, the label text updates are rendered by the standard python string representation applying the str function to the connected variable. For further details, see the “label example”.

Names for text entry widget in supported toolkits: GTK+ “Label”, Qt3 and Qt4 “QLabel”, Tk “Label”, wxWidgets “StaticText”.

Progress bar

The progress bar, its connected variable must be a float. If the value assigned to the variable is negative, the progress bar is pulsed (display effect: a short colored segment shuttling along the progress bar). If the value assigned to the variable is in the range 0.0 – 1.0, the progress bar is extended for the proportional amount (0.0 → 0%, 1.0 → 100%).

Names for progress bar widget in supported toolkits: GTK+ “ProgressBar”, Qt3 and Qt4 “QProgressBar”, Tk not supported, wxWidgets “Gauge”.

Radio button

The radio buttons come always in groups of two or more radio buttons. Each radio button behaves like a check button, but only one radio button at a time can be checked in each group. A variable of type integer can be connected to each group of radio buttons, its value is the index of the checked radio button in the group.

Names for text entry widget in supported toolkits: GTK+ “RadioButton”, Qt3 and Qt4 “QRadioButton”, Tk “Radiobutton”, wxWidgets “RadioBox”.

Slider

The slider, its connected variable can be integer or float. The GTK+ "HScale" and "VScale" support both types. On the contrary, Qt3 and Qt4 support only integer with "QSlider" widget. Remember that in python floats are always doubles.

Names for text entry widget in supported toolkits: GTK+ “Hscale” and “Vscale”, Qt3 and Qt4 “QSlider”, Tk “Slider”, wxWidgets “Slider”.

Spin button

The spin button, its connected variable can be integer or float. The GTK+ "SpinButton" support both types. On the contrary, Qt3 and Qt4 differentiate integer or float support with two widgets: "SpinBox" and "DoubleSpinBox". Remember that in python floats are always doubles.

Names for spin button widget in supported toolkits: GTK+ "SpinButton", Qt3 and Qt4 "QSpinBox" for integer and "QDoubleSpinBox" for float, Tk “Spinbox”, wxWidgets “SpinCtrl”.

Status bar

The status bar, its connected variable is a string.

Names for text view/edit widget in supported toolkits: GTK+ "StatusBar", Qt3, Qt4 and Tk not supported, wxWidgets “StatusBar”.

Text view/edit

The text view/edit, its connected variable is a string.

Names for text view/edit widget in supported toolkits: GTK+ "TextView", Qt3 and Qt4 "QtextEdit", Tk “Text”, wxWidgets “TextCtrl”.

Toggle button

The toggle button, a button with memory, its connected variable must be a boolean. Each time the button is pressed, it changes its state: from on to off or viceversa. In off state the variable is "False", in on state the variable is "True".

Names for toggle button widget in supported toolkits: GTK+ "ToggleButton", Qt3 and Qt4 "PushButton" with toggle attribute on, Tk “Togglebutton”, wxWidgets “ToggleButton”.

2.10 Advanced abstract widget collection

The advanced real widgets of the supported toolkits are mapped to the following set of abstract widgets. The detailed python data corresponding at each abstract widget is given.

List view

The list view, this widget can display data as a 2D table of one or more columns, the columns can have an optional header. At present, only textual data can by displayed: no icons, no check boxes, etc. Let explain the connected python variable with an example.

A list view widget displaying some data	The connected python variable

col1 int	col2 str
3	three
1	one
2	two

```
{'head':['col1 int','col2 str'], \
'body':[[1,'one'],[2,'two'],[3,'three']]}
```

In the above example, the list view displays a data table with two columns and three rows plus an header. The connected python variable is contained into a dictionary with two keys: “head” and “body”. The value of the key “head” controls the header of the list view. Its value type must be a list of strings, each string appears into the head of a column. To remove the header in the widget, remove the “head” key/value pair from the dictionary. The value of the key “body” controls the data displayed in the table. Its must be a list of row data, where each row is a list of column values.

Names for list view widget in supported toolkits: GTK+ “TreeView”, Qt3 “QlistView”, Qt4 “QTreeWidget”, Tk not supported, wxWidgets “ListCtrl”.

Note: wxWidgets “ListCtrl”works with property “style” set to ”report”.

Tree view

The tree view, this widget can display a hierarchical data tree, it can have an optional header. At present, only textual data can be diplayed: no icons, no check boxes, etc. Let explain the connected python variable with an example.

A tree view widget displaying some data

col1 int	col2 str
▽ 1	one
11	one one
12	one two
▽ 2	two
21	two one
22	two two

The connected python variable

```
{'head':['col1 int','col2 str'], \
'body':{'1':[1,'one'],'2':[2,'two'], \
'1.1':[11,'one one'],'1.2':[12,'one two'],\
'2.1':[21,'two one'],'2.2':[22,'two two']}}
```

In the above example, the tree view displays two root rows, rows 1 and 2. Each root row has two children rows, rows 11 and 12 for root row 1, rows 21 and 22 for root rows 2. The whole tree has 6 rows and two columns with an header. The connected python variable is contained into a dictionary with two keys: “head” and “body”. The value of the key “head” controls the header of the tree view. Its value type must be a list of strings, each string appears into the head of a column. To remove the header in the widget, remove the “head” key/value pair from the dictionary. The value of the key “body” controls the data displayed in the tree. Its must be a dictionary of row data. The row value is a list of column values. The key of each row is the path of the row in the tree, referred only to the visual current position of the row respect to the other rows. A row path is represented as a string with one or more integers separated by dots. Root rows paths have only one integer, starting from 1 for the topmost row and increasing by one at each root row going toward bottom. First level children have two integers. The first is the parent path, the second is the child top-down order, starting from 1 for the topmost child and increasing by one at each child of the same parent going toward bottom. Path of deeper rows in a tree is built applying recursively the above rules.

Names for tree view widget in supported toolkits: GTK+ “TreeView”, Qt3 “QlistView”, Qt4 “QTreeWidget”, Tk not supported, wxWidgets “TreeCtrl”.

Note: wxWidgets “TreeCtrl” do not support columns and headers.

2.11 Connection update trigger events

On the application side there is only one event triggering the update of the connected widgets, the assignment of a new value to the connected variable. On the contrary, from the GUI side, several events can trigger the update of a new value in the connected variable and in the other connected widgets. The following table specifies for each widget which GUI events trigger the update.

Table 3: GUI events triggering connection update

AVC abstract widget type	**real widgets events by supported toolkits**				
	GTK+	**Qt3**	**Qt4**	**Tk**	**wxWidgets**
Button	MLB press MLB release	MLB press MLB release	MLB press MLB release	MLB press MLB release	MLB press MLB release
Check Button	MLB release	MLB release	MLB release	MLB press	MLB release
Combo Box	MLB release Arrows+Enter	MLB release Arrows+Enter	MLB release Arrows+Enter	NA	MLB release Arrows+Enter
Entry	Enter	Enter	Enter	Enter	Key press
Label	-	-	-	-	-
List View	Row deleted Row changed	Selection changed Current changed Item renamed	Layout changed Data changed Header data changed	NA	Label edit end
Progress Bar	NE	NE	NE	NA	NE
Radio Button	MLB release Arrow press	MLB release	MLB release Arrow press	MLB press	MLB release Arrow press
Slider	Drag	Drag	Drag	Drag	Drag end
Spin Button	MLB press MRB press Enter	MLB press Enter	MLB press Key press	MLB release Enter	MLB press MRB press Enter
Status Bar	NE	NE	NE	NA	NE
Text View	Key press	Enter	Key press	Enter	Key press
Toggle Button	MLB release	MLB release	MLB release	MLB press	MLB release
Tree View	Row deleted Row changed	Selection changed Current changed Item renamed	Layout changed Data changed Header data changed	NA	Label edit end

Notes
Arrows: up and down arrow keys.
Drag: mouse left button pressed while moving.
Enter: the enter key.
Key: any printable key.
Label edit end: enter key pressed after label editing.
MLB: mouse left button.
MRB: mouse right button.
NA: widget not available.
NE : display only widget, no input event.

2.12 Caveat

Below, there is a list of things to pay attention to have a good experience with AVC. They are in part limitations chosen by design to keep AVC as simple as possible, in part limitations imposed by the python language. They may become development targets in the future.

The attributes exploration goes deep one level, it is not recursive on objects. This means that only attributes of the current class are considered for matching. If an attribute of the current object class is an object containing other attributes, these are not considered for matching.

Several core operation of AVC must be executed atomically, to avoid the burden of mutually exclusive execution provisions, AVC cannot be used together with multiple thread of control.

When the connected variable is a mutable sequence (list or dictionary), the assignment to the variable with subscripts do not trigger the value update into the connected widgets. So, assign the connected variable as a whole without any subscript.

For efficient programming, use small (in memory footprint sense) connected variables: avoid long lists or big dictionaries.

At present, no persistence of connected variables is implemented. At application termination, nothing is saved about the status of the connected variables.

2.13 Testing and debugging

AVC can produce a printout of its activity that can be useful for testing and debug purposes. The verbosity level of the printout can be selected from 0 (minimum) to 4 (maximum). Let suppose that the program to test is “myprogram.py”, then to produce the printout with the maximum verbosity the following command is required.

```
myprogram.py --avc-verbosity 4
```

The content of the each verbosity level is the following.

- **level 0**: nothing printed, the default.
- **level 1**: header with AVC version, widget toolkit type, program name, verbosity level, connection update mode; connection list with name, variable type, initial value, removed connections.
- **level 2**: as level 1 plus the widgets and the change handlers list of each connection, the removed widgets.
- **level 3**: as level 2 plus the details of widgets in connections lists.
- **level 4**: as level 3 plus full widget tree for each scansion.

2.13.1 Testing printout for example gtk_counter.py

The following example shows the output produced by running the example “gtk_counter.py” (see “GTK+ examples”) with maximum verbosity.

```
./gtk_counter.py --avc-verbosity 4

AVC 0.7.0 - Activity Report
widget toolkit binding: GTK+
program: ./gtk_counter.py
```

```
verbosity: 4
connection update mode: periodic, period=0.1 sec
widget tree scansion from top level [<gtk.Window object at 0x832b4dc (GtkWindow at
0x839b048)>, <gtk.Window object at 0x832b504 (GtkWindow at 0x839b0f8)>]
  skip unsupported widget Window,"GtkWindow"
  skip unsupported widget Window,"counter"
  skip unmatched widget Label,"GtkLabel"
  skip unsupported widget HBox,"hbox1"
  creating connection "counter" in <__main__.ExampleMain object at 0x83205ec>
    type: <type 'int'>
    initial value: 0
  add widget Label,"counter" to connection "counter"
    valid format string: "<b>%d</b>"
  creating connection "high_speed" in <__main__.ExampleMain object at 0x83205ec>
    type: <type 'bool'>
    initial value: False
    connected handler "high_speed_changed"
  add widget CheckButton,"high_speed" to connection "high_speed"
  skip unmatched widget Label,"GtkLabel"
removing widget Label from connection "counter" of <__main__.ExampleMain object at
0x83205ec>
removing connection "counter" from <__main__.ExampleMain object at 0x83205ec>
removing widget CheckButton from connection "high_speed" of <__main__.ExampleMain
object at 0x83205ec>
removing connection "high_speed" from <__main__.ExampleMain object at 0x83205ec>
```

In the “widget tree scansion” all the widgets of the GUI are analyzed. In fact, the root widgets of the searched tree are the top level windows. Each widget can be skipped (ignored) or added to a connection. A widget is skipped because it is of type not supported AVC or it has a name not matching any variable of the application or it is already connected. When a name match is found and the related connection do not exists, the message “ creating connection ...” appears with the name of the connection and the object in which resides the connected variable. The type and the initial value of the variable is also displayed. A widget is added to a connection because it name matches some application variable. For each added widget, its class type and its name are printed.

Things to be noticed. The connection “counter” has a label widget that was preloaded with a valid formatting string ("%d"). The connection “high_speed” has a check button widget and it has the change handler “high_speed_changed”.

When the main window is closed, all the contained widgets are deleted, so for each deleted widget that is also connected a remove message appears. When a connection has no more widgets, it is also removed and a remove message appears.

3 GTK+ Reference

This is the part of the user manual specific to the GTK+ widgets toolkit.

3.1 Module dependencies

AVC GTK+ depends on PyGTK [7] the python wrapper for GTK+ libraries. AVC GTK+ imports the following modules from PyGTK.

```
import gtk
import gobject
```

3.2 Widget naming

Both Glade, the interface designer, and GTK+ allow duplicated naming of widgets.

3.3 Status bar widget

AVC uses the GTK+ status bar widget as a simple output label. Only context #1 with one or none message on status bar stack is used.

3.4 Interface designer

AVC is fully compatible with Glade, the design tool for GTK+. Glade produces an interface description that is saved as a specific xml format (.glade).

4 Qt3 Reference

This is the part of the user manual specific to Qt3 [3] widgets toolkit.

4.1 Module dependencies

AVC Qt3 depends on PyQt v3 [8] the python bindings for Qt v3 application framework. AVC Qt3 imports the following modules from PyQt.

```
import qt
```

4.2 Widget naming

Qt3 Designer and Qt3 **do not** allow duplicated naming of widgets. So use the 'double underscore' mechanism to differentiate widgets names.

4.3 Application GUI class

The application objects that need to interact with Qt3 GUI, must be instantiated from an application class that is derived from the `QApplication` class. Let suppose that the application GUI class name is "theAppGUI", the application class statement will be

```
class theAppGUI(QApplication):
```

4.4 Interface designer

AVC is fully compatible with Qt3 Designer, the design tool for Qt3. Qt3 Designer produces an interface description that is saved as a specific xml format (.ui).

5 Qt4 reference

This is the part of the user manual specific to Qt4 [4] widgets toolkit.

5.1 Module dependencies

AVC Qt4 depends on PyQt v4 [8] the python bindings for Qt v4 application framework. AVC Qt4 imports the following modules from PyQt.

```
import PyQt4.Qt as qt
```

5.2 Widget naming

Qt4 Designer and Qt4 **do not** allow duplicated naming of widgets. So use the 'double underscore' mechanism to differentiate widgets names.

5.3 Application GUI class

The application objects that need to interact with Qt4 GUI, must be instantiated from an application class that is derived from the `QApplication` class. Let suppose that the application GUI class name is "theAppGUI", the application class statement will be

```
class theAppGUI(QApplication):
```

5.4 Interface designer

AVC is fully compatible with Qt4 Designer, the design tool for Qt4. Qt4 Designer produces an interface description that is saved as a specific xml format (.ui).

6 Tk reference

This is the part of the user manual specific to Tk [5] widgets toolkit.

6.1 Module dependencies

AVC Tk depends on Tkinter [9] the python bindings for Tk application framework. Tkinter is part of the standard python library. AVC Tk imports the following module from python standard library.

```
import Tkinter
```

6.2 Widget naming

The Tk toolkit has a specific naming scheme for its widgets. Widget name is generally the concatenation of its parent's name followed by a period (unless the parent is the root window .) and a string containing no periods, e. g. ".baseframe.button1". For this reason, the complete name of each widget is unique. AVC takes as widget name not the complete Tk name but only the part after the rightmost dot. For example a widget with the complete Tk name ".baseframe.button1" has the AVC name "button1".

6.3 Interface designer

AVC supports the 'Visual Tcl' interface design tool for Tk. Visual Tcl produces an interface description that is saved as tcl script.

7 wxWidgets reference

This is the part of the user manual specific to wxWidgets [6] widgets toolkit.

7.1 Module dependencies

AVC wxWidgets depends on wxPython [10] the python bindings for wxWidgets application framework. AVC wxWidgets imports the following module from python standard library.

```
import wx
```

7.2 Widget naming

Both wxGlade, the interface designer, and wxWidgets allow duplicated naming of widgets.

7.3 Application GUI class

The application objects that need to interact with wxWidgets GUI, must be instantiated (in the simplest form) from an application class that is derived from the `PySimpleApp` class. Let suppose that the application GUI class name is "theAppGUI", the application class statement will be

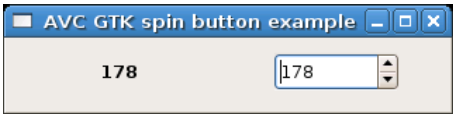
```
class theAppGUI(PySimpleApp):
```

7.4 Interface designer

AVC supports the 'wxGlade' interface design tool for wxWidgets and all other design tools producing an interface description that is saved in the native xml format ('xrc') of wxWidgets.

8 GTK+ examples

8.1 Spin button example



This simple example shows how **AVC** can manage data exchange from widget to widget without any specific code in the application. The program creates a window with two widgets: a spin button and a label. When the value in the spin button is changed by clicking on up or down arrows or by entering it with the keyboard, the new value is displayed into the label.

8.1.1 Python source

```
#!/usr/bin/python
# .copyright  : (c) 2006 Fabrizio Pollastri
# .license    : GNU General Public License v3

import gtk                             # gimp tool kit bindings
import gtk.glade                       # glade bindings

from avc import *                      # AVC


GLADE_XML = 'gtk_spinbutton.glade'     # GUI glade descriptor


class Example(AVC):
  """
  A spin button whose value is replicated into a label
  """

  def __init__(self):

    # create GUI
    self.glade = gtk.glade.XML(GLADE_XML)

    # autoconnect GUI signal handlers
    self.glade.signal_autoconnect(self)

    # the variable holding the spin button value
    self.spin_value = 0


  def on_destroy(self,window):
    "Terminate program at window destroy"
    gtk.main_quit()


#### MAIN

example = Example()                    # instantiate the application
```

```
example.avc_init()                      # connect widgets with variables
gtk.main()                              # run GTK event loop until quit

#### END
```

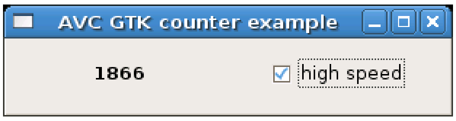
The GUI layout was previously edited with Glade and saved to the file ‘gtk_spinbutton.glade’.

The key points of the example regarding **AVC** are the following.

- During Glade editing, the same name '**spin_value**' was given to the spin button and to the label.
- The **AVC** package is imported at program begin (`from avc import *`).
- The application class is derived from the **AVC** class (`class Example(AVC):`).
- A integer variable with an initial value of 0 and name '**spin_value**' is declared in the application (`self.spin_value = 0`).
- The avc_init method is called after the instantiation of the application class, to realize the connections of the two widgets through the '**spin_value**' variable and to initialize the widgets values with the initial value of the variable (`example.avc_init()`).

Example files in directory 'examples' of distribution: program 'gtk_spinbutton.py' , Glade descriptor 'gtk_spinbutton.glade'.

8.2 Counter example



This example shows how **AVC** can manage data input from a check button widget to the application and from the application to a label widget without any specific code in the application. The program creates a window with two widgets: a check button and a label. The label displays the value of an integer counter. The check button controls the increment speed of the counter. Initially, it is unchecked meaning that the increment speed of the counter is 2 units per second. When the user checks the check button the increment speed grows to 10 units per seconds and returns to the initial value (2) when the check button is unchecked again.

8.2.1 Python source

```
#!/usr/bin/python
# .copyright  : (c) 2006 Fabrizio Pollastri
# .license    : GNU General Public License v3


import gobject                          #--
import gtk                              #- gimp tool kit bindings
import gtk.glade                        # glade bindings

from avc import *                       # AVC

GLADE_XML = 'gtk_counter.glade'         # GUI glade descriptor
LOW_SPEED = 500                         #--
HIGH_SPEED = 100                        #- low and high speed period (ms)
```

```
class ExampleGUI:
  "Counter GUI creation"

  def __init__(self):

    # create GUI
    glade = gtk.glade.XML(GLADE_XML)

    # autoconnect GUI signal handlers
    glade.signal_autoconnect(self)


  def timer(self,period,function):
    "Start a GTK timer calling back 'function' every 'period' seconds."
    self.timer1 = gobject.timeout_add(period,function)

  def on_destroy(iself,window):
    "Terminate program at window destroy"
    gtk.main_quit()


class ExampleMain(AVC):
  """
  A counter displayed in a Label widget whose count speed can be
  accelerated by checking a check box.
  """

  def __init__(self,gui):

    # save GUI
    self.gui = gui

    # the counter variable and its speed status
    self.counter = 0
    self.high_speed = False

    # start incrementer timer
    self.gui.timer(LOW_SPEED,self.incrementer)


  def incrementer(self):
    """
    Counter incrementer: increment period = LOW_SPEED, if high speed is False,
    increment period = HIGH_SPEED otherwise. Return False to destroy previous
    timer.
    """
    self.counter += 1
    if self.high_speed:
      period = HIGH_SPEED
    else:
      period = LOW_SPEED
    self.gui.timer(period,self.incrementer)
    return False

  def high_speed_changed(self,value):
    "Notify change of counting speed to terminal"
    if value:
      print 'counting speed changed to high'
    else:
      print 'counting speed changed to low'
```

```
#### MAIN

example_gui = ExampleGUI()              # create the application GUI
example = ExampleMain(example_gui)      # instantiate the application
example.avc_init()                      # connect widgets with variables
gtk.main()                              # run GTK event loop until quit

#### END
```

The GUI layout was previously edited with Glade and saved to the file 'gtk_counter.glade'.

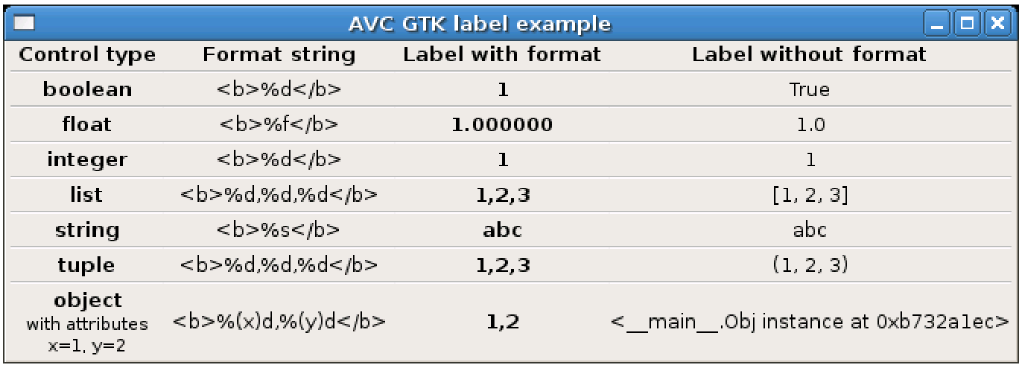
The key points of the example regarding **AVC** are the following.

- During Glade editing, the name '**counter**' was given to the label and the name '**high_speed**' was given to the check button.
- The **AVC** package is imported at program begin (`from avc import *`).
- The application class is derived from the **AVC** class (`class Example(AVC):`).
- A integer variable with an initial value of 0 and name '**counter**' is declared in the application to hold the counter value (`self.counter = 0`).
- A boolean variable with an initial value of False and name '**high_speed**' is declared in the application to hold the speed status of the counter increment speed (`self.high_speed = False`).
- The avc_init method is called after the instantation of the application class (`example.avc_init()`) to realize the connections between the '**counter**' variable and the label widget and between the the '**high_speed**' variable and the check button, the label widget is initialized with the initial value of the '**counter**' variable.

Example files in directory 'examples' of distribution: program 'gtk_counter.py' , Glade descriptor 'gtk_counter.glade'.

8.3 Label example

This example shows the formatting capabilities of the label widget. For each supported type of the connected variable, a formatting string is defined and a sample value of the connected variable is displayed into two label widgets: one with formatting and the other with the standard python string representation.


AVC GTK label example

Control type	Format string	Label with format	Label without format
boolean	%d	**1**	True
float	%f	**1.000000**	1.0
integer	%d	**1**	1
list	%d,%d,%d	**1,2,3**	[1, 2, 3]
string	%s	**abc**	abc
tuple	%d,%d,%d	**1,2,3**	(1, 2, 3)
object with attributes x=1, y=2	%(x)d,%(y)d	**1,2**	<__main__.Obj instance at 0xb732a1ec>

8.3.1 Python source

```
#!/usr/bin/python
# .copyright  : (c) 2008 Fabrizio Pollastri
# .license    : GNU General Public License v3


import gtk                        # gimp tool kit bindings
import gtk.glade                  # glade bindings

from avc import *                 # AVC

GLADE_XML = 'gtk_label.glade'     # GUI glade descriptor


class Example(AVC):
  """
  Showcase of formatting capabilities for the label widget
  """

  def __init__(self):

    # create GUI
    self.glade = gtk.glade.XML(GLADE_XML)

    # autoconnect GUI signal handlers
    self.glade.signal_autoconnect(self)

    # all types of connected variables
    self.bool_value = True
    self.float_value = 1.0
    self.int_value = 1
    self.list_value = [1,2,3]
    self.str_value = 'abc'
    self.tuple_value = (1,2,3)
    class Obj:
      "A generic object with 2 attributes x,y"
      def  __init__(self):
        self.x = 1
        self.y = 2
    self.obj_value = Obj()


  def on_destroy(self,window):
    "Terminate program at window destroy"
    gtk.main_quit()


#### MAIN

example = Example()               # instantiate the application
example.avc_init()                # connect widgets with variables
gtk.main()                        # run GTK event loop until quit

#### END
```

The GUI layout was previously edited with Glade and saved to the file ‘gtk_label.glade’.

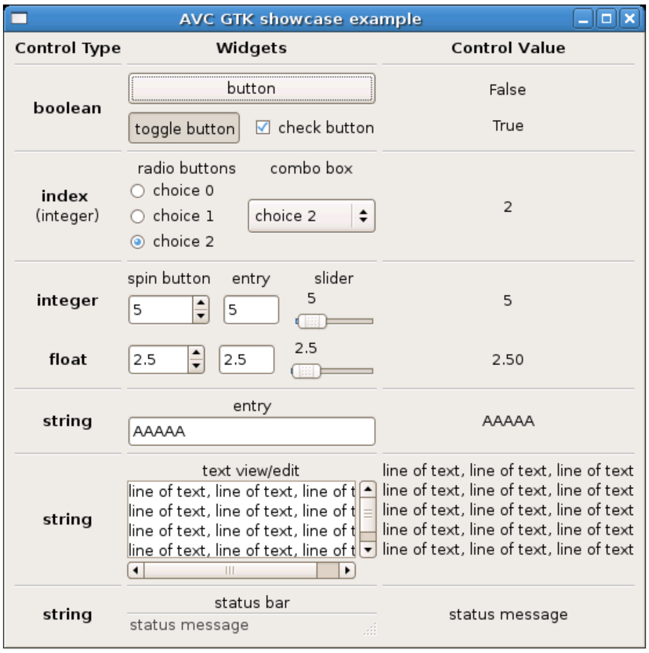
Apart the general requirements of AVC, already pointed out in the other examples, the relevant points of the label example about AVC are the following.

- For each control type (for each row) the two label widgets, one in the column “Label with format" and one in the column "Label without format", are connected to the variable of the corresponding type. For example, in row "boolean", both label widgets are called "bool_value", so they connect to the variable `self.bool_value` .

- When the GTK event loop is entered both columns are set to display the initial values of the connected variables. For example, in row "integer", both labels are set to display the integer value 1.
- The differences of representation between the column "Label with format" and the column "Label without format" reflect the different printout results coming from the formatting capabilities of the label widget and from `str`, the generic textual rendering function of python.

Example files in directory 'examples' of distribution: program 'gtk_label.py' , Glade descriptor 'gtk_label.glade'.

8.4 Showcase example



This example shows a table of all widget/variable type combinations supported by **AVC**. The program creates a window with three columns: the first shows the type of the connected variable, the second shows all the widgets that can be connected to that type of variable, the third shows the current value of each variable. Each row of the window represent a widgets/variable combination as follows.

- Row 1: memoryless button with boolean variable, pressed = True, unpressed = False.
- Row 2: buttons with memory, toggle and check buttons, pressed = True, unpressed = False.
- Row 3: mutually exclusive choices widgets, radio buttons numbered from 0 to 2 and a combo box with 3 items, index variable = number of checked radio button and selected item of combo box.
- Row 4: integer input/output widgets, spin button, entry and slider.
- Row 5: float input/output widgets, spin button, entry and slider.
- Row 6: string input/output widget, entry.
- Row 7: string input/output widget, text view/edit.
- Row 8: status messages, status bar.

The text label widget is used in all output modes for the column of the connected variable values. The program increment the value of each connected variable looping top-bottom at three rows per seconds. The user can also change the values in the connected variables interacting with the widgets.

8.4.1 Python source

```
#!/usr/bin/python
# .copyright  : (c) 2006 Fabrizio Pollastri
# .license    : GNU General Public License v3

import gobject                         #--
import gtk                             #- gimp tool kit bindings
import gtk.glade                       # glade bindings

from avc import *                      # AVC


GLADE_XML = 'gtk_showcase.glade'       # GUI glade descriptor
INCREMENTER_PERIOD = 333               # ms


class Example(AVC):
  "A table of all supported widget/control type combinations"

  def __init__(self):

    # create GUI
    self.glade = gtk.glade.XML(GLADE_XML)

    # autoconnect GUI signal handlers
    self.glade.signal_autoconnect(self)

    # the control variables
    self.boolean1 = False
    self.boolean2 = False
    self.radio = 0
    self.integer = 0
    self.float = 0.0
    self.string = ''
    self.textview = ''
    self.status = ''

    # start variables incrementer
    increment = self.incrementer()
    gobject.timeout_add(INCREMENTER_PERIOD,increment.next)


  def incrementer(self):
    """
    Booleans are toggled, radio button index is rotated from first to last,
    integer is incremented by 1, float by 0.5, string is appended a char
    until maxlen when string is cleared, text view/edit is appended a line
    of text until maxlen when it is cleared. Status bar message is toggled.
    Return True to keep timer alive.
    """
    while True:

      self.boolean1 = not self.boolean1
      yield True

      self.boolean2 = not self.boolean2
```

```
      yield True

      if self.radio >= 2:
        self.radio = 0
      else:
        self.radio += 1
      yield True

      self.integer += 1
      yield True

      self.float += 0.5
      yield True

      if len(self.string) >= 10:
        self.string = ''
      else:
        self.string += 'A'
      yield True

      if len(self.textview) >= 200:
        self.textview = ''
      else:
        self.textview += 'line of text, line of text, line of text\n'
      yield True

      if not self.status:
        self.status = 'status message'
      else:
        self.status = ''
      yield True


  def on_destroy(self,window):
    "Terminate program at window destroy"
    gtk.main_quit()


#### MAIN

example = Example()                       # instantiate the application
example.avc_init()                        # connect widgets with variables
gtk.main()                                # run GTK event loop until quit

#### END
```

The GUI layout was previously edited with Glade and saved to the file ‘gtk_showcase.glade’.

The key points of the example regarding **AVC** are the following.

- During Glade editing, the following names were given to the widgets.

Row	widget	name
1	button	**boolean1__button**
	output value label	**boolean1__var**
2	togglebutton	**boolean2__togglebutton**
	checkbutton	**boolean2__checkbutton**
	output value label	**boolean2__var**
3	radiobutton0	**radio__radiobutton0**
	radiobutton1	**radio__radiobutton1**
	radiobutton2	**radio__radiobutton2**

	combobox	**radio__combobox**
	output value label	**radio__var**
4	spinbutton	**integer__spinbutton**
	entry	**integer__entry**
	slider	**integer__slider**
	output value label	**integer__var**
5	spinbutton	**float__spinbutton**
	entry	**float__entry**
	slider	**float__slider**
	output value label	**float__var**
6	entry	**string__entry**
	output value label	**string__var**
7	textview	**textview__textview**
	output value label	**textview__var**
8	statusbar	**status__statusbar**
	output value label	**status__var**

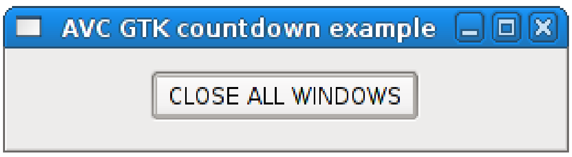
- The **AVC** package is imported at program begin (`from avc import *`).
- The application class is derived from the **AVC** class (`class Example(AVC):`).
- The following variables are declared in the application.

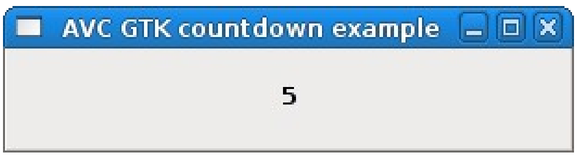
```
self.boolean1 = False
self.boolean2 = False
self.radio = 0
self.integer = 0
self.float = 0.0
self.string = ''
self.textview = ''
self.status = ''
```

- The avc_init method is called after the instantation of the application class (`example.avc_init()`) to realize the connections of all widegts/variable combinations and to initialize the widgets values with the initial value of the connected variable .

Example files in directory 'examples' of distribution: program 'gtk_showcase.py' , Glade descriptor 'gtk_showcase.glade'.

8.5 Countdown example





This example continuously creates at random intervals windows displaying a counter. Each counter starts from 10 and is independently decremented. When the count reaches zero, the counter window is destroyed. Also a main window with a “close all windows” button is displayed.

8.5.1 Python source

```
#!/usr/bin/python
# .copyright  : (c) 2008 Fabrizio Pollastri
# .license    : GNU General Public License v3


import gobject                          #--
import gtk                              #- gimp tool kit bindings
import gtk.glade                        # glade bindings

from avc import *                       # AVC

from random import randint              # random integer generator

GLADE_XML_MAIN = 'gtk_countdown_main.glade'   # main window glade descriptor
GLADE_XML_CD = 'gtk_countdown.glade'    # count down window glade descriptor
TOPLEVEL_NAME = 'countdown'             # name of the top level widget
COUNTDOWN_PERIOD = 500                  # count down at 2 unit per second
MAX_CREATION_PERIOD = 4000              # create a new count down at 1/2 this


class Countdown(AVC):
  """
  A countdown counter displayed in a Label widget. Count starts at given
  value. When count reaches zero the counter and its GUI are destroyed.
  """

  def __init__(self,count_start=10):

    # create GUI
    self.glade = gtk.glade.XML(GLADE_XML_CD)

    # autoconnect GUI signal handlers
    self.glade.signal_autoconnect(self)

    # init the counter variable
    self.counter = count_start

    # connect counter variable with label widget
    self.avc_connect(self.glade.get_widget(TOPLEVEL_NAME))

    # start count down
    gobject.timeout_add(COUNTDOWN_PERIOD,self.decrementer)


  def decrementer(self):
    "Counter decrementer. Return False to destroy previous timer."

    self.counter -= 1

    if self.counter:
      # if counter not zero: reschedule count timer
      gobject.timeout_add(COUNTDOWN_PERIOD,self.decrementer)
    else:
      # counter reached zero: destroy this countdown and its GUI
      self.glade.get_widget(TOPLEVEL_NAME).destroy()

    return False


class Example(AVC):
```

```
  """
  Continuously create at random intervals windows with a countdown from 10 to 0.
  When a countdown reaches zero, its window is destroyed. Also create a main
  window with a "close all" button.
  """

  def __init__(self):

    # create main window
    self.glade = gtk.glade.XML(GLADE_XML_MAIN)

    # create the first countdown
    self.new_countdown()

    # close all button connected variable
    self.close_all = False

    # autoconnect GUI signal handlers
    self.glade.signal_autoconnect(self)


  def new_countdown(self,count_start=10):
    "Create a new countdown"

    # create a new countdown
    Countdown(count_start)

    # autocall after a random delay
    gobject.timeout_add(randint(1,MAX_CREATION_PERIOD),self.new_countdown)

    return False                # destroy previous timer


  def on_destroy(self,window):
    "Terminate program at window destroy"
    gtk.main_quit()

  def close_all_changed(self,value):
    "Terminate program at 'close all' button pressing"
    gtk.main_quit()


#### MAIN

example = Example()                    # instantiate the application
example.avc_init()                     # connect widgets with variables
gtk.main()                             # run GTK event loop until quit

#### END
```

The GUI layout was previously edited with Glade and saved to the file ‘gtk_countdown_main.glade’ for the main window and to the file 'gtk_countdown.glade' for the counter windows.

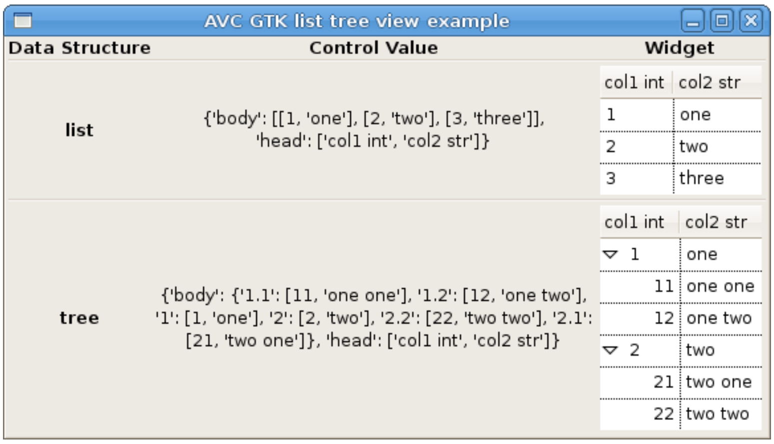
The key points of the example regarding **AVC** are the following.

- During Glade editing of the main window, the name '**close_all**' was given to the button widget; during Glade editing of the counter window, the name '**counter**' was given to the label widget.
- The **AVC** package is imported at program begin (`from avc import *`).

- Both the application class and the counter class are derived from the **AVC** class (`class Example(AVC): | class Countdown(AVC):`).
- A boolean variable with an initial value of False and name '**close_all**' is declared in the application (`self.close_all = False`).
- The method '**close_all_changed**' is defined in the application to handle the press event of the 'close all windows' button.
- The avc_init method is called after the instantiation of the application class (`example.avc_init()`) to init AVC logic and to realize the connection of the 'close all windows' button to the '**close_all**' variable.
- A integer variable with an initial default value of 10 and name '**counter**' is declared in the Countdown class (`self.counter = count_start`)
- The avc_connect method is called at the instantation of the Countdown class (`self.avc_connect(self.glade.get_widget(TOPLEVEL_NAME))`) with argument the window widget of the counter. This call realizes the connection of the label widget to the '**counter**' variable.

Example files in directory 'examples' of distribution: program 'gtk_countdown.py' , Glade descriptors 'gtk_countdown_main.glade' anc 'gtk_countdown.glade'.

8.6 List tree view example



The first row of this example shows the display capabilities of a widget in list view mode: display of 2D tabular data. The second row shows the display capabilities of a widget in tree mode: display of a hierarchical data tree. For each row, it is showed the connected python data equivalent to data displayed by each widget. The rows of the list view are rolled down by one position every 2 seconds.

8.6.1 Python source

```
#!/usr/bin/python
# .copyright  : (c) 2008 Fabrizio Pollastri.
# .license    : GNU General Public License v3

import gobject                          #--
import gtk                              #- gimp tool kit bindings
import gtk.glade                        # glade bindings

from avc import *                       # AVC
```

```
import copy                            # object cloning support

GLADE_XML = 'gtk_listtreeview.glade'   # GUI glade descriptor

UPDATE_PERIOD = 2000                   # ms


class Example(AVC):
  """
  Showcase of display capabilities for the tree view widget
  """

  def __init__(self):

    # create GUI
    self.glade = gtk.glade.XML(GLADE_XML)

    # autoconnect GUI signal handlers
    self.glade.signal_autoconnect(self)

    # make tree view rows reorderable
    self.glade.get_widget('list__treeview').set_reorderable(True)
    self.glade.get_widget('tree__treeview').set_reorderable(True)

    # connected variables
    self.list = {'head':['col1 int','col2 str'], \
      'body':[[1,'one'],[2,'two'],[3,'three']]}
    self.list_work = copy.deepcopy(self.list)
    self.tree = {'head':['col1 int','col2 str'],'body':{ \
      # root rows
      '1':[1,'one'], \
      '2':[2,'two'], \
      # children of root row '1'
      '1.1':[11,'one one'], \
      '1.2':[12,'one two'], \
      # children of root row '2'
      '2.1':[21,'two one'], \
      '2.2':[22,'two two']}}

    # start variables update
    update = self.update()
    gobject.timeout_add(UPDATE_PERIOD,update.next)


  def update(self):
    """
    Tabular data rows data are rolled down.
    """
    rows_num = len(self.list['body'])
    while True:
      # save last row of data
      last_row = self.list_work['body'][-1]
      # shift down one position each data row
      for i in range(1,rows_num):
        self.list_work['body'][-i] = \
          self.list_work['body'][-1-i]
      # copy last row into first position
      self.list_work['body'][0] = last_row
      # copy working copy into connected variable
      self.list = self.list_work
      yield True
```

```
  def on_destroy(self,window):
    "Terminate program at window destroy"
    gtk.main_quit()


#### MAIN

example = Example()                       # instantiate the application
example.avc_init()                        # connect widgets with variables
gtk.main()                                # run GTK event loop until quit

#### END
```

The GUI layout was previously edited with Glade and saved to the file ‘gtk_listtreeview.glade’.

Apart the general requirements of AVC, already pointed out in the other examples, the relevant points of the label example about AVC are the following.

- For the data structure of type list, a control variable named '**self.list**' is defined in the application and connected to label widget is put in the column “Control value” and to the list view widget put in the column “Widget”. The control variable is set to the following initial value:

```
self.list = {'head':['col1 int','col2 str'], \
      'body':[[1,'one'],[2,'two'],[3,'three']]}
```

- For the data structure of type tree, a control variable named '**self.tree**' is defined in the application and connected to label widget is put in the column “Control value” and to the tree view widget put in the column “Widget”. The control variable is set to the following initial value:

```
self.tree = {'head':['col1 int','col2 str'],'body':{ \
      # root rows
      '1':[1,'one'], \
      '2':[2,'two'], \
      # children of root row '1'
      '1.1':[11,'one one'], \
      '1.2':[12,'one two'], \
      # children of root row '2'
      '2.1':[21,'two one'], \
       '2.2':[22,'two two']}}
```

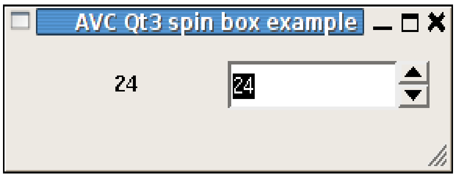
- When the GTK event loop is entered both list and tree view are set to display the initial values of the connected variables as explained in “List view“ at page 13 and in “Tree view” at page 14.

Example files in directory 'examples' of distribution: program 'gtk_listtreeview.py' , Glade descriptor 'gtk_listtreeview.glade'.

9 Qt3 examples

9.1 Spin box example

For a functional description of the graphic interface see the GTK+ “Spin button example“ at page 23.



9.1.1 Python source

```
#!/usr/bin/python
# .copyright  : (c) 2006 Fabrizio Pollastri
# .license    : GNU General Public License v3

from qt import *                       # Qt interface
from qtui import *                     # ui files realizer
import sys                             # system support

from avc import *                      # AVC


UI_FILE = 'qt3_spinbox.ui'


class Example(QApplication,AVC):
  "A spin box whose value is replicated into a text label"

  def __init__(self):

    # create GUI
    QApplication.__init__(self,sys.argv)
    self.root = QWidgetFactory.create(UI_FILE)
    self.setMainWidget(self.root)
    self.root.show()

    # the variable holding the spinbox value
    self.spin_value = 0


#### MAIN

example = Example()                    # instantiate the application
example.avc_init()                     # connect widgets with variables
example.exec_loop()                    # run Qt event loop until quit

#### END
```

The GUI layout was previously edited with Qt3 Designer and saved to the file ‘qt3_spinbox.ui’.

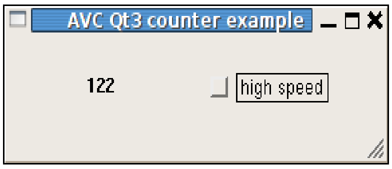
The key points of the example regarding **AVC** are the following.

- During Qt3 Designer editing, the name '**spin_value__spinbox**' was given to the spin box and the name '**spin_value__label**' was given to the label.
- The **AVC** packge is imported at program begin (`from avc import *`).
- The application class is derived from the **QApplication** class of Qt3 and from the **AVC** class of AVC (`class Example(QApplication,AVC):`).
- A integer variable with an initial value of 0 and name '**spin_value**' is declared in the application (`self.spin_value = 0`).
- The avc_init method is called after the instantation of the application class (`example.avc_init()`) to realize the connections of the two widgets through the '**spin_value**' variable and to initialize the widgets values with the initial value of the variable .

Example files in directory 'examples' of distribution: program 'qt3_spinbox.py', UI descriptor 'qt3_spinbox.ui'.

9.2 Counter example

For a functional description of the graphical interface see the GTK+ “Counter example”at page 24.



9.2.1 Python source

```
#!/usr/bin/python
# .copyright  : (c) 2006 Fabrizio Pollastri
# .license    : GNU General Public License v3


from qt import *                       # Qt interface
from qtui import *                     # ui files realizer
import sys                             # system support

from avc import *                      # AVC

UI_FILE = 'qt3_counter.ui'             # qt ui descriptor
LOW_SPEED = 0.5                        #--
HIGH_SPEED = 0.1                       #- low and high speed period (secs)


class ExampleGUI(QApplication):
  "Counter GUI creation"

  def __init__(self):

    # create GUI
    QApplication.__init__(self,sys.argv)
    self.root = QWidgetFactory.create(UI_FILE)
    self.setMainWidget(self.root)
    self.root.show()
```

```
  def timer(self,period,function):
    "Start a Qt timer calling back 'function' every 'period' seconds."
    self.timer1 = QTimer()
    QObject.connect(self.timer1,SIGNAL("timeout()"),function)
    self.timer1.start(int(period * 1000.0))

  def timer_set_period(self,period):
    "Set a new period to timer"
    self.timer1.stop()
    self.timer1.start(int(period * 1000.0))


class ExampleMain(AVC):
  """
  A counter displayed in a Label widget whose count speed can be
  accelerated by checking a check box.
  """

  def __init__(self,gui):

    # save GUI
    self.gui = gui

    # the counter variable and its speed status
    self.counter = 0
    self.high_speed = False

    # start incrementer timer
    self.gui.timer(LOW_SPEED,self.incrementer)


  def incrementer(self):
    """
    Counter incrementer: increment period = LOW_SPEED, if high speed
    is False, increment period = HIGH_SPEED otherwise.
    """
    self.counter += 1
    if self.high_speed:
      period = HIGH_SPEED
    else:
      period = LOW_SPEED
    self.gui.timer_set_period(period)

  def high_speed_changed(self,value):
    "Notify change of counting speed to terminal"
    if value:
      print 'counting speed changed to high'
    else:
      print 'counting speed changed to low'


#### MAIN

example_gui = ExampleGUI()              # create the application GUI
example = ExampleMain(example_gui)      # instantiate the application
example.avc_init()                      # connect widgets with variables
example_gui.exec_loop()                 # run Qt event loop until quit

#### END
```

The GUI layout was previously edited with Qt3 Designer and saved to the file ‘qt3_counter.ui’.

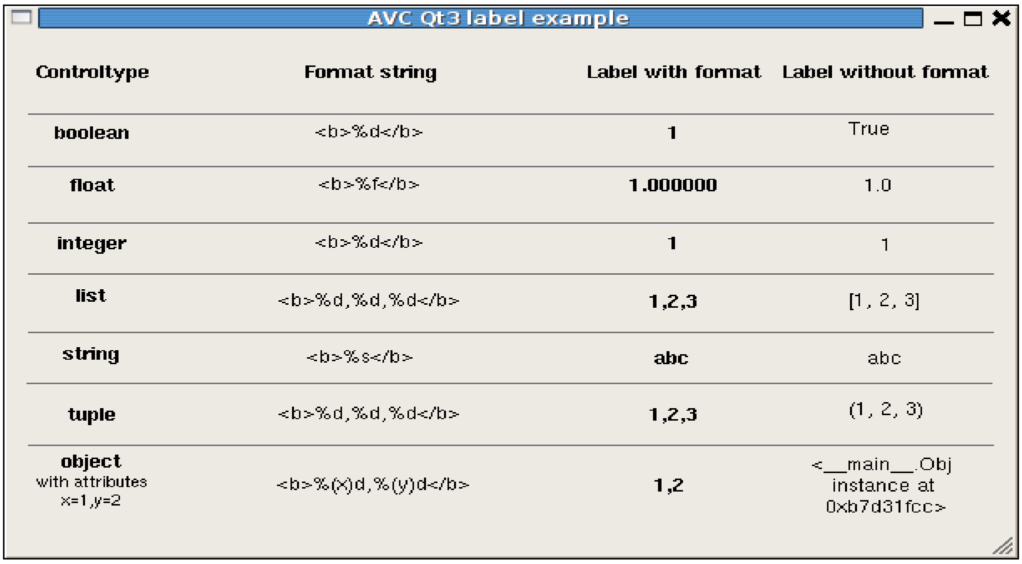
The key points of the example regarding **AVC** are the following.

- During Glade editing, the name '**counter**' was given to the label and the name '**high_speed**' was given to the check button.
- The **AVC** package is imported at program begin (`from avc import *`).
- The application class is derived from the **QApplication** class of Qt3 and from the **AVC** class of AVC (`class Example(QApplication,AVC):`).
- A integer variable with an initial value of 0 and name '**counter**' is declared in the application to hold the counter value (`self.counter = 0`). A boolean variable with an initial value of False and name '**high_speed**' is declared in the application to hold the speed status of the counter increment (`self.high_speed = False`).
- The avc_init method is called after the instantation of the application class (`example.avc_init()`) to realize the connections between the '**counter**' variable and the label widget and between the the '**high_speed**' variable and the check button, the label widget is initialized with the initial value of the '**counter**' variable .

Example files in directory 'examples' of distribution: program 'qt3_counter.py', UI descriptor 'qt3_counter.ui'.

9.3 Label example

This example shows the formatting capabilities of the label widget. For each supported type of the connected variable, a formatting string is defined and a sample value of the connected variable is displayed into two label widgets: one with formatting and the other with the standard python string representation.



Controltype	Format string	Label with format	Label without format
boolean	%d	1	True
float	%f	1.000000	1.0
integer	%d	1	1
list	%d,%d,%d	1,2,3	[1, 2, 3]
string	%s	abc	abc
tuple	%d,%d,%d	1,2,3	(1, 2, 3)
object with attributes x=1,y=2	%(x)d,%(y)d	1,2	<__main__.Obj instance at 0xb7d31fcc>

9.3.1 Python source

```
#!/usr/bin/python
# .copyright  : (c) 2008 Fabrizio Pollastri
# .license    : GNU General Public License v3
```

```
from qt import *                  # Qt interface
from qtui import *                # ui files realizer
import sys                        # system support

from avc import *                 # AVC

UI_FILE = 'qt3_label.ui'          # qt ui descriptor


class Example(QApplication,AVC):
  """
  Showcase of formatting capabilities for the label widget
  """

  def __init__(self):

    # create GUI
    QApplication.__init__(self,sys.argv)
    self.root = QWidgetFactory.create(UI_FILE)
    self.setMainWidget(self.root)
    self.root.show()

    # all types of connected variables
    self.bool_value = True
    self.float_value = 1.0
    self.int_value = 1
    self.list_value = [1,2,3]
    self.str_value = 'abc'
    self.tuple_value = (1,2,3)
    class Obj:
      "A generic object with 2 attributes x,y"
      def  __init__(self):
        self.x = 1
        self.y = 2
    self.obj_value = Obj()


#### MAIN

example = Example()                     # instantiate the application
example.avc_init()                      # connect widgets with variables
example.exec_loop()                     # run Qt event loop until quit

#### END
```

The GUI layout was previously edited with Qt3 Designer and saved to the file ‘qt3_label.ui’.

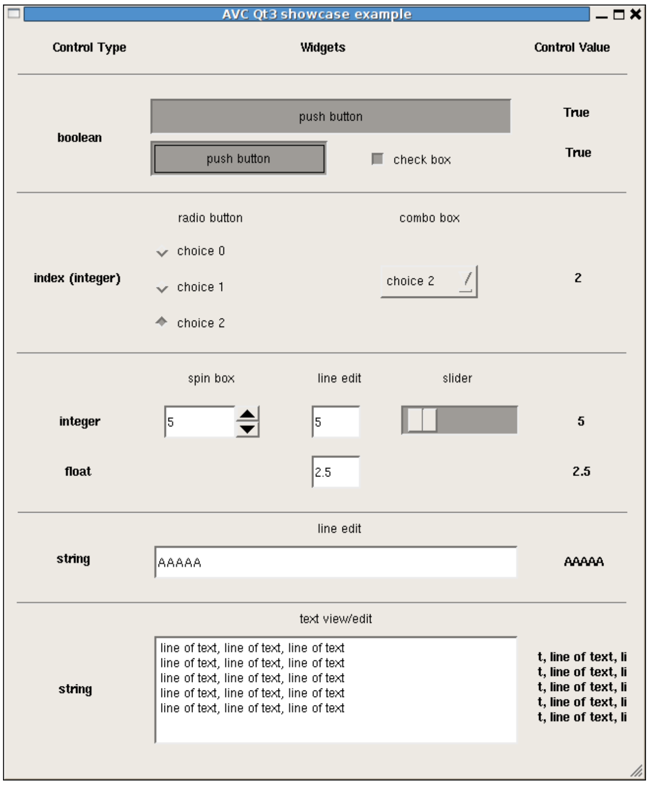
Apart the general requirements of AVC, already pointed out in the other examples, the relevant points of the label example about AVC are the following.

- For each control type (for each row) the two label widgets, one in the column “Label with format” and one in the column “Label without format”, are connected to the variable of the corresponding type. For example, in row “boolean”, both label widgets are called “bool_value”, so they connect to the variable `self.bool_value` .
- When the Qt3 event loop is entered both columns are set to display the initial values of the connected variables. For example, in row “integer”, both labels are set to display the integer value 1.
- The differences of representation between the column “Label with format” and the column “Label without format” reflect the different printout results coming from the formatting capabilities of the label widget and from `str`, the generic textual rendering

function of python.

Example files in directory 'examples' of distribution: program 'qt3_label.py' , UI descriptor 'qt3_label.ui'.

9.4 Showcase example



This example shows a table of all widget/variable type combinations supported by **AVC**. The program creates a window with three columns: the first shows the type of the connected variable, the second shows all the widgets that can be connected to that type of variable, the third shows the current value of each variable. Each row of the window represent a widgets/variable combination.

- Row 1: memoryless button with boolean variable, pressed = True, unpressed = False.
- Row 2: buttons with memory, toggle and check buttons, pressed = True, unpressed = False.
- Row 3: mutually exclusive choices widgets, radiobuttons numbered from 0 to 2 and a combo box with 3 items, index variable = number of checked radiobutton and selected item of combo box.
- Row 4: integer input/output widgets, spin button, entry and slider.
- Row 5: float input/output widget, entry.
- Row 6: string input/output widget, entry.
- Row 7: string input/output widget, text view/edit.

The text label widget is used in all output modes for the column of the connected variable values. The program increment the value of each connected variable looping top-bottom at three rows per seconds. The user can also change the values of the connected variables interacting with the widgets.

9.4.1 Python source

```
#!/usr/bin/python
# .copyright  : (c) 2006 Fabrizio Pollastri
# .license    : GNU General Public License v3


from qt import *                # Qt interface
from qtui import *              # ui files realizer
import sys                      # system support

from avc import *               # AVC

UI_FILE = 'qt3_showcase.ui'     # qt ui descriptor
INCREMENTER_PERIOD = 333        # ms


class Example(QApplication,AVC):
  "A table of all supported widget/control type combinations"

  def __init__(self):

    # create GUI
    QApplication.__init__(self,sys.argv)
    self.root = QWidgetFactory.create(UI_FILE)
    self.setMainWidget(self.root)
    self.root.show()

    # the control variables
    self.boolean1 = False
    self.boolean2 = False
    self.radio = 0
    self.integer = 0
    self.float = 0.0
    self.string = ''
    self.textview = ''

    # start variables incrementer
    self.increment = self.incrementer()
    self.timer = qt.QTimer(self)
    self.connect(self.timer,qt.SIGNAL("timeout()"),self.timer_function)
    self.timer.start(INCREMENTER_PERIOD)


  def timer_function(self):
    self.increment.next()


  def incrementer(self):
    """
    Booleans are toggled, radio button index is rotated from first to last,
    integer is incremented by 1, float by 0.5, string is appended a char
    until maxlen when string is cleared, text view/edit is appended a line
    of text until maxlen when it is cleared.
    Return True to keep timer alive.
    """
    while True:

      self.boolean1 = not self.boolean1
```

```
      yield True

      self.boolean2 = not self.boolean2
      yield True

      if self.radio == 2:
        self.radio = 0
      else:
        self.radio += 1
      yield True

      self.integer += 1
      yield True

      self.float += 0.5
      yield True

      if len(self.string) >= 10:
        self.string = 'A'
      else:
        self.string += 'A'
      yield True

      if len(self.textview) >= 200:
        self.textview = ''
      else:
        self.textview += 'line of text, line of text, line of text\n'
      yield True


#### MAIN

example = Example()                       # instantiate the application
example.avc_init()                        # connect widgets with variables
example.exec_loop()                       # run Qt event loop until quit

#### END
```

The GUI layout was previously edited with Qt3 Designer and saved to the file ‘qt3_showcase.ui’.

The key points of the example regarding **AVC** are the following.

- During Glade editing, the following names were given to the widgets.

widget	name
Row 1:	
button	**boolean1__button**
output value label	**boolean1__var**
Row 2:	
togglebutton	**boolean2__togglebutton**
checkbutton	**boolean2__checkbutton**
output value label	**boolean2__var**
Row 3:	
radiobutton0	**radio__radiobutton0**
radiobutton1	**radio__radiobutton1**
radiobutton2	**radio__radiobutton2**
combobox	**radio__combobox**

output value label	**radio__var**
Row 4:	
spinbutton	**integer__spinbox**
entry	**integer__entry**
slider	**integer__slider**
output value label	**integer__var**
Row 5:	
entry	**float__entry**
output value label	**float__var**
Row 6:	
entry	**string__entry**
output value label	**string__var**
Row 7:	
textview	**textview__textview**
output value label	**textview__var**

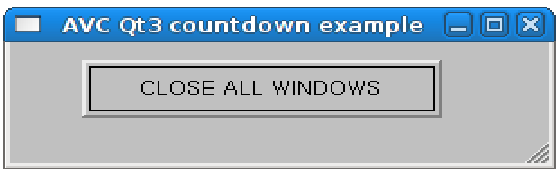
- The **AVC** package is imported at program begin (`from avc import *`).
- The application class is derived from the **QApplication** class of Qt3 and from the **AVC** class of AVC (`class Example(QApplication,AVC):`).
- The following variables are declared in the application.

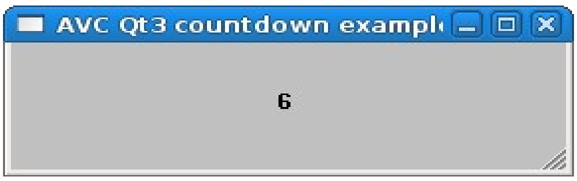
```
        self.boolean1 = False
        self.boolean2 = False
        self.radio = 0
        self.integer = 0
        self.float = 0.0
        self.string = ''
        self.textview = ''
```

- The avc_init method is called after the instantation of the application class (`example.avc_init()`) to realize the connections of all widegts/variable combinations and to initialize the widgets values with the initial value of the connected variable.

Example files in directory 'examples' of distribution: program 'qt3_showcase.py', UI descriptor 'qt3_showcase.ui'.

9.5 Countdown example





This example continuously creates at random intervals windows displaying a counter. Each counter starts from 10 and is independently decremented. When the count reaches zero, the counter window is destroyed. Also a main window with a “close all windows” button is displayed.

9.5.1 Python source

```
#!/usr/bin/python
# .copyright  : (c) 2008 Fabrizio Pollastri
# .license    : GNU General Public License v3


from qt import *                       # Qt interface
from qtui import *                     # ui files realizer
import sys                             # system support

from avc import *                      # AVC

from random import randint             # random integer generator

UI_MAIN = 'qt3_countdown_main.ui'      # qt ui descriptor for main window
UI_CD = 'qt3_countdown.ui'             # qt ui descriptor for countdown window
TOPLEVEL_NAME = 'countdown'            # name of the top level widget
COUNTDOWN_PERIOD = 500                 # count down at 2 unit per second
MAX_CREATION_PERIOD = 4000             # create a new count down at 1/2 this


class Countdown(AVC):
  """
  A countdown counter displayed in a Label widget. Count starts at given
  value. When count reaches zero the counter and its GUI are destroyed.
  """

  def __init__(self,count_start=10):

    # create GUI
    self.root = QWidgetFactory.create(UI_CD)
    self.root.show()

    # init the counter variable
    self.counter = count_start

    # connect counter variable with label widget
    self.avc_connect(self.root)

    # start count down
    self.timer = QTimer(self.root)
    self.root.connect(self.timer,SIGNAL("timeout()"),self.decrementer)
    self.timer.start(COUNTDOWN_PERIOD)


  def decrementer(self):
    "Counter decrementer. Return False to destroy previous timer."
    self.counter -= 1
    # if counter reached zero, destroy this countdown and its GUI
    if not self.counter:
      self.timer.stop()
      del self.timer
      self.root.close()


class Example(QApplication,AVC):
  """
  Continuosly create at random intervals windows with a countdown from 10 to 0.
```

```
  When a countdown reaches zero, its window is destroyed. Also create a main
  window with a "close all" button.
  """

  def __init__(self):

    # create main window
    QApplication.__init__(self,sys.argv)
    self.root = QWidgetFactory.create(UI_MAIN)
    self.setMainWidget(self.root)
    self.root.show()

    # close all button connected variable
    self.close_all = False

    # start count down
    self.timer = QTimer(self)
    self.connect(self.timer,SIGNAL("timeout()"),self.new_countdown)
    self.timer.start(randint(1,MAX_CREATION_PERIOD))


  def new_countdown(self,count_start=10):
    "Create a new countdown"

    # create a new countdown
    Countdown(count_start)

    # autocall after a random delay
    self.timer.stop()
    self.timer.start(randint(1,MAX_CREATION_PERIOD))


  def close_all_changed(self,value):
    "Terminate program at 'close all' button pressing"
    self.quit()


#### MAIN

example = Example()                       # instantiate the application
example.avc_init()                        # connect widgets with variables
example.exec_loop()                       # run Qt event loop until quit

#### END
```

The GUI layout was previously edited with Qt Designer and saved to the file ‘qt3_countdown_main.ui’ for the main window and to the file 'qt3_countdown.ui' for the counter windows.

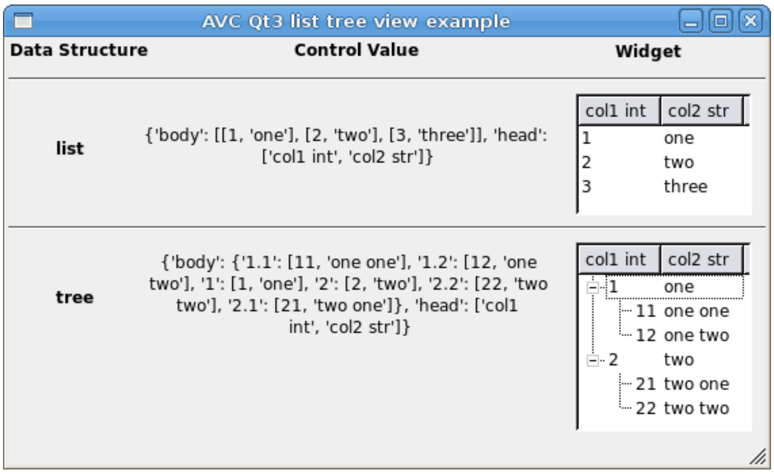
The key points of the example regarding **AVC** are the following.

- During Designer editing of the main window, the name '**close_all**' was given to the button widget; during Designer editing of the counter window, the name '**counter**' was given to the label widget.
- The **AVC** package is imported at program begin (`from avc import *`).
- Both the application class and the counter class are derived from the **AVC** class (`class Example(QApplication,AVC): | class Countdown(AVC):`).
- A boolean variable with an initial value of False and name '**close_all**' is declared in the application (`self.close_all = False`).

- The method '**close_all_changed**' is defined in the application to handle the press event of the 'close all windows' button.
- The avc_init method is called after the instantiation of the application class (`example.avc_init()`) to init AVC logic and to realize the connection of the 'close all windows' button to the '**close_all**' variable.
- A integer variable with an initial default value of 10 and name '**counter**' is declared in the Countdown class (`self.counter = count_start`)
- The avc_connect method is called at the instantation of the Countdown class (`self.avc_connect(self.root)`) with argument the window widget of the counter. This call realizes the connection of the label widget to the '**counter**' variable.

Example files in directory 'examples' of distribution: program 'qt3_countdown.py' , Qt Designer descriptors 'qt3_countdown_main.ui' anc 'qt3_countdown.ui'.

9.6 List tree view example



The first row of this example shows the display capabilities of a widget in list view mode: display of 2D tabular data. The second row shows the display capabilities of a widget in tree mode: display of a hierarchical data tree. For each row, it is showed the connected python data equivalent to data displayed by each widget. The rows of the list view are rolled down by one position every 2 seconds.

9.6.1 Python source

```
#!/usr/bin/python
# .copyright  : (c) 2008 Fabrizio Pollastri.
# .license    : GNU General Public License v3


from qt import *                       # Qt interface
from qtui import *                     # ui files realizer

import copy                            # object cloning support
import sys                             # system support

from avc import *                      # AVC

UI_FILE = 'qt3_listtreeview.ui'        # qt ui descriptor
```

```
UPDATE_PERIOD = 2000                   # ms


class Example(QApplication,AVC):
  """
  Showcase of display capabilities for the list tree view widget
  """

  def __init__(self):

    # create GUI
    QApplication.__init__(self,sys.argv)
    self.root = QWidgetFactory.create(UI_FILE)
    self.setMainWidget(self.root)
    self.root.show()

    # connected variables
    self.list = {'head':['col1 int','col2 str'], \
      'body':[[1,'one'],[2,'two'],[3,'three']]}
    self.list_work = copy.deepcopy(self.list)
    self.tree = {'head':['col1 int','col2 str'],'body':{ \
      # root rows
      '1':[1,'one'], \
      '2':[2,'two'], \
      # children of root row '1'
      '1.1':[11,'one one'], \
      '1.2':[12,'one two'], \
      # children of root row '2'
      '2.1':[21,'two one'], \
      '2.2':[22,'two two']}}

    # start variables update
    update = self.update()
    self.timer1 = QTimer()
    QObject.connect(self.timer1,SIGNAL("timeout()"),update.next)
    self.timer1.start(UPDATE_PERIOD)


  def update(self):
    """
    Tabular data rows data are rolled down.
    """
    rows_num = len(self.list['body'])
    while True:
      # save last row of data
      last_row = self.list_work['body'][-1]
      # shift down one position each data row
      for i in range(1,rows_num):
        self.list_work['body'][-i] = \
          self.list_work['body'][-1-i]
      # copy last row into first position
      self.list_work['body'][0] = last_row
      # copy working copy into connected variable
      self.list = self.list_work
      yield True


#### MAIN

example = Example()                    # instantiate the application
example.avc_init()                     # connect widgets with variables
example.exec_loop()                    # run Qt event loop until quit
```

```
### END
```

The GUI layout was previously edited with Qt Designer and saved to the file ‘qt3_listtreeview.ui’.

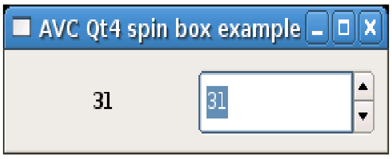
Apart the general requirements of AVC, already pointed out in the other examples, the relevant points of the list tree view example are the same of the GTK+ “List tree view example”example at page 34.

Example files in directory 'examples' of distribution: program 'qt3_listtreeview.py' , Qt Designer descriptor 'qt3_listtreeview.ui'.

10 Qt4 examples

10.1 Spin box example

For a functional description of the graphic interface see the GTK+ “Spin button example“ at page 23.



10.1.1 Python source

```
#!/usr/bin/python
# .copyright  : (c) 2006 Fabrizio Pollastri
# .license    : GNU General Public License v3


from PyQt4.QtCore import *             # Qt core
from PyQt4.QtGui import *              # Qt GUI interface
from PyQt4.uic import *                # ui files realizer
import sys                             # system support

from avc import *                      # AVC

UI_FILE = 'qt4_spinbox.ui'             # qt ui descriptor


class Example(QApplication,AVC):
  "A spin box whose value is replicated into a text label"

  def __init__(self):

    # create GUI
    QApplication.__init__(self,sys.argv)
    self.root = loadUi(UI_FILE)
    self.root.show()

    # the variable holding the spin box value
    self.spin_value = 0


#### MAIN

example = Example()                    # instantiate the application
example.avc_init()                     # connect widgets with variables
example.exec_()                        # run Qt event loop until quit

#### END
```

The GUI layout was previously edited with Qt4 Designer and saved to the file ‘qt4_spinbox.ui’.

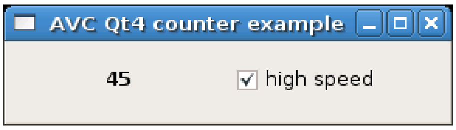
The key points of the example regarding **AVC** are the following.

- During Qt4 Designer editing, the name '**spin_value__spinbox**' was given to the spin box and the name '**spin_value__label**' was given to the label.
- The **AVC** package is imported at program begin (`from avc import *`).
- The application class is derived from the **QApplication** class of Qt4 and from the **AVC** class of AVC (`class Example(QApplication,AVC):`).
- A integer variable with an initial value of 0 and name '**spin_value**' is declared in the application (`self.spin_value = 0`).
- The avc_init method is called after the instantiation of the application class (`example.avc_init()`) to realize the connections of the two widgets through the '**spin_value**' variable and to initialize the widgets values with the initial value of the variable .

Example files in directory 'examples' of distribution: program 'qt4_spinbox.py', UI descriptor 'qt4_spinbox.ui'.

10.2 Counter example

For a functional description of the graphical interface see the GTK+ “Counter example“ at page 24.



10.2.1 Python source

```
#!/usr/bin/python
# .copyright  : (c) 2006 Fabrizio Pollastri
# .license    : GNU General Public License v3


from PyQt4.QtCore import *       # Qt core
from PyQt4.QtGui import *        # Qt GUI interface
from PyQt4.uic import *                 # ui files realizer
import sys                       # system support

from avc import *                # AVC

UI_FILE = 'qt4_counter.ui'       # qt ui descriptor
LOW_SPEED = 0.5                         #--
HIGH_SPEED = 0.1                 #- low and high speed count period (sec)


class ExampleGUI(QApplication):
  "Counter GUI creation"

  def __init__(self):

    # create GUI
    QApplication.__init__(self,sys.argv)
    self.root = loadUi(UI_FILE)
    self.root.show()

  def timer_start(self,period,function):
```

```
    "Start a Qt timer calling back 'function' every 'period' seconds."
    self.timer1 = QTimer()
    QObject.connect(self.timer1,SIGNAL("timeout()"),function)
    self.timer1.start(int(period * 1000.0))

  def timer_set_period(self,period):
    "Set a new period to timer"
    self.timer1.stop()
    self.timer1.start(int(period * 1000.0))


class ExampleMain(AVC):
  """
  A counter displayed in a Label widget whose count speed can be
  accelerated by checking a check box.
  """

  def __init__(self,gui):

    # save GUI
    self.gui = gui

    # the counter variable and its speed status
    self.counter = 0
    self.high_speed = False

    # start incrementer timer
    self.gui.timer_start(LOW_SPEED,self.incrementer)


  def incrementer(self):
    """
    Counter incrementer: increment period = LOW_SPEED, if high speed
    is False, increment period = HIGH_SPEED otherwise.
    """
    self.counter += 1
    if self.high_speed:
      period = HIGH_SPEED
    else:
      period = LOW_SPEED
    self.gui.timer_set_period(period)

  def high_speed_changed(self,value):
    "Notify change of counting speed to terminal"
    if value:
      print 'counting speed changed to high'
    else:
      print 'counting speed changed to low'


#### MAIN

example_gui = ExampleGUI()              # create the application GUI
example = ExampleMain(example_gui)      # instantiate the application
example.avc_init()                      # connect widgets with variables
example_gui.exec_()                     # run Qt event loop until quit

#### END
```

The GUI layout was previously edited with Qt4 Designer and saved to the file ‘qt4_counter.ui’.

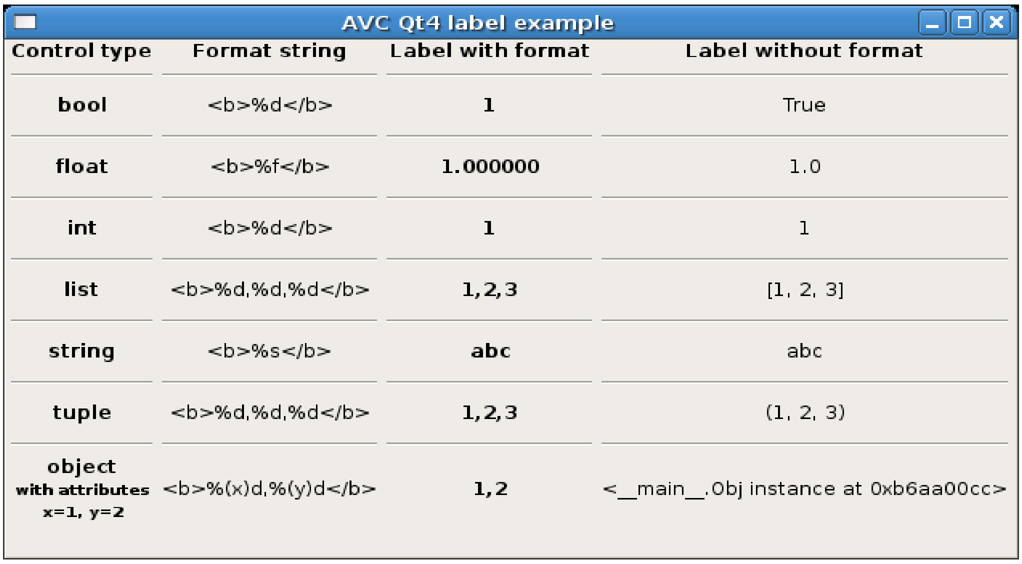
The key points of the example regarding **AVC** are the following.

- During Qt4 Designer editing, the name '**counter**' was given to the label and the name '**high_speed**' was given to the check button.
- The **AVC** package is imported at program begin (`from avc import *`).
- The application class is derived from the **QApplication** class of Qt4 and from the **AVC** class of AVC. (`class Example(QApplication,AVC):`).
- A integer variable with an initial value of 0 and name '**counter**' is declared in the application to hold the counter value (`self.counter = 0`).
- A boolean variable with an initial value of False and name '**high_speed**' is declared in the application to hold the speed status of the counter increment speed (`self.high_speed = False`).
- The avc_init method is called after the instantation of the application class (`example.avc_init()`) to realize the connections between the '**counter**' variable and the label widget and between the the '**high_speed**' variable and the check button, the label widget is initialized with the initial value of the '**counter**' variable .

Example files in directory 'examples' of distribution: program 'qt4_counter.py', UI descriptor 'qt4_counter.ui'.

10.3 Label example

This example shows the formatting capabilities of the label widget. For each supported type of the connected variable, a formatting string is defined and a sample value of the connected variable is displayed into two label widgets: one with formatting and the other with the standard python string representation.



AVC Qt4 label example

Control type	Format string	Label with format	Label without format
bool	%d	**1**	True
float	%f	**1.000000**	1.0
int	%d	**1**	1
list	%d,%d,%d	**1,2,3**	[1, 2, 3]
string	%s	**abc**	abc
tuple	%d,%d,%d	**1,2,3**	(1, 2, 3)
object with attributes x=1, y=2	%(x)d,%(y)d	**1,2**	<__main__.Obj instance at 0xb6aa00cc>

10.3.1 Python source

```
#!/usr/bin/python
# .copyright  : (c) 2008 Fabrizio Pollastri
# .license    : GNU General Public License v3
```

```
from PyQt4.QtCore import *             # Qt core
from PyQt4.QtGui import *              # Qt GUI interface
from PyQt4.uic import *                # ui files realizer
import sys                             # system support

from avc import *                      # AVC

UI_FILE = 'qt4_label.ui'               # qt ui descriptor


class Example(QApplication,AVC):
  """
  Showcase of formatting capabilities for the label widget
  """

  def __init__(self):

    # create GUI
    QApplication.__init__(self,sys.argv)
    self.root = loadUi(UI_FILE)
    self.root.show()

    # all types of connected variables
    self.bool_value = True
    self.float_value = 1.0
    self.int_value = 1
    self.list_value = [1,2,3]
    self.str_value = 'abc'
    self.tuple_value = (1,2,3)
    class Obj:
      "A generic object with 2 attributes x,y"
      def  __init__(self):
        self.x = 1
        self.y = 2
    self.obj_value = Obj()


#### MAIN

example = Example()                    # instantiate the application
example.avc_init()                     # connect widgets with variables
example.exec_()                        # run Qt event loop until quit

#### END
```

The GUI layout was previously edited with Qt4 Designer and saved to the file ‘qt4_label.ui’.

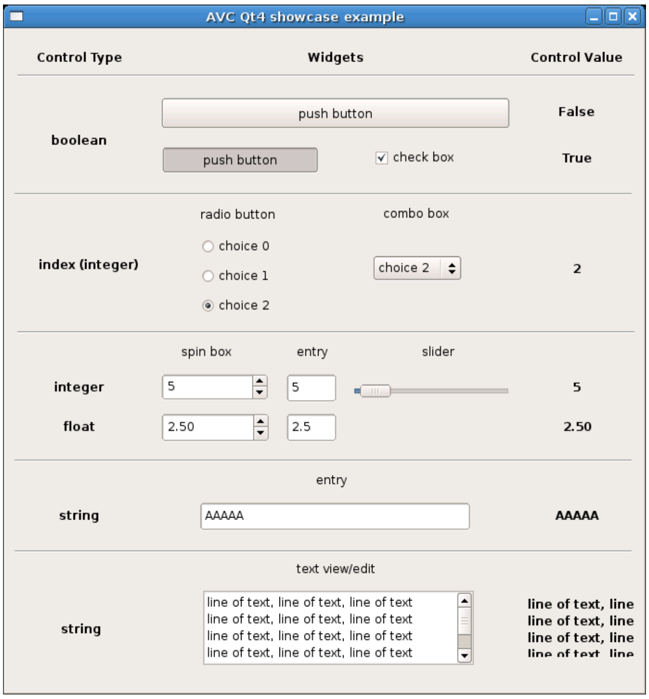
Apart the general requirements of AVC, already pointed out in the other examples, the relevant points of the label example about AVC are the following.

- For each control type (for each row) the two label widgets, one in the column “Label with format” and one in the column “Label without format”, are connected to the variable of the corresponding type. For example, in row “boolean”, both label widgets are called “bool_value”, so they connect to the variable `self.bool_value` .
- When the Qt4 event loop is entered both columns are set to display the initial values of the connected variables. For example, in row “integer”, both labels are set to display the integer value 1.
- The differences of representation between the column “Label with format” and the column “Label without format” reflect the different printout results coming from the

formatting capabilities of the label widget and from `str`, the generic textual rendering function of python.

Example files in directory 'examples' of distribution: program 'qt4_label.py' , UI descriptor 'qt4_label.ui'.

10.4 Showcase example



This example shows a table of all widget/variable type combinations supported by **AVC**. The program creates a window with three columns: the first shows the type of the connected variable, the second shows all the widgets that can be connected to that type of variable, the third shows the current value of each variable. Each row of the window represent a widgets/variable combination.

- Row 1: memoryless button with boolean variable, pressed = True, unpressed = False.
- Row 2: buttons with memory, toggle and check buttons, pressed = True, unpressed = False.
- Row 3: mutually exclusive choices widgets, radio buttons numbered from 0 to 2 and a combo box with 3 items, index variable = number of checked radio button and selected item of combo box.
- Row 4: integer input/output widgets, spin button, entry and slider.
- Row 5: float input/output widgets, spin button and entry.
- Row 6: string input/output widget, entry.
- Row 7: string input/output widget, text view/edit.

The text label widget is used in all output modes for the column of the connected variable values. The program increment the value of each connected variable looping top-bottom at three rows per seconds. The user can also change the values of the connected variables interacting with the widgets.

10.4.1 Python source

```
#!/usr/bin/python
# .copyright  : (c) 2006 Fabrizio Pollastri
# .license    : GNU General Public License v3


from PyQt4.QtCore import *              # Qt core
from PyQt4.QtGui import *               # Qt GUI interface
from PyQt4.uic import *                 # ui files realizer
import sys                              # system support

from avc import *                       # AVC

UI_FILE = 'qt4_showcase.ui'             # qt ui descriptor
INCREMENTER_PERIOD = 333                # ms


class Example(QApplication,AVC):
  """
  A table of all supported widget/control type combinations
  """

  def __init__(self):

    # create GUI
    QApplication.__init__(self,sys.argv)
    self.root = loadUi(UI_FILE)
    self.root.show()

    # group all radio buttons into a button group. Button group not
    # managed by Qt4 Designer ?!
    self.radio_button0 = self.root.findChild(QWidget,'radio__button0')
    self.radio_button1 = self.root.findChild(QWidget,'radio__button1')
    self.radio_button2 = self.root.findChild(QWidget,'radio__button2')
    self.radio_button_group = QButtonGroup()
    self.radio_button_group.addButton(self.radio_button0,0)
    self.radio_button_group.addButton(self.radio_button1,1)
    self.radio_button_group.addButton(self.radio_button2,2)

    # the control variables
    self.boolean1 = False
    self.boolean2 = False
    self.radio = 0
    self.integer = 0
    self.float = 0.0
    self.string = ''
    self.textview = ''

    # start variables incrementer
    self.increment = self.incrementer()
    self.timer = QTimer(self)
    self.connect(self.timer,SIGNAL("timeout()"),self.timer_function)
    self.timer.start(int(INCREMENTER_PERIOD))


  def timer_function(self):
    self.increment.next()


  def incrementer(self):
    """
```

```
    Booleans are toggled, radio button index is rotated from first to last,
    integer is incremented by 1, float by 0.5, string is appended a char
    until maxlen when string is cleared, text view/edit is appended a line
    of text until maxlen when text is cleared, status bar message is toggled.
    Return True to keep timer alive.
    """
    while True:

      self.boolean1 = not self.boolean1
      yield True

      self.boolean2 = not self.boolean2
      yield True

      if self.radio == 2:
        self.radio = 0
      else:
        self.radio += 1
      yield True

      self.integer += 1
      yield True

      self.float += 0.5
      yield True

      if len(self.string) >= 10:
        self.string = 'A'
      else:
        self.string += 'A'
      yield True

      if len(self.textview) >= 200:
        self.textview = ''
      else:
        self.textview += 'line of text, line of text, line of text\n'
      yield True


#### MAIN

example = Example()                    # instantiate the application
example.avc_init()                     # connect widgets with variables
example.exec_()                        # run Qt event loop until quit

#### END
```

The GUI layout was previously edited with Qt4 Designer and saved to the file ‘qt4_showcase.ui’.

The key points of the example regarding **AVC** are the following.

- During Qt designer editing, the following names were given to the widgets.

widget	name
Row 1:	
button	**boolean1__button**
output value label	**boolean1__var**
Row 2:	
togglebutton	**boolean2__togglebutton**

checkbutton	**boolean2__checkbutton**
output value label	**boolean2__var**
Row 3:	
radiobutton0	**radio__radiobutton0**
radiobutton1	**radio__radiobutton1**
radiobutton2	**radio__radiobutton2**
combobox	**radio__combobox**
output value label	**radio__var**
Row 4:	
spinbutton	**integer__spinbox**
entry	**integer__entry**
slider	**integer__slider**
output value label	**integer__var**
Row 5:	
spinbutton	**float__spinbutton**
entry	**float__entry**
output value label	**float__var**
Row 6:	
entry	**string__entry**
output value label	**string__var**
Row 7:	
textview	**textview__textview**
output value label	**textview__var**

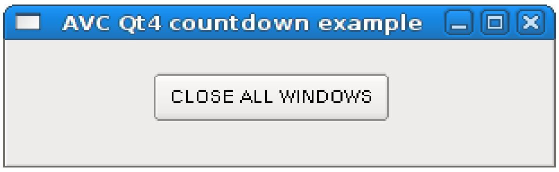
- The **AVC** package is imported at program begin (`from avc import *`).
- The application class is derived from the **QApplication** class of Qt4 and from the **AVC** class of AVC (`class Example(QApplication,AVC):`).
- The following variables are declared in the application.

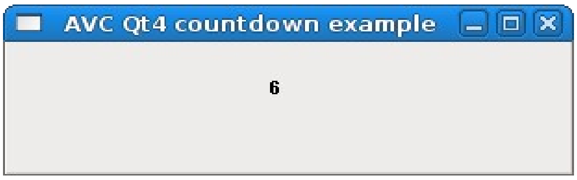
```
self.boolean1 = False
self.boolean2 = False
self.radio = 0
self.integer = 0
self.float = 0.0
self.string = ''
self.textview = ''
```

- The avc_init method is called after the instantation of the application class (`example.avc_init()`) to realize the connections of all widegts/variable combinations and to initialize the widgets values with the initial value of the connected variable.

Example files in directory 'examples' of distribution: program 'qt4_showcase.py', UI descriptor 'qt4_showcase.ui'.

10.5 Countdown example





This example continuously creates at random intervals windows displaying a counter. Each counter starts from 10 and is independently decremented. When the count reaches zero, the counter window is destroyed. Also a main window with a “close all windows” button is displayed.

10.5.1 Python source

```
#!/usr/bin/python
# .copyright  : (c) 2008 Fabrizio Pollastri
# .license    : GNU General Public License v3


from PyQt4.QtCore import *              # Qt core
from PyQt4.QtGui import *               # Qt GUI interface
from PyQt4.uic import *                 # ui files realizer
import sys                              # system support

from avc import *                       # AVC

from random import randint              # random integer generator

UI_MAIN = 'qt4_countdown_main.ui'       # qt ui descriptor for main window
UI_CD = 'qt4_countdown.ui'              # qt ui descriptor for countdown window
TOPLEVEL_NAME = 'countdown'             # name of the top level widget
COUNTDOWN_PERIOD = 500                  # count down at 2 unit per second
MAX_CREATION_PERIOD = 4000              # create a new count down at 1/2 this


class Countdown(AVC):
  """
  A countdown counter displayed in a Label widget. Count starts at given
  value. When count reaches zero the counter and its GUI are destroyed.
  """

  def __init__(self,count_start=10):

    # create GUI
    self.root = loadUi(UI_CD)
    self.root.show()

    # init the counter variable
    self.counter = count_start

    # connect counter variable with label widget
    self.avc_connect(self.root)

    # start count down
```

```
    self.timer = QTimer(self.root)
    self.root.connect(self.timer,SIGNAL("timeout()"),self.decrementer)
    self.timer.start(COUNTDOWN_PERIOD)


  def decrementer(self):
    "Counter decrementer. Return False to destroy previous timer."
    self.counter -= 1
    # if counter reached zero, destroy this countdown and its GUI
    if not self.counter:
      self.timer.stop()
      del self.timer
      self.root.close()


class Example(QApplication,AVC):
  """
  Continuously create at random intervals windows with a countdown from 10 to 0.
  When a countdown reaches zero, its window is destroyed. Also create a main
  window with a "close all" button.
  """

  def __init__(self):

    # create main window
    QApplication.__init__(self,sys.argv)
    self.root = loadUi(UI_MAIN)
    self.root.show()

    # close all button connected variable
    self.close_all = False

    # start count down
    self.timer = QTimer(self)
    self.connect(self.timer,SIGNAL("timeout()"),self.new_countdown)
    self.timer.start(randint(1,MAX_CREATION_PERIOD))


  def new_countdown(self,count_start=10):
    "Create a new countdown"

    # create a new countdown
    Countdown(count_start)

    # autocall after a random delay
    self.timer.stop()
    self.timer.start(randint(1,MAX_CREATION_PERIOD))


  def close_all_changed(self,value):
    "Terminate program at 'close all' button pressing"
    self.quit()


#### MAIN

example = Example()                       # instantiate the application
example.avc_init()                        # connect widgets with variables
example.exec_()                           # run Qt event loop until quit

#### END
```

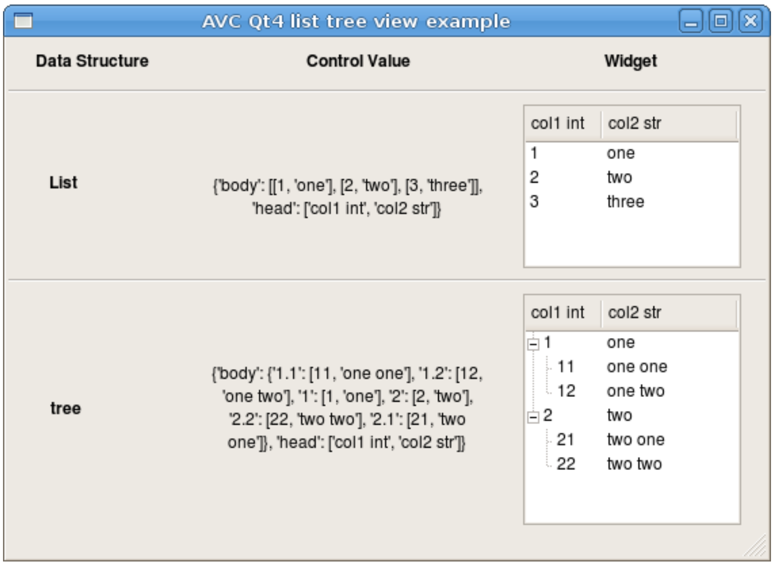
The GUI layout was previously edited with Qt Designer and saved to the file ‘qt4_countdown_main.ui’ for the main window and to the file 'qt4_countdown.ui' for the counter windows.

The key points of the example regarding **AVC** are the following.

- During Designer editing of the main window, the name '**close_all**' was given to the button widget; during Designer editing of the counter window, the name '**counter**' was given to the label widget.
- The **AVC** package is imported at program begin (`from avc import *`).
- Both the application class and the counter class are derived from the **AVC** class (`class Example(QApplication,AVC): | class Countdown(AVC):`).
- A boolean variable with an initial value of False and name '**close_all**' is declared in the application (`self.close_all = False`).
- The method '**close_all_changed**' is defined in the application to handle the press event of the 'close all windows' button.
- The avc_init method is called after the instantiation of the application class (`example.avc_init()`) to init AVC logic and to realize the connection of the 'close all windows' button to the '**close_all**' variable.
- A integer variable with an initial default value of 10 and name '**counter**' is declared in the Countdown class (`self.counter = count_start`)
- The avc_connect method is called at the instantation of the Countdown class (`self.avc_connect(self.root)`) with argument the window widget of the counter. This call realizes the connection of the label widget to the '**counter**' variable.

Example files in directory 'examples' of distribution: program 'qt4_countdown.py' , Qt Designer descriptors 'qt4_countdown_main.ui' anc 'qt4_countdown.ui'.

10.6 List tree view example



The first row of this example shows the display capabilities of a widget in list view mode: display of 2D tabular data. The second row shows the display capabilities of a widget in tree mode: display of a hierarchical data tree. For each row, it is showed the connected python data equivalent to data displayed by each widget. The rows of the list view are rolled down by one position every 2 seconds.

10.6.1 Python source

```
#!/usr/bin/python
# .copyright  : (c) 2008 Fabrizio Pollastri.
# .license    : GNU General Public License v3


from PyQt4.QtCore import *             # Qt core
from PyQt4.QtGui import *              # Qt GUI interface
from PyQt4.uic import *                # ui files realizer

import copy                            # object cloning support
import sys                             # system support

from avc import *                      # AVC

UI_FILE = 'qt4_listtreeview.ui'        # qt ui descriptor

UPDATE_PERIOD = 2000                   # ms


class Example(QApplication,AVC):
  """
  Showcase of display capabilities for the list tree view widget
  """

  def __init__(self):

    # create GUI
    QApplication.__init__(self,sys.argv)
    self.root = loadUi(UI_FILE)
    self.root.show()

    # connected variables
    self.list = {'head':['col1 int','col2 str'], \
      'body':[[1,'one'],[2,'two'],[3,'three']]}
    self.list_work = copy.deepcopy(self.list)
    self.tree = {'head':['col1 int','col2 str'],'body':{ \
      # root rows
      '1':[1,'one'], \
      '2':[2,'two'], \
      # children of root row '1'
      '1.1':[11,'one one'], \
      '1.2':[12,'one two'], \
      # children of root row '2'
      '2.1':[21,'two one'], \
      '2.2':[22,'two two']}}

    # start variables update
    update = self.update()
    self.timer1 = QTimer()
    QObject.connect(self.timer1,SIGNAL("timeout()"),update.next)
    self.timer1.start(UPDATE_PERIOD)


  def update(self):
    """
    Tabular data rows data are rolled down.
    """
    rows_num = len(self.list['body'])
    while True:
      # save last row of data
```

```
      last_row = self.list_work['body'][-1]
      # shift down one position each data row
      for i in range(1,rows_num):
        self.list_work['body'][-i] = \
          self.list_work['body'][-1-i]
      # copy last row into first position
      self.list_work['body'][0] = last_row
      # copy working copy into connected variable
      self.list = self.list_work
      yield True


#### MAIN

example = Example()                     # instantiate the application
example.avc_init()                      # connect widgets with variables
example.exec_()                         # run Qt event loop until quit

#### END
```

The GUI layout was previously edited with Qt Designer and saved to the file ‘qt4_listtreeview.ui’.

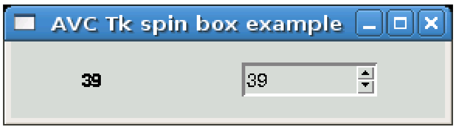
Apart the general requirements of AVC, already pointed out in the other examples, the relevant points of the list tree view example are the same of the GTK+ “List tree view example”example at page 34.

Example files in directory 'examples' of distribution: program 'qt4_listtreeview.py' , Qt Designer descriptor 'qt4_listtreeview.ui'.

11 Tk examples

11.1 Spin box example

For a functional description of the graphical interface see the GTK+ “Spin button example“ at page 23 .



11.1.1 Python source

```
#!/usr/bin/python
# .copyright  : (c) 2007 Fabrizio Pollastri
# .license    : GNU General Public License v3


from Tkinter import *                   # Tk interface

from avc import *                       # AVC

TCL_FILE = 'tk_spinbox.tcl'             # GUI description as tcl script


class Example(AVC):
  """
  A spin control whose value is replicated into a label
  """

  def __init__(self):

    # create GUI
    self.root = Tk()
    self.root.eval('set argc {}; set argv {}; proc ::main {argc argv} {};')
    self.root.tk.evalfile(TCL_FILE)

    # terminate program at toplevel window destroy: connect toplevel
    # destroy signal to termination handler.
    self.root.bind_class('Toplevel','<Destroy>',lambda event: self.root.quit())

    # the variable holding the spin control value
    self.spin_value = 0


#### MAIN

example = Example()                     # instantiate the application
example.avc_init()                      # connect widgets with variables
Tkinter.mainloop()                      # run Tk event loop until quit

#### END
```

The GUI layout was previously edited with Visual Tcl and saved to the file ‘tk_spinbox.tcl’.

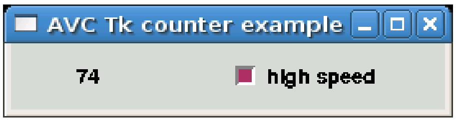
The key points of the example regarding **AVC** are the following.

- During Visual Tcl editing, the name '**spin_value__spinbox**' was given to the spin box and the name '**spin_value__label**' was given to the label.
- The **AVC** package is imported at program begin (`from avc import *`).
- The application class is derived from the from the **AVC** class of AVC (`class Example(AVC):`).
- A integer variable with an initial value of 0 and name '**spin_value**' is declared in the application (`self.spin_value = 0`).
- The avc_init method is called after the instantation of the application class, to realize the connections of the two widgets through the '**spin_value**' variable and to initialize the widgets values with the initial value of the variable (`example.avc_init()`).

Example files in directory 'examples' of distribution: program 'tk_spinbox.py', graphic interface descriptor as tcl script 'tk_spinbox.tcl'.

11.2 Counter example

For a functional description of the graphical interface see the GTK+ “Counter example“ at page 24.



11.2.1 Python source

```
#!/usr/bin/python
# .copyright  : (c) 2006 Fabrizio Pollastri
# .license    : GNU General Public License v3


from Tkinter import *                 # Tk interface

from avc import *                     # AVC

TCL_FILE = 'tk_counter.tcl'           # GUI description as tcl script
LOW_SPEED = 500                       #--
HIGH_SPEED = 100                      #- low and high speed count period (ms)


class ExampleGUI:
  "Counter GUI creation"

  def __init__(self):

    # create GUI
    self.root = Tk()
    self.root.eval('set argc {}; set argv {}; proc ::main {argc argv} {};')
    self.root.tk.evalfile(TCL_FILE)

    # terminate program at toplevel window destroy: connect toplevel
    # destroy signal to termination handler.
    self.root.bind_class('Toplevel','<Destroy>',lambda event: self.root.quit())


  def timer(self,period,function):
```

```
    "Start a Tk timer calling back 'function' every 'period' seconds."
    self.root.after(period,function)


class ExampleMain(AVC):
  """
  A counter displayed in a Label widget whose count speed can be doubled
  by pressing a Toggle Button.
  """

  def __init__(self,gui):

    # save GUI
    self.gui = gui

    # the counter variable and its speed status
    self.counter = 0
    self.high_speed = False

    # start incrementer timer
    self.gui.timer(LOW_SPEED,self.incrementer)


  def incrementer(self):
    """
    Counter incrementer: increment period = LOW_SPEED, if high speed is False,
    increment period = HIGH_SPEED otherwise.
    """
    self.counter += 1
    if self.high_speed:
      period = HIGH_SPEED
    else:
      period = LOW_SPEED
    self.gui.timer(period,self.incrementer)

  def high_speed_changed(self,value):
    "Notify change of counting speed to terminal"
    if value:
      print 'counting speed changed to high'
    else:
      print 'counting speed changed to low'


#### MAIN

example_gui = ExampleGUI()              # create the application GUI
example = ExampleMain(example_gui)      # instantiate the application
example.avc_init()                      # connect widgets with variables
mainloop()                              # run Tk event loop until quit

#### END
```

The GUI layout was previously edited with Visual Tcl and saved to the file 'tk_counter.tcl'.

The key points of the example regarding **AVC** are the following.

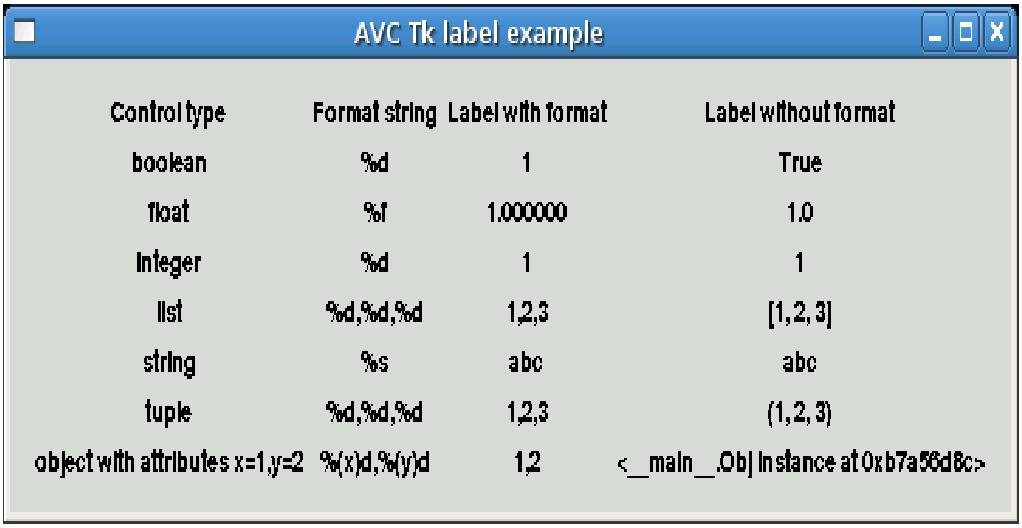
- During Visual Tcl editing, the name '**counter**' was given to the label and the name '**high_speed**' was given to the check button.
- The **AVC** package is imported at program begin (`from avc import *`).
- The application class is derived from the **AVC** class of AVC. (`class Example(AVC):`).

- A integer variable with an initial value of 0 and name '**counter**' is declared in the application to hold the counter value (`self.counter = 0`).
- A boolean variable with an initial value of False and name '**high_speed**' is declared in the application to hold the speed status of the counter increment (`self.high_speed = False`).
- The avc_init method is called after the instantation of the application class (`example.avc_init()`) to realize the connections between the '**counter**' variable and the label widget and between the the '**high_speed**' variable and the check button, the label widget is initialized with the initial value of the '**counter**' variable .

Example files in directory 'examples' of distribution: program 'tk_counter.py', graphic interface descriptor as tcl script 'tk_counter.tcl'.

11.3 Label example

This example shows the formatting capabilities of the label widget. For each supported type of the connected variable, a formatting string is defined and a sample value of the connected variable is displayed into two label widgets: one with formatting and the other with the standard python string representation.



11.3.1 Python source

```
#!/usr/bin/python
# .copyright  : (c) 2008 Fabrizio Pollastri
# .license    : GNU General Public License v3


from Tkinter import *                   # Tk interface

from avc import *                       # AVC

TCL_FILE = 'tk_label.tcl'               # GUI description as tcl script


class Example(AVC):
```

```
  """
  Showcase of formatting capabilities for the label widget
  """

  def __init__(self):

    # create GUI
    self.root = Tk()
    self.root.eval('set argc {}; set argv {}; proc ::main {argc argv} {};')
    self.root.tk.evalfile(TCL_FILE)

    # terminate program at toplevel window destroy: connect toplevel
    # destroy signal to termination handler.
    self.root.bind_class('Toplevel','<Destroy>',lambda event: self.root.quit())

    # all types of connected variables
    self.bool_value = True
    self.float_value = 1.0
    self.int_value = 1
    self.list_value = [1,2,3]
    self.str_value = 'abc'
    self.tuple_value = (1,2,3)
    class Obj:
      "A generic object with 2 attributes x,y"
      def  __init__(self):
        self.x = 1
        self.y = 2
    self.obj_value = Obj()


#### MAIN

example = Example()                        # instantiate the application
example.avc_init()                         # connect widgets with variables
Tkinter.mainloop()                         # run Tk event loop until quit

#### END
```

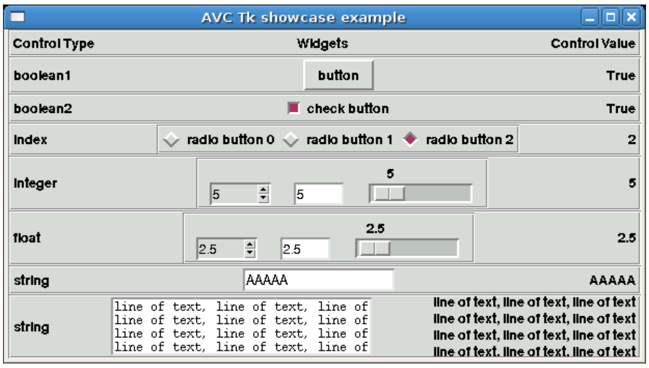
The GUI layout was previously edited with Visual Tcl and saved to the file ‘tk_label.tcl’.

Apart the general requirements of AVC, already pointed out in the other examples, the relevant points of the label example about AVC are the following.

- For each control type (for each row) the two label widgets, one in the column “Label with format” and one in the column “Label without format”, are connected to the variable of the corresponding type. For example, in row “boolean”, both label widgets are called “bool_value”, so they connect to the variable `self.bool_value` .
- When the Tk event loop is entered both columns are set to display the initial values of the connected variables. For example, in row “integer”, both labels are set to display the integer value 1.
- The differences of representation between the column “Label with format” and the column “Label without format” reflect the different printout results coming from the formatting capabilities of the label widget and from `str`, the generic textual rendering function of python.

Example files in directory 'examples' of distribution: program 'tk_label.py', graphic interface descriptor as tcl script 'tk_label.tcl'.

11.4 Showcase example



This example shows a table of all widget/variable type combinations supported by **AVC**. The program creates a window with three columns: the first shows the type of the connected variable, the second shows all the widgets that can be connected to that type of variable, the third shows the current value of each variable. Each row of the window represent a widgets/variable combination as follows.

- Row 1: memoryless button with boolean variable, pressed = True, unpressed = False.
- Row 2: button with memory, check button, pressed = True, unpressed = False.
- Row 3: mutually exclusive choices widgets, radio buttons numbered from 0 to 2, index variable = number of checked radio button.
- Row 4: integer input/output widgets, spin button, entry and slider.
- Row 5: float input/output widgets, spin button, entry and slider.
- Row 6: string input/output widget, entry.
- Row 7: string input/output widget, text view/edit.

The text label widget is used in all output modes for the column of the connected variable values. The program increment the value of each connected variable looping top-bottom at three rows per seconds. The user can also change the values of the connected variables interacting with the widgets.

11.4.1 Python source

```
#!/usr/bin/python
# .copyright  : (c) 2007 Fabrizio Pollastri
# .license    : GNU General Public License v3


from Tkinter import *                  # Tk interface

from avc import *                      # AVC

TCL_FILE = 'tk_showcase.tcl'           # GUI description as tcl script
INCREMENTER_PERIOD = 0.333             # seconds


class Example(AVC):
  "A table of all supported widget/control type combinations"

  def __init__(self):

    # create GUI
    self.root = Tk()
    self.root.eval('set argc {}; set argv {}; proc ::main {argc argv} {};')
    self.root.tk.evalfile(TCL_FILE)
```

```
    # terminate program at toplevel window destroy: connect toplevel
    # destroy signal to termination handler.
    self.root.bind_class('Toplevel','<Destroy>',lambda event: self.root.quit())

    # the control variables
    self.boolean1 = False
    self.boolean2 = False
    self.radio = 0
    self.integer = 0
    self.float = 0.0
    self.string = ''
    self.textview = ''

    # start variables incrementer
    increment = self.incrementer()
    self.timer_function = increment.next
    self.root.after(int(INCREMENTER_PERIOD * 1000.0),self.timer_wrap)


  def timer_wrap(self):
    "Call given function, reschedule it after return"
    self.timer_function()
    self.root.after(int(INCREMENTER_PERIOD * 1000.0),self.timer_wrap)


  def incrementer(self):
    """
    Booleans are toggled, radio button index is rotated from first to last,
    integer is incremented by 1, float by 0.5, string is appended a char
    until maxlen when string is cleared, text view/edit is appended a line
    of text until maxlen when it is cleared.
    Return True to keep timer alive.
    """
    while True:
      self.boolean1 = not self.boolean1
      yield True

      self.boolean2 = not self.boolean2
      yield True

      if self.radio == 2:
        self.radio = 0
      else:
        self.radio += 1
      yield True

      self.integer += 1
      yield True

      self.float += 0.5
      yield True

      if len(self.string) >= 20:
        self.string = 'A'
      else:
        self.string += 'A'
      yield True

      if len(self.textview) >= 200:
        self.textview = ''
      else:
```

```
        self.textview += 'line of text, line of text, line of text\n'
      yield True


#### MAIN

example = Example()                         # instantiate the application
example.avc_init()                          # connect widgets with variables
Tkinter.mainloop()                          # run Tk event loop until quit

#### END
```

The GUI layout was previously edited with Visual Tcl and saved to the file 'tk_showcase.tcl'.

The key points of the example regarding **AVC** are the following.

- During Visual Tcl editing, the following names were given to the widgets.

Row	widget	name
1	button	**boolean1__button**
	output value label	**boolean1__var**
2	checkbutton	**boolean2__checkbutton**
	output value label	**boolean2__var**
3	radiobutton0	**radio__radiobutton0**
	radiobutton1	**radio__radiobutton1**
	radiobutton2	**radio__radiobutton2**
	output value label	**radio__var**
4	spinbutton	**integer__spinbox**
	entry	**integer__entry**
	slider	**integer__hscale**
	output value label	**integer__var**
5	spinbutton	**float__spinbox**
	entry	**float__entry**
	slider	**float__hscale**
	output value label	**float__var**
6	entry	**string__entry**
	output value label	**string__var**
7	textview	**textview__textview**
	output value label	**textview__var**

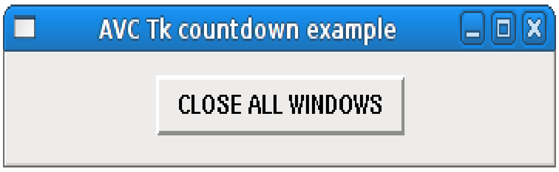
- The **AVC** package is imported at program begin (`from avc import *`).
- The application class is derived from the **AVC** class (`class Example(AVC):`).
- The following variables are declared in the application.

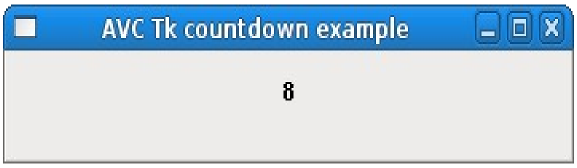
```
      self.boolean1 = False
      self.boolean2 = False
      self.radio = 0
      self.integer = 0
      self.float = 0.0
      self.string = ''
      self.textview = ''
      self.status = ''
```

- The avc_init method is called after the instantation of the application class (`example.avc_init()`) to realize the connections of all widegts/variable combinations and to initialize the widgets values with the initial value of the connected variable .

Example files in directory 'examples' of distribution: program 'tk_showcase.py', graphic interface descriptor as tcl script 'tk_showcase.tcl'.

11.5 Countdown example





This example continuously creates at random intervals windows displaying a counter. Each counter starts from 10 and is independently decremented. When the count reaches zero, the counter window is destroyed. Also a main window with a “close all windows” button is displayed.

11.5.1 Python source

```
#!/usr/bin/python
# .copyright  : (c) 2008 Fabrizio Pollastri
# .license    : GNU General Public License v3


from Tkinter import *                   # Tk interface

from avc import *                       # AVC for Tk

from random import randint              # random integer generator

TOPLEVEL_NAME = 'countdown'             # name of the top level widget
COUNTDOWN_PERIOD = 500                  # count down at 2 unit per second
MAX_CREATION_PERIOD = 4000              # create a new count down at 1/2 this


class Countdown(AVC):
  """
  A countdown counter displayed in a Label widget. Count starts at given
  value. When count reaches zero the counter and its GUI are destroyed.
  """

  def __init__(self,count_start=10):

    ## create GUI

    # main window
    self.root = Tk()
    self.root.title('AVC Tk countdown example')
    self.frame = Frame(self.root,name='countdown',width=350,height=50)
    self.frame.pack(expand=1)
```

```
    # count down label
    self.label = Label(self.frame,name='counter')
    self.label.place(relx=0.5,rely=0.4,anchor=CENTER)

    # terminate program at toplevel window destroy: connect toplevel
    # destroy signal to termination handler.
    self.root.bind_class('Toplevel','<Destroy>',lambda event: self.root.quit())

    # init the counter variable
    self.counter = count_start

    # connect counter variable with label widget
    self.avc_connect(self.root)

    # start count down
    self.root.after(COUNTDOWN_PERIOD,self.decrementer)


  def decrementer(self):
    "Counter decrementer. Return False to destroy previous timer."
    self.counter -= 1
    if self.counter:
      # if counter not zero: reschedule count timer
      self.root.after(COUNTDOWN_PERIOD,self.decrementer)
    else:
      # counter reached zero: destroy this countdown and its GUI
      self.root.destroy()


class Example(AVC):
  """
  Continuously create at random intervals windows with a countdown from 10 to 0.
  When a countdown reaches zero, its window is destroyed. Also create a main
  window with a "close all" button.
  """

  def __init__(self):

    ## create GUI

    # main window
    self.root = Tk()
    self.root.title('AVC Tk countdown example')
    self.frame = Frame(self.root,name='countdown',width=350,height=50)
    self.frame.pack(expand=1)

    # close all button
    self.button = Button(self.frame,name='close_all',text='CLOSE ALL WINDOWS')
    self.button.place(relx=0.5,rely=0.5,anchor=CENTER)

    # terminate program at toplevel window destroy: connect toplevel
    # destroy signal to termination handler.
    self.root.bind_class('Toplevel','<Destroy>',lambda event: self.root.quit())

    # create the first countdown
    self.new_countdown()

    # close all button connected variable
    self.close_all = False
```

```
  def new_countdown(self,count_start=10):
    "Create a new countdown"

    # create a new countdown
    Countdown(count_start)

    # autocall after a random delay
    self.root.after(randint(1,MAX_CREATION_PERIOD),self.new_countdown)


  def close_all_changed(self,value):
    "Terminate program at 'close all' button pressing"
    self.root.quit()


#### MAIN

example = Example()                    # instantiate the application
example.avc_init()                     # connect widgets with variables
mainloop()                             # run Tk event loop until quit

#### END
```

The key points of the example regarding **AVC** are the following.

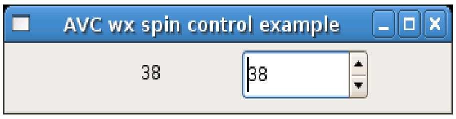
- In the main window, the name '**close_all**' was given to the button widget; in the counter window, the name '**counter**' was given to the label widget.
- The **AVC** package is imported at program begin (`from avc import *`).
- Both the application class and the counter class are derived from the **AVC** class (`class Example(AVC): | class Countdown(AVC):`).
- A boolean variable with an initial value of False and name '**close_all**' is declared in the application (`self.close_all = False`).
- The method '**close_all_changed**' is defined in the application to handle the press event of the 'close all windows' button.
- The avc_init method is called after the instantiation of the application class (`example.avc_init()`) to init AVC logic and to realize the connection of the 'close all windows' button to the '**close_all**' variable.
- A integer variable with an initial default value of 10 and name '**counter**' is declared in the Countdown class (`self.counter = count_start`)
- The avc_connect method is called at the instantation of the Countdown class (`self.avc_connect(self.root)`) with argument the window widget of the counter. This call realizes the connection of the label widget to the '**counter**' variable.

Example files in directory 'examples' of distribution: program 'tk_countdown_progui.py'.

12 wxWidgets examples

12.1 Spin control example

For a functional description of the graphic interface see the GTK+ “Spin button example“ at page 23.



12.1.1 Python source

```
#!/usr/bin/python
# .copyright  : (c) 2007 Fabrizio Pollastri
# .license    : GNU General Public License v3


import wx                             # wx tool kit bindings
from wx import xrc                    # xml resource support

from avc import *                     # AVC

WXGLADE_XML = 'wx_spinctrl.xrc'       # GUI wxGlade descriptor


class Example(wx.PySimpleApp,AVC):
  """
  A spin button whose value is replicated into a static text
  """

  def __init__(self):

    ## create GUI

    # init wx application base class
    wx.PySimpleApp.__init__(self)

    # create GUI
    xml_resource = xrc.XmlResource(WXGLADE_XML)
    self.root = xml_resource.LoadFrame(None,'frame_1')
    self.root.Show()

    ## the variable holding the spin button value
    self.spin_value = 0


#### MAIN

example = Example()                   # instantiate the application
example.avc_init()                    # connect widgets with variables
example.MainLoop()                    # run wx event loop until quit

#### END
```

The GUI layout was previously edited with wxGlade and saved to the file 'wx_spinctrl.xrc'.

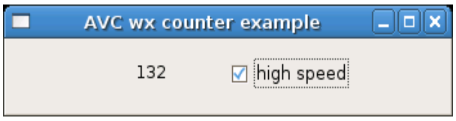
The key points of the example regarding **AVC** are the following.

- During wxGlade editing, the same name '**spin_value**' was given to the spin button and to the label.
- The **AVC** package is imported at program begin (`from avc import *`).
- The application class is derived from the class **PySimpleApp** of wxWidgets and from the class **AVC** of AVC (`class Example(wx.PySimpleApp,AVC):`).
- A integer variable with an initial value of 0 and name '**spin_value**' is declared in the application (`self.spin_value = 0`).
- The avc_init method is called after the instantiation of the application class, to realize the connections of the two widgets through the '**spin_value**' variable and to initialize the widgets values with the initial value of the variable (`example.avc_init()`).

Example files in directory 'examples' of distribution: program 'wx_spinctrl.py' , UI descriptor 'wx_spinctrl.xrc'.

12.2 Counter example

For a functional description of the graphical interface see the GTK+ "Counter example" at page 24.



12.2.1 Python source

```
#!/usr/bin/python
# .copyright  : (c) 2007 Fabrizio Pollastri
# .license    : GNU General Public License v3


import wx                              # wx tool kit bindings
from wx import xrc                     # xml resource support

from avc import *                      # AVC

WXGLADE_XML = 'wx_counter.xrc'         # GUI wxGlade descriptor
LOW_SPEED = 0.5                        #--
HIGH_SPEED = 0.1                       #- low and high speed period (ms)


class ExampleGUI(wx.PySimpleApp):
  "Counter GUI creation"

  def __init__(self):

    # init wx application base class
    wx.PySimpleApp.__init__(self)

    # create GUI
    xml_resource = xrc.XmlResource(WXGLADE_XML)
```

```
    self.root = xml_resource.LoadFrame(None,'frame_1')
    self.root.Show()

    # timer
    self.timer1 = None


  def timer(self,period,function):
    "Start a wx timer calling back 'function' every 'period' seconds."
    if not self.timer1:
      self.timer1 = wx.Timer(self.root,wx.NewId())
      self.root.Bind(wx.EVT_TIMER,function,self.timer1)
    self.timer1.Start(period * 1000,oneShot=True)


class ExampleMain(AVC):
  """
  A counter displayed in a Label widget whose count speed can be
  accelerated by checking a check button.
  """

  def __init__(self,gui):

    # save gui
    self.gui = gui

    # the counter variable and its speed status
    self.counter = 0
    self.high_speed = False

    # start incrementer timer
    self.gui.timer(LOW_SPEED,self.incrementer)


  def incrementer(self,event):
    """
    Counter incrementer: increment period = LOW_SPEED, if high speed is False,
    increment period = HIGH_SPEED otherwise. Return False to destroy previous
    timer.
    """
    self.counter += 1
    if self.high_speed:
      period = HIGH_SPEED
    else:
      period = LOW_SPEED
    self.gui.timer(period,self.incrementer)

  def high_speed_changed(self,value):
    "Notify change of counting speed to terminal"
    if value:
      print 'counting speed changed to high'
    else:
      print 'counting speed changed to low'


#### MAIN

example_gui = ExampleGUI()             # create the application GUI
example = ExampleMain(example_gui)     # instantiate the application
example.avc_init()                     # connect widgets with variables
example_gui.MainLoop()                 # run wx event loop until quit
```

```
#### END
```

The GUI layout was previously edited with wxGlade and saved to the file ‘wx_counter.xrc’.

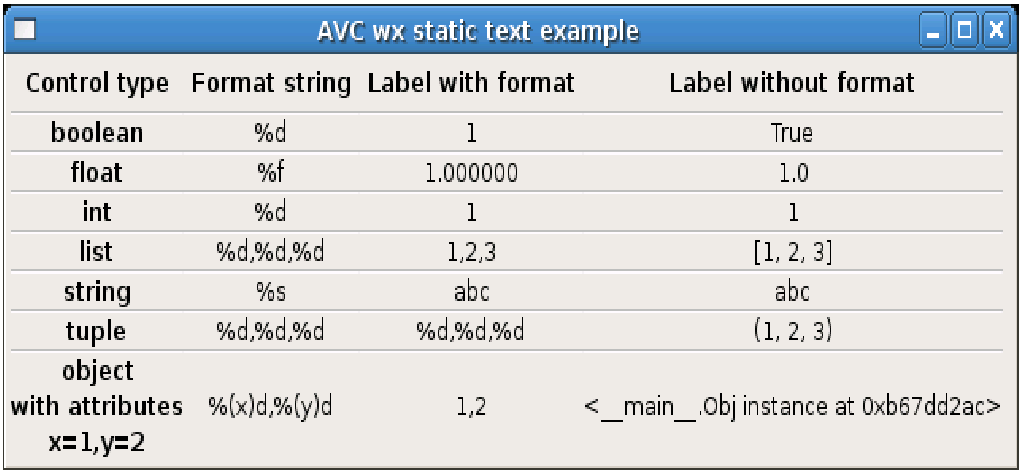
The key points of the example regarding **AVC** are the following.

- During wxGlade editing, the name '**counter**' was given to the static text and the name '**high_speed**' was given to the check box.
- The **AVC** package is imported at program begin (`from avc import *`).
- The application class is derived from the class **PySimpleApp** fo wxWidgets and from the class **AVC** of AVC (`class Example(wx.PySimpleApp,AVC):`).
- A integer variable with an initial value of 0 and name '**counter**' is declared in the application to hold the counter value (`self.counter = 0`).
- A boolean variable with an initial value of False and name '**high_speed**' is declared in the application to hold the speed status of the counter increment speed (`self.high_speed = False`).
- The avc_init method is called after the instantation of the application class (`example.avc_init()`) to realize the connections between the '**counter**' variable and the label widget and between the '**high_speed**' variable and the check button, the label widget is initialized with the initial value of the '**counter**' variable.

Example files in directory 'examples' of distribution: program 'wx_counter.py' , UI descriptor 'wx_counter.xrc'.

12.3 Label example

This example shows the formatting capabilities of the label widget. For each supported type of the connected variable, a formatting string is defined and a sample value of the connected variable is displayed into two label widgets: one with formatting and the other with the standard python string representation.



12.3.1 Python source

```
#!/usr/bin/python
# .copyright  : (c) 2008 Fabrizio Pollastri
```

```
# .license    : GNU General Public License v3


import wx                                # wx tool kit bindings
from wx import xrc                       # xml resource support

from avc import *                        # AVC

WXGLADE_XML = 'wx_label.xrc'             # GUI wxGlade descriptor


class Example(wx.PySimpleApp,AVC):
  """
  Showcase of formatting capabilities for the label widget
  """

  def __init__(self):

    # init wx application base class
    wx.PySimpleApp.__init__(self)

    # create GUI
    xml_resource = xrc.XmlResource(WXGLADE_XML)
    self.root = xml_resource.LoadFrame(None,'frame_1')
    self.root.Show()

    # all types of connected variables
    self.bool_value = True
    self.float_value = 1.0
    self.int_value = 1
    self.list_value = [1,2,3]
    self.str_value = 'abc'
    self.tuple_value = (1,2,3)
    class Obj:
      "A generic object with 2 attributes x,y"
      def  __init__(self):
        self.x = 1
        self.y = 2
    self.obj_value = Obj()


#### MAIN

example = Example()                      # instantiate the application
example.avc_init()                       # connect widgets with variables
example.MainLoop()                       # run wx event loop until quit

#### END
```

The GUI layout was previously edited with wxGlade and saved to the file 'wx_label.xrc'.

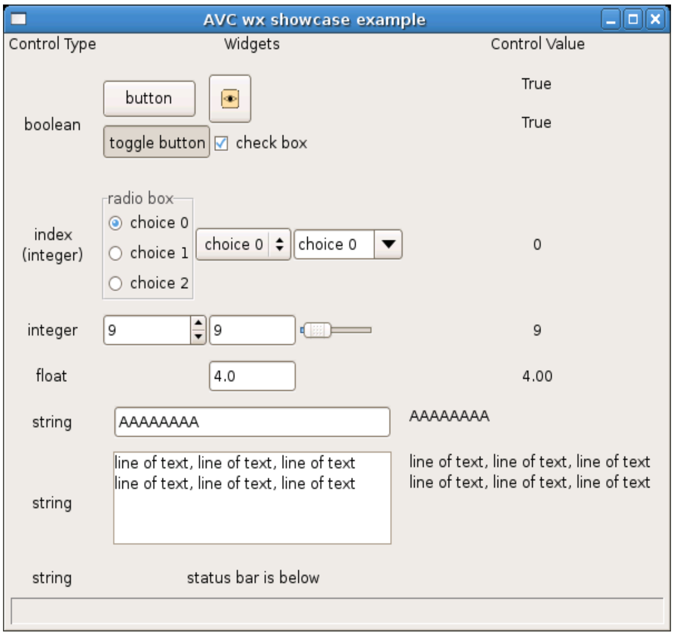
Apart the general requirements of AVC, already pointed out in the other examples, the relevant points of the label example about AVC are the following.

- For each control type (for each row) the two label widgets, one in the column "Label with format" and one in the column "Label without format", are connected to the variable of the corresponding type. For example, in row "boolean", both label widgets are called "bool_value", so they connect to the variable `self.bool_value` .
- When the wxWidget event loop is entered both columns are set to display the initial values of the connected variables. For example, in row "integer", both labels are set to display the integer value 1.

- The differences of representation between the column “Label with format” and the column “Label without format” reflect the different printout results coming from the formatting capabilities of the label widget and from `str`, the generic textual rendering function of python.

Example files in directory 'examples' of distribution: program 'wx_label.py', UI descriptor 'wx_label.xrc'.

12.4 Showcase example



This example shows a table of all widget/variable type combinations supported by **AVC**. The program creates a window with three columns: the first shows the type of the connected variable, the second shows all the widgets that can be connected to that type of variable, the third shows the current value of each variable. Each row of the window represent a widgets/variable combination as follows.

- Row 1: memoryless button and bitmap button with boolean variable, pressed = True, unpressed = False.
- Row 2: buttons with memory, toggle and check box, pressed = True, unpressed = False.
- Row 3: mutually exclusive choices widgets, radio box buttons numbered from 0 to 2, a choice with 3 items and a combo box with 3 items, index variable = number of checked radio button and selected item of combo box.
- Row 4: integer input/output widgets, spin control, text control and slider.
- Row 5: float input/output widget, text control.
- Row 6: string input/output widget, text control.
- Row 7: string input/output widget, text control view/edit.
- Row 8: status messages, status bar.

The text label widget is used in all output modes for the column of the connected variable values. The program increment the value of each connected variable looping top-bottom at three rows per seconds. The user can also change the values in the connected variables interacting with the widgets.

12.4.1 Python source

```
#!/usr/bin/python
# .copyright  : (c) 2007 Fabrizio Pollastri
# .license    : GNU General Public License v3


import wx                               # wx tool kit bindings
from wx import xrc                      # xml resource support

from avc import *                       # AVC

WXGLADE_XML = 'wx_showcase.xrc'         # GUI wxGlade descriptor
INCREMENTER_PERIOD = 333                # ms


class Example(wx.PySimpleApp,AVC):
  "A table of all supported widget/control type combinations"

  def __init__(self):

    # init wx application base class
    wx.PySimpleApp.__init__(self)

    # create GUI
    xml_resource = xrc.XmlResource(WXGLADE_XML)
    self.root = xml_resource.LoadFrame(None,'frame_1')
    self.root.Show()

    # the control variables
    self.boolean1 = False
    self.boolean2 = False
    self.index = 0
    self.integer = 0
    self.float = 0.0
    self.string = ''
    self.textview = ''
    self.status = ''

    # start counter incrementer at low speed
    self.timer = wx.Timer(self.root,wx.NewId())
    self.root.Bind(wx.EVT_TIMER,self.incrementer_wrap,self.timer)
    self.timer.Start(int(INCREMENTER_PERIOD),oneShot=False)
    self.increment = self.incrementer()


  def incrementer_wrap(self,event):
    "Discard event argument and call the real incrementer iterator"
    self.increment.next()

  def incrementer(self,*args):
    """
    Booleans are toggled, radio button index is rotated from first to last,
    integer is incremented by 1, float by 0.5, string is appended a char
    until maxlen when string is cleared, text view/edit is appended a line
    of text until maxlen when it is cleared. Status bar message is toggled.
    Return True to keep timer alive.
    """
```

```
    while True:

      self.boolean1 = not self.boolean1
      yield True

      self.boolean2 = not self.boolean2
      yield True

      if self.index >= 2:
        self.index = 0
      else:
        self.index += 1
      yield True

      self.integer += 1
      yield True

      self.float += 0.5
      yield True

      if len(self.string) >= 10:
        self.string = ''
      else:
        self.string += 'A'
      yield True

      if len(self.textview) >= 200:
        self.textview = ''
      else:
        self.textview += 'line of text, line of text, line of text\n'
      yield True

      if not self.status:
        self.status = 'status message'
      else:
        self.status = ''
      yield True


#### MAIN

example = Example()                        # instantiate the application
example.avc_init()                         # connect widgets with variables
example.MainLoop()                         # run wx event loop until quit

#### END
```

The GUI layout was previously edited with wxGlade and saved to the file ‘wx_showcase.xrc’.

The key points of the example regarding **AVC** are the following.

- During Glade editing, the following names were given to the widgets.

Row	widget	name
1	button	**boolean1__button**
	bitmap button	**boolean1__bitmapbutton**
	output value label	**boolean1__var**
2	togglebutton	**boolean2__togglebutton**
	checkbox	**boolean2__checkbox**
	output value label	**boolean2__var**
3	radiobox	**index__radiobox**

	choice	**index__choice**
	combobox	**index__combobox**
	output value label	**index__var**
4	spinctrl	**integer__spinctrl**
	textctrl	**integer__textctrl**
	slider	**integer__slider**
	output value label	**integer__var**
5	textctrl	**float__entry**
	output value label	**float__var**
6	textctrl	**string__textctrl**
	output value label	**string__var**
7	textctrl	**textview__textctrl**
	output value label	**textview__var**
8	statusbar	**status__statusbar**
	output value label	**status__var**

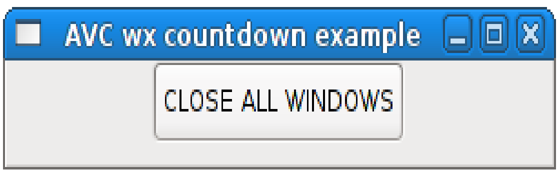
- The **AVC** package is imported at program begin (`from avc import *`).
- The application class is derived from the class **PySimpleApp** of wxWidgets and from the class **AVC** of AVC (`class Example(wx.PySimpleApp,AVC):`).
- The following variables are declared in the application.

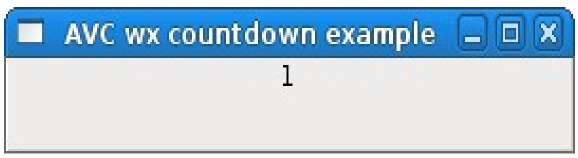
```
self.boolean1 = False
self.boolean2 = False
self.index = 0
self.integer = 0
self.float = 0.0
self.string = ''
self.textview = ''
self.status = ''
```

- The avc_init method is called after the instantation of the application class (`example.avc_init()`) to realize the connections of all widegts/variable combinations and to initialize the widgets values with the initial value of the connected variable .

Example files in directory 'examples' of distribution: program 'wx_showcase.py' , UI descriptor 'wx_showcase.xrc'.

12.5 Countdown example





This example continuously creates at random intervals windows displaying a counter. Each counter starts from 10 and is independently decremented. When the count reaches zero, the counter window is destroyed. Also a main window with a “close all windows” button is displayed.

12.5.1 Python source

```
#!/usr/bin/python
# .copyright  : (c) 2008 Fabrizio Pollastri
# .license    : GNU General Public License v3


import wx                               # wx tool kit bindings
from wx import xrc                      # xml resource support

from avc import *                       # AVC

from random import randint              # random integer generator

WXGLADE_MAIN = 'wx_countdown_main.xrc'  # main window glade descriptor
WXGLADE_CD = 'wx_countdown.xrc'         # count down window glade descriptor
COUNTDOWN_PERIOD = 500                  # count down at 2 unit per second
MAX_CREATION_PERIOD = 4000              # create a new count down at 1/2 this


class Countdown(AVC):
  """
  A countdown counter displayed in a Label widget. Count starts at given
  value. When count reaches zero the counter and its GUI are destroyed.
  """

  def __init__(self,count_start=10):

    # create GUI
    xml_resource = xrc.XmlResource(WXGLADE_CD)
    self.root = xml_resource.LoadFrame(None,'frame_1')
    self.root.Show()

    # init the counter variable
    self.counter = count_start

    # connect counter variable with label widget
    self.avc_connect(self.root)

    # start count down
    self.timer = wx.Timer(self.root,wx.NewId())
    self.root.Bind(wx.EVT_TIMER,self.decrementer,self.timer)
    self.timer.Start(COUNTDOWN_PERIOD)


  def decrementer(self,event):
    "Counter decrementer. Return False to destroy previous timer."
    self.counter -= 1
    if not self.counter:
      # counter reached zero: destroy this countdown and its GUI
      self.root.Close()


class Example(wx.PySimpleApp,AVC):
  """
  Continuously create at random intervals windows with a countdown from 10 to 0.
  When a countdown reaches zero, its window is destroyed. Also create a main
  window with a "close all" button.
  """

  def __init__(self):
```

```
    # init wx application base class
    wx.PySimpleApp.__init__(self)

    # create GUI
    xml_resource = xrc.XmlResource(WXGLADE_MAIN)
    self.root = xml_resource.LoadFrame(None,'frame_1')
    self.root.Show()

    # terminate application at main window close
    self.root.Bind(wx.EVT_CLOSE,self.on_destroy)

    # close all button connected variable
    self.close_all = False

    # create count down creation timer
    self.timer = wx.Timer(self.root,wx.NewId())
    self.root.Bind(wx.EVT_TIMER,self.new_countdown,self.timer)

    # create the first countdown
    self.new_countdown(None)


  def new_countdown(self,event,count_start=10):
    "Create a new countdown"

    # create a new countdown
    Countdown(count_start)

    # autocall after a random delay
    self.timer.Start(randint(1,MAX_CREATION_PERIOD),oneShot=True)


  def on_destroy(self,window):
    "Terminate program at window destroy"
    self.Exit()

  def close_all_changed(self,value):
    "Terminate program at 'close all' button pressing"
    self.Exit()


#### MAIN

example = Example()                       # instantiate the application
example.avc_init()                        # connect widgets with variables
example.MainLoop()                        # run wx event loop until quit

#### END
```

The GUI layout was previously edited with wxGlade and saved to the file ‘wx_countdown_main.xrc’ for the main window and to the file 'wx_countdown.xrc' for the counter windows.

The key points of the example regarding **AVC** are the following.

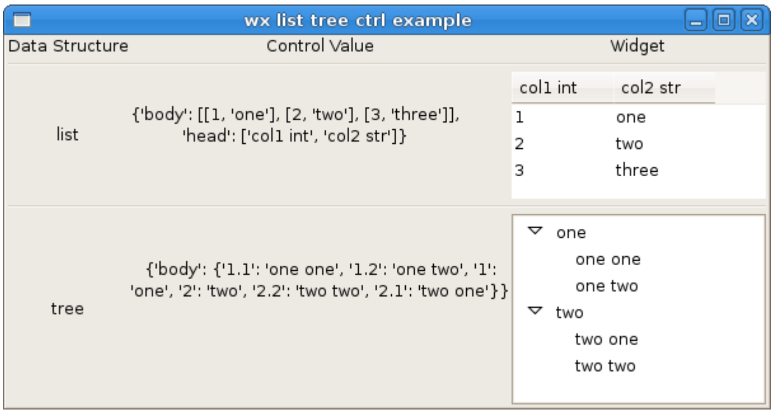
- During wxGlade editing of the main window, the name '**close_all**' was given to the button widget; during wxGlade editing of the counter window, the name '**counter**' was given to the label widget.
- The **AVC** package is imported at program begin (`from avc import *`).
- Both the application class and the counter class are derived from the **AVC** class (`class`

`Example(PySimpleApp,AVC): | class Countdown(AVC):`).

- A boolean variable with an initial value of False and name '**close_all**' is declared in the application (`self.close_all = False`).
- The method '**close_all_changed**' is defined in the application to handle the press event of the 'close all windows' button.
- The avc_init method is called after the instantiation of the application class (`example.avc_init()`) to init AVC logic and to realize the connection of the 'close all windows' button to the '**close_all**' variable.
- A integer variable with an initial default value of 10 and name '**counter**' is declared in the Countdown class (`self.counter = count_start`)
- The avc_connect method is called at the instantiation of the Countdown class (`self.avc_connect(self.root)`) with argument the window widget of the counter. This call realizes the connection of the label widget to the '**counter**' variable.

Example files in directory 'examples' of distribution: program 'wx_countdown.py' , wxGlade descriptors 'wx_countdown_main.xrc' anc 'wx_countdown.xrc'.

12.6 List tree control example



The first row of this example shows the display capabilities of a widget in list view mode: display of 2D tabular data. The second row shows the display capabilities of a widget in tree mode: display of a hierarchical data tree. For each row, it is showed the connected python data equivalent to data displayed by each widget. The rows of the list view are rolled down by one position every 2 seconds.

12.6.1 Python source

```
#!/usr/bin/python
# .copyright  : (c) 2008 Fabrizio Pollastri.
# .license    : GNU General Public License v3


import wx                                  # wx tool kit bindings
from wx import xrc                         # xml resource support

from avc import *                          # AVC

import copy                                # object cloning support

WXGLADE_XML = 'wx_listtreectrl.xrc'        # GUI wxGlade descriptor
```

```
UPDATE_PERIOD = 2000                    # ms


class Example(wx.PySimpleApp,AVC):
  """
  Showcase of display capabilities for the list control and tree control widgets
  """

  def __init__(self):

    # init wx application base class
    wx.PySimpleApp.__init__(self)

    # create GUI
    xml_resource = xrc.XmlResource(WXGLADE_XML)
    self.root = xml_resource.LoadFrame(None,'frame_1')
    self.root.Show()

    # connected variables
    self.list = {'head':['col1 int','col2 str'], \
      'body':[[1,'one'],[2,'two'],[3,'three']]}
    self.list_work = copy.deepcopy(self.list)
    self.tree = {'body':{ \
      # root rows
      '1':'one', \
      '2':'two', \
      # children of root row '1'
      '1.1':'one one', \
      '1.2':'one two', \
      # children of root row '2'
      '2.1':'two one', \
      '2.2':'two two'}}

    # start a wx timer calling back 'function' every 'period' seconds."
    self.timer1 = wx.Timer(self.root,wx.NewId())
    self.root.Bind(wx.EVT_TIMER,self.update_wrap,self.timer1)
    self.timer1.Start(UPDATE_PERIOD,oneShot=False)


  def update_wrap(self,event):
    "Discard event argument and call the real update iterator"
    self.update().next()

  def update(self):
    """
    Tabular data rows data are rolled down.
    """
    rows_num = len(self.list['body'])
    while True:
      # save last row of data
      last_row = self.list_work['body'][-1]
      # shift down one position each data row
      for i in range(1,rows_num):
        self.list_work['body'][-i] = \
          self.list_work['body'][-1-i]
      # copy last row into first position
      self.list_work['body'][0] = last_row
      # copy working copy into connected variable
      self.list = self.list_work
      yield True
```

```
#### MAIN

example = Example()                    # instantiate the application
example.avc_init()                     # connect widgets with variables
example.MainLoop()                     # run wx event loop until quit

#### END
```

The GUI layout was previously edited with wxGlade and saved to the file ‘wx_listtreectrl.xrc’.

Apart the general requirements of AVC, already pointed out in the other examples, the relevant points of the list tree view example are the same of the GTK+ “List tree view example”example at page 34.

Example files in directory 'examples' of distribution: program 'wx_listtreectrl.py' , wxGlade descriptor 'qt4_listtreeview.ui'.

Apart the general requirements of AVC, already pointed out in the other examples, the relevant points of the label example about AVC are the following.

13 References

[1] Python, http://www.python.org/

[2] GTK+, http://www.gtk.org/

[3] Qt3, http://trolltech.com/products/qt/qt3/

[4] Qt4, http://trolltech.com/products/qt/

[5] Tk, http://www.tcl.tk/

[6] wxWidgets, http://www.wxwidgets.org/

[7] Pygtk, http://www.pygtk.org/

[8] PyQt v3 and v4, http://www.riverbankcomputing.co.uk/pyqt/

[9] Tkinter, http://effbot.org/tkinterbook/

[10] wxPython, http://www.wxpython.org/

[11] Glade, http://glade.gnome.org/

[12] Qt designer, http://trolltech.com/products/qt/features/designer/

[13] Visual Tcl, http://vtcl.sourceforge.net/

[14] wxGlade, http://www.wxglade.org/

[15] GNU General Public License, http://www.gnu.org/licenses/gpl.html/

[16] GNU Free Documentation License, http://www.gnu.org/copyleft/fdl.html

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END