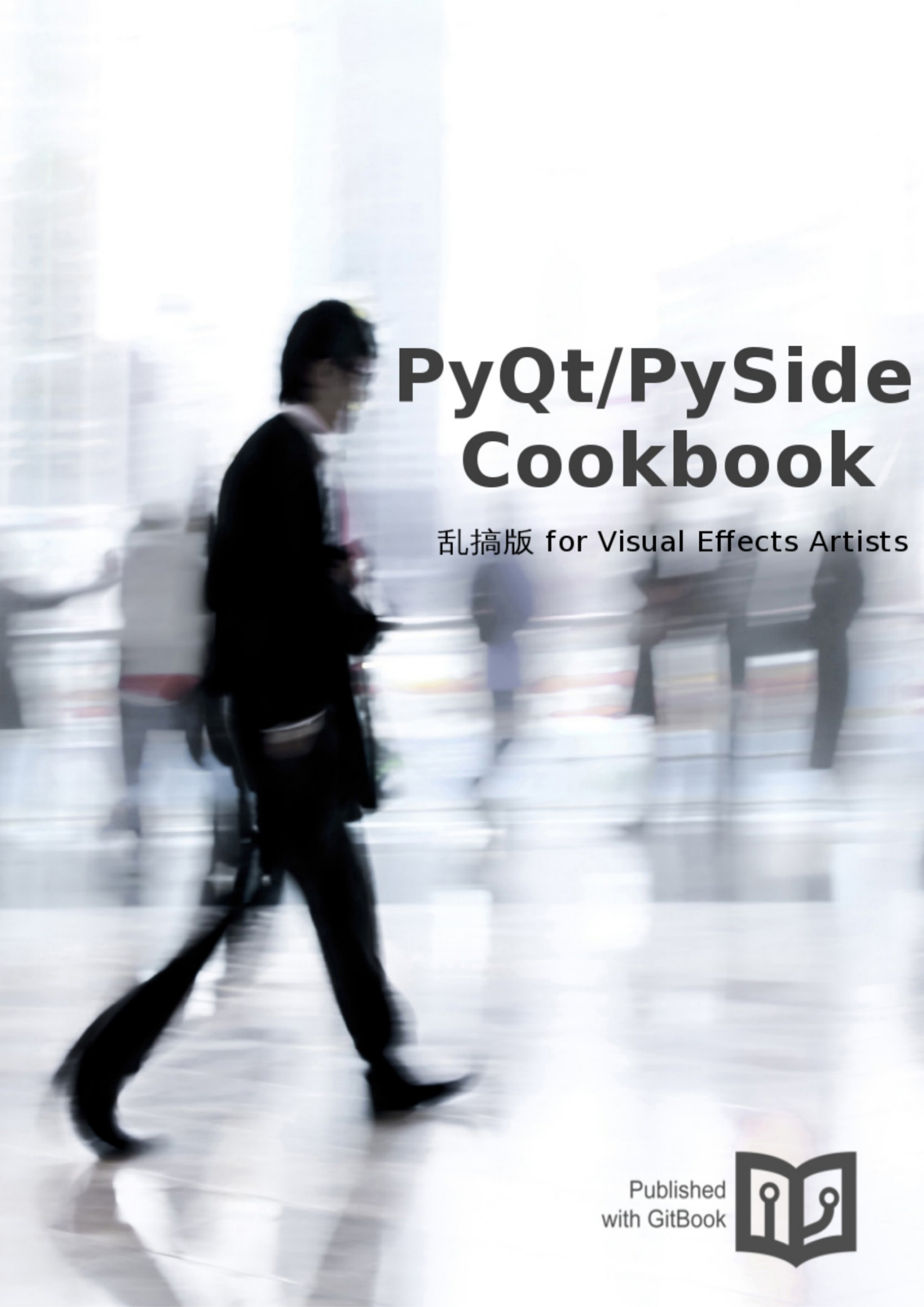

PyQt/PySide Cookbook

乱搞版 for Visual Effects Artists

Published with GitBook

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PyQt/PySide Cookbook

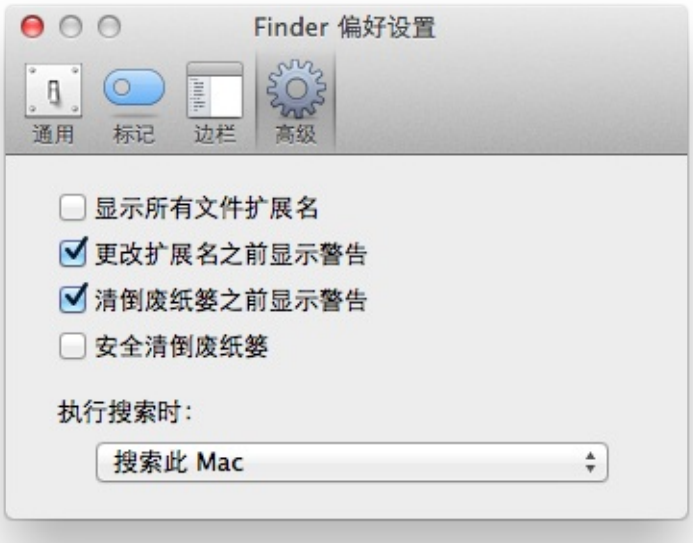
该项目主要用于收集PyQt/PySide开发中碰到的问题的解决方案，以及一些案例。

主要代码说话，解决问题为主，少讲或不讲原理。

资源和翻译

信号和槽

动态创建一系列组件并绑定信号和槽



如上图所示的需求，需要创建4个QCheckBox，一种做法是直接Designer中设计，这种做法适合知道选项的情况。还有种情况是这些选项是通过配置文件读出来的，或者是数据库中取出来，或者其他情况得到的，这时候就需要动态创建了。

解决思路是循环一个列表，创建对象，插入布局即可。这里稍微增加一些复杂性，对所创建的QCheckBox对象进行信号和槽的绑定，并处理信号，这时候我们可以通过 `sender()` 方法来获得是哪个对象发出的信号。

其他的控件类似，这里就用QCheckBox做例子了。

下面是完整代码(PyQt4/Python2.7)：

```
# -*- coding: utf-8 -*-
from PyQt4 import QtGui, QtCore

class Widget(QtGui.QWidget):
    def __init__(self, parent=None):
        QtGui.QWidget.__init__(self, parent)

        layout = QtGui.QVBoxLayout()

        items = [(0, 'Python'), (1, 'Golang'), (2, 'JavaScript'), (3, 'Ruby')]
        for id_, text in items:
            checkBox = QtGui.QCheckBox(text, self)
            checkBox.id_ = id_
            checkBox.stateChanged.connect(self.checkLanguage)
            layout.addWidget(checkBox)

        self.lMessage = QtGui.QLabel(self)
        layout.addWidget(self.lMessage)

        self.setLayout(layout)

    def checkLanguage(self, state):
        checkBox = self.sender()    # 获取发射信号的对象

        if state == QtCore.Qt.Unchecked:
            self.lMessage.setText(u'取消选择了{0}: {1}'.format(checkBox.id_, checkBox.text()))
        elif state == QtCore.Qt.Checked:
            self.lMessage.setText(u'选择了{0}: {1}'.format(checkBox.id_, checkBox.text()))


if __name__ == '__main__':
    import sys

    app = QtGui.QApplication(sys.argv)
    widget = Widget()
    widget.show()
    sys.exit(app.exec_())
```

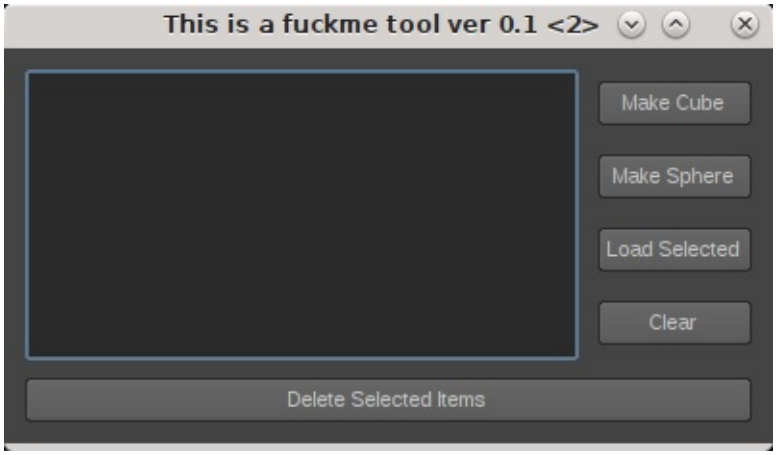
效果截图：

Widget

在Maya内部运行的模板

Note:

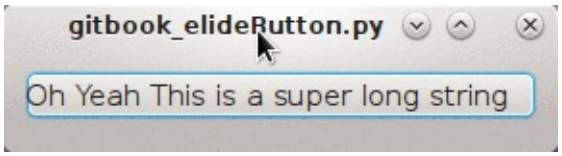
- 因为 `self.ui = uic.loadUi(uiFile, self)` 这一行把self传给了 `loadUi` function作为baseinstance,所以之后可以直接用 `self.myWidget` 来引用widget,而用不着 `self.ui.myWidget` 。
- 因为想再次按下shelf button时，关掉已有窗口，再开一个新 的，所以使用了全局变量win,这个变量显然应该对每个工具都要起成不同的名字。
- 如果在Maya里,qApp已经在global namespace里了。
- 模板抄袭自Nathan网站



```
import os
import sys
from PyQt4 import QtCore, QtGui
from PyQt4 import uic

uiFile = os.path.join(os.path.dirname(__file__), 'pyqt_example.ui')

try:
    import maya.OpenMayaUI as apiUI
    import sip

    def getMayaWindow():
        ptr = apiUI.MQtUtil.mainWindow()
        return sip.wrapinstance(long(ptr), QtCore.QObject)
except:
    pass


class MyWindow(QtGui.QDialog):

    def __init__(self, parent=None):
        super(MyWindow, self).__init__(parent)
        self.ui = uic.loadUi(uiFile, self)
        self.ui.show()


def main():
    if QtGui.qApp.applicationName().startsWith('Maya'):
        global win
        try:
            win.close()
        except:
            pass
        win = MyWindow(getMayaWindow())
    else:
        app = QtGui.QApplication(sys.argv)
        win = MyWindow()
        sys.exit(app.exec_())

if __name__ == "__main__":
        main()
```

带overflow效果的按钮

想实现的效果是，当QPushButton上的label过长的时候，自动把过长的部分...类似css里的overflow效果



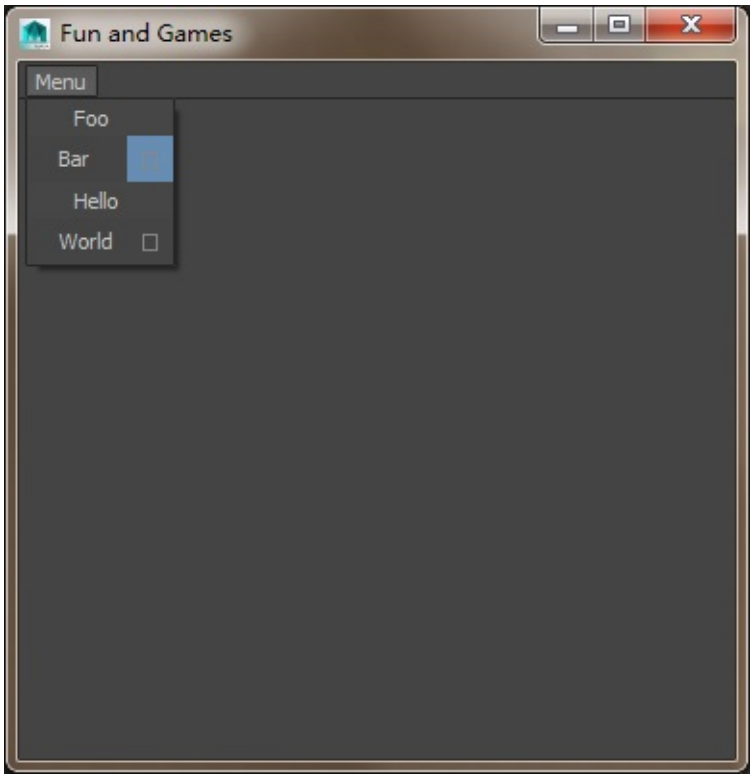
代码如下：

```
#!/usr/bin/env python2
import os
import sys
from PyQt4 import QtGui, QtCore
from PyQt4.QtCore import Qt, QString


class ElideButton(QtGui.QPushButton):

    def __init__(self, parent=None):

        super(ElideButton, self).__init__(parent)
        font = self.font()
        font.setPointSize(10)
        self.setFont(font)

    def paintEvent(self, event):
        painter = QtGui.QStylePainter(self)

        metrics = QtGui.QFontMetrics(self.font())
        elided = metrics.elidedText(self.text(), Qt.ElideRight, self.width())

        option = QtGui.QStyleOptionButton()
        self.initStyleOption(option)
        option.text = ''
        painter.drawControl(QtGui.QStyle.CE_PushButton, option)
        painter.drawText(self.rect(), Qt.AlignLeft | Qt.AlignVCenter, elided)


class TheUI(QtGui.QDialog):

    def __init__(self, args=None, parent=None):
        super(TheUI, self).__init__(parent)
        self.layout = QtGui.QVBoxLayout(self)
        self.button = ElideButton('Oh Yeah This is a super long string')
        self.layout.addWidget(self.button)
        self.setMinimumWidth(20)

if __name__ == '__main__':
    app = QtGui.QApplication(sys.argv)
    gui = TheUI()
    gui.show()
    app.exec_()
```

其实这个例子有个小缺陷，label左侧应该有些空隙（由style决定的）但是此处没有继承到。

3.1.QAction

类似maya里的下拉菜单




```
import os
import sys

from PyQt4 import QtGui, QtCore

MY_ICON = [
      '16 16 4 1',
      '  c None',
      '. c #c6c4c4',
      'l c #888888',
      ': c #909090',
      '                ',
      '                ',
      '                ',
      '                ',
      '   llllllll     ',
      '   l      l     ',
      '   l      l     ',
      '   l      l     ',
      '   l      l     ',
      '   l      l     ',
      '   l      l     ',
      '   l      l     ',
      '   llllllll     ',
      '                ',
      '                ',
      '                ',
      '                ',
      '                ',
]

## Custom Action used to provide an action and a clickable icon
```

```
#
class ExtendedQAction(QtGui.QWidgetAction):
	def __init__(self, label, mainAction, secondaryAction, *args, **kw):
		QtGui.QWidgetAction.__init__(self, *args, **kw)

		myWidget = QtGui.QWidget()
		myLayout = QtGui.QHBoxLayout()
		myLayout.setSpacing( 0 )
		myLayout.setContentsMargins( 0, 0, 0, 0 )
		myWidget.setLayout(myLayout)
		myLabel = ExtendedQLabel(label)
		myIcon = ExtendedQLabel()
		myIcon.setPixmap(QtGui.QPixmap(MY_ICON))
		myLayout.addWidget(myLabel, stretch=1)
		myLayout.addWidget(myIcon, stretch=0)

		## Hack in the hover colors to a style sheet
		#  The global stylesheet is not controlling the highlight color.
		#  It would be good to figure out how to avoid hardcoding styles here.
		defaultHLBackground = "#%02x%02x%02x" % myWidget.palette().highlight().color().getRgb(
		defaultHLText = "#%02x%02x%02x" % myWidget.palette().highlightedText().color().getRgb()|
		myLabel.setStyleSheet('padding-left:14px')
		myWidget.setStyleSheet("QWidget:hover { background:%s; color: %s;} QWidget { padding: 4p


		myIcon.setToolTip("Secondary Action Toolttip" )

		self.connect(myLabel, QtCore.SIGNAL('clicked()'), mainAction)
		self.connect(myIcon, QtCore.SIGNAL('clicked()'), secondaryAction)

		self.setDefaultWidget(myWidget)


## Clickable QLabel, this was the path of least resistance for making a
#  clickable image/label.
#
class ExtendedQLabel(QtGui.QLabel):

	def __init(self, parent):
		QtGui.QLabel.__init__(self, parent)

	def mouseReleaseEvent(self, ev):
		self.emit(QtCore.SIGNAL('clicked()'))


################################################################################
# Usage of the dual action menu items.
################################################################################
class MyMainWindow(QtGui.QMainWindow):
	def __init__(self, *args, **kwargs):
		QtGui.QMainWindow.__init__(self, *args, **kwargs)

		regularAction = QtGui.QAction('Foo', self)
		extendedAction = ExtendedQAction('Bar', self.mainAction, self.secondaryAction, self)
		regularAction2 = QtGui.QAction('Hello', self)
		extendedAction2 = ExtendedQAction('World', self.mainAction, self.secondaryAction, self)

		menubar = self.menuBar()
		myMenu = menubar.addMenu('&Menu')
		myMenu.addAction(regularAction)
		myMenu.addAction(extendedAction)
		myMenu.addAction(regularAction2)
		myMenu.addAction(extendedAction2)
```

```
            self.setWindowTitle('Fun and Games')

        def mainAction(self):
            print "performing main action"

        def secondaryAction(self):
            print "performing sectiondary action"

def main():
        app = QtGui.QApplication(sys.argv)
        funAndGames = MyMainWindow()
        funAndGames.show()
        sys.exit(app.exec_())

if __name__ == '__main__':
        main()
```

List Widget

遍历List Widget

最直接的方法如下：

```
items = []
for index in xrange(self.listWidget.count()):
    items.append(self.listWidget.item(index))
```

但是这样很不pythonic，基于一般越短的代码就是越正确的代码的原理，可以像下面这样：

```
all_items = self.listWidgetA.findItems(QString('*'), Qt.MatchWrap | Qt.MatchWildcard)
```

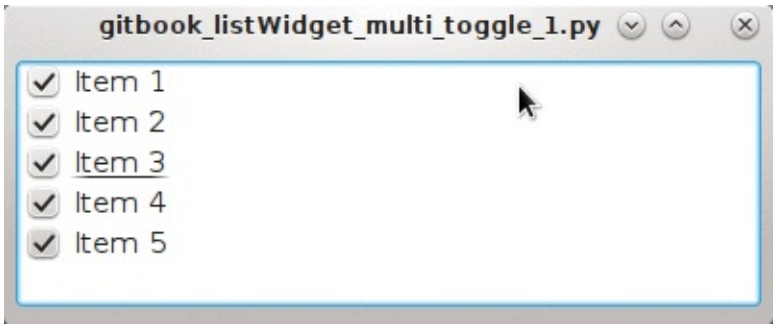
但是这相当于把所有的items全部存到一个list里面了，会费资源，还是不好。

可以考虑如下方式，在listWidget的subclass里定义一个iterAllItems method,其实他是一个generator。

```
def iterAllItems(self):
    for i in range(self.count()):
        yield self.item(i)
```

同时勾选多个items

框选多个item之后，用空格键可以勾选/去选多个item，效果如下图所示：



方法是reimplement keyPressEvent，只要按键是空格键，就勾选/去选选择了的items，代码如下

```python
```

from PyQt4 import QtGui, QtCore from PyQt4.QtCore import Qt, QString import sys import os

class ThumbListWidget(QtGui.QListWidget):

```
def __init__(self, type, parent=None):
    super(ThumbListWidget, self).__init__(parent)
    self.setIconSize(QtCore.QSize(124, 124))
    self.setSelectionMode(QtGui.QAbstractItemView.ExtendedSelection)
    self.setAcceptDrops(True)
    self.setSelectionRectVisible(True)

def keyPressEvent(self, event):

    if event.key() == Qt.Key_Space:
        if self.selectedItems():
            new_state = Qt.Unchecked if self.selectedItems()[0].checkState() else Qt.Checked
            for item in self.selectedItems():
                if item.flags() & Qt.ItemIsUserCheckable:
                    item.setCheckState(new_state)

        self.viewport().update()

    elif event.key() == Qt.Key_Delete:
        for item in self.selectedItems():
            self.takeItem(self.row(item))

def iterAllItems(self):
    for i in range(self.count()):
        yield self.item(i)
```

class Dialog(QtGui.QMainWindow):

```
def __init__(self):
    super(QtGui.QMainWindow, self).__init__()
    self.listItems = {}

    myQWidget = QtGui.QWidget()
    myBoxLayout = QtGui.QVBoxLayout()
    myQWidget.setLayout(myBoxLayout)
    self.setCentralWidget(myQWidget)

    self.listWidgetA = ThumbListWidget(self)
    for i in range(5):
        QtGui.QListWidgetItem('Item ' + str(i + 1), self.listWidgetA)

    for item in self.listWidgetA.iterAllItems():
        item.setFlags(item.flags() | Qt.ItemIsUserCheckable)
        item.setCheckState(Qt.Checked)

    myBoxLayout.addWidget(self.listWidgetA)
    self.listWidgetA.setAcceptDrops(False)
    self.listWidgetA.viewport().update()
```

if **name** == '**main**': app = QtGui.QApplication(sys.argv) dialog = Dialog() dialog.show() dialog.resize(400, 140) sys.exit(app.exec_())

但是还存在一个问题，希望能够在框选了多个item之后，通过单击任意一个item的checkbox，也能达到勾选/去选所有it

```python
    def mouseReleaseEvent(self, event):
        item = self.selectedCheckStateItem(event.pos())
        if item:
            selectedItems = self.selectedItems()
            new_state = Qt.Unchecked if item.checkState() == Qt.Checked else Qt.Checked
            self.setSelectedCheckStates(new_state, item)
            # QtGui.QApplication.processEvents()
            self.viewport().update()

        QtGui.QListWidget.mouseReleaseEvent(self, event)
        if item:
            for sel_item in selectedItems:
                sel_item.setSelected(True)

    def setSelectedCheckStates(self, state, click_item):
        for item in self.selectedItems():
            if item is not click_item:
                item.setCheckState(state)

    def selectedCheckStateItem(self, pos):
        item = self.itemAt(pos)
        if item:
            opt = QtGui.QStyleOptionButton()
            opt.rect = self.visualItemRect(item)
            rect = self.style().subElementRect(QtGui.QStyle.SE_ViewItemCheckIndicator, opt)
            if item in self.selectedItems() and rect.contains(pos):
                return item
        return None
```

其原理是当鼠标按键释放时，通过在 selectedCheckStateItem 中判断释放位置是否刚好在某个item的左侧的checkbox上，如果是，则返回此item，否则返回None。

如果确实鼠标按键在某个item左侧的checkbox上释放了，那就拿到他现在的勾选状态，然后相应的勾选/去选当前所有选中的items。

Note:

- 解决问题的关键点是

  ```
  opt = QtGui.QStyleOptionButton()
  opt.rect = self.visualItemRect(item)
  rect = self.style().subElementRect(QtGui.QStyle.SE_ViewItemCheckIndicator, opt)
  ```

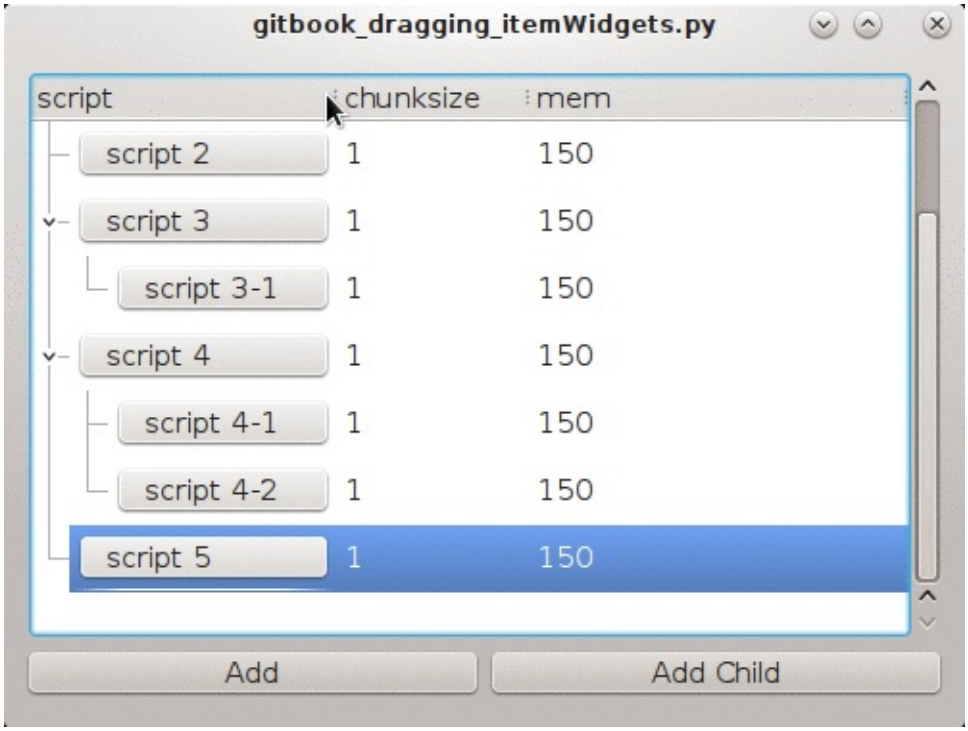
  此3行代码得到的是某个item的左侧的checkbox所占据的rect。

Tree

拖拽带itemWidget的treeWidgetItem

如果你在QTreeWidget的item上设置了itemWidget，你会发现拖放之后,itemWidget就消失了，这是“正常现象“，因为按照qt文档的描述，这个 `setItemWidget` 只能用来显示静态widet。

这里想了一个绕过的方法：给每个custom widget都写一个 `clone` method,使其 返回一个和自己当前状态完全一样的新的instance，然后在TreeWidget的dropEvent里调用这个 `clone` method，drop之前把"clone"出来的itemWidget存在list里，drop之后再使用刚才保存的itemWidget，对"clone"出来的itemWidget进行setItemWidget。



下面的代码包含了前一节的自定义drop indicator的效果

```
#!/usr/bin/env python2
import os
import sys
import re

from PyQt4 import QtGui, QtCore
from PyQt4.QtCore import Qt, QString


class MyWidget(QtGui.QDialog):

    def __init__(self, parent=None, val=None):
        super(MyWidget, self).__init__()
        self.layout = QtGui.QHBoxLayout(self)
        browseBtn = ElideButton(parent)
        browseBtn.setMinimumSize(QtCore.QSize(0, 25))
        browseBtn.setText(QString(val))
        browseBtn.setStyleSheet("text-align: left")
        self.layout.addWidget(browseBtn)
        self.browseBtn = browseBtn
        self.browseBtn.clicked.connect(self.browseCommandScript)
        self.browseBtn.setIconSize(QtCore.QSize(64, 64))

    def browseCommandScript(self):
```

```
        script = QtGui.QFileDialog.getOpenFileName(
            self, 'Select Script file', '/tmp/crap', "Executable Files (*)")
        if script:
            self._script = script
            old_text = str(self.browseBtn.text()).strip()
            old_text = re.search('^script [\d-]*', old_text).group()
            self.browseBtn.setText(('%s %s' % (old_text, script)))

    def clone(self):
        clone = MyWidget(val=str(self.browseBtn.text()))
        return clone


class ElideButton(QtGui.QPushButton):

    def __init__(self, parent=None):

        super(ElideButton, self).__init__(parent)
        font = self.font()
        font.setPointSize(10)
        self.setFont(font)

    def paintEvent(self, event):
        painter = QtGui.QStylePainter(self)

        metrics = QtGui.QFontMetrics(self.font())
        elided = metrics.elidedText(self.text(), Qt.ElideRight, self.width())

        option = QtGui.QStyleOptionButton()
        self.initStyleOption(option)
        option.text = ''
        painter.drawControl(QtGui.QStyle.CE_PushButton, option)
        painter.drawText(self.rect(), Qt.AlignLeft | Qt.AlignVCenter, elided)


class MyTreeView(QtGui.QTreeView):

    def __init__(self, parent=None):
        super(MyTreeView, self).__init__(parent)
        self.dropIndicatorRect = QtCore.QRect()

    def paintEvent(self, event):
        painter = QtGui.QPainter(self.viewport())
        self.drawTree(painter, event.region())
        # in original implementation, it calls an inline function paintDropIndicator here
        self.paintDropIndicator(painter)

    def paintDropIndicator(self, painter):

        if self.state() == QtGui.QAbstractItemView.DraggingState:
            opt = QtGui.QStyleOption()
            opt.init(self)
            opt.rect = self.dropIndicatorRect
            rect = opt.rect

            if rect.height() == 0:
                pen = QtGui.QPen(QtCore.Qt.black, 1, QtCore.Qt.DashLine)
                painter.setPen(pen)
                painter.drawLine(rect.topLeft(), rect.topRight())
            else:
                pen = QtGui.QPen(QtCore.Qt.black, 1, QtCore.Qt.DashLine)
                painter.setPen(pen)
                painter.drawRect(rect)
```

```
class MyTreeWidget(QtGui.QTreeWidget, MyTreeView):

    # def mouseMoveEvent(self, e):
    #     if self.state()==QtGui.QAbstractItemView.DraggingState:
    #         mimeData = self.model().mimeData(self.selectedIndexes())
    #         drag = QtGui.QDrag(self)
    #         drag.setMimeData(mimeData)
    #         drag.exec_(QtCore.Qt.MoveAction)

    def startDrag(self, supportedActions):
        listsQModelIndex = self.selectedIndexes()
        if listsQModelIndex:
            mimeData = QtCore.QMimeData()
            dataQMimeData = self.model().mimeData(listsQModelIndex)
            # if not dataQMimeData:
            #     return None
            dragQDrag = QtGui.QDrag(self)
            # dragQDrag.setPixmap(QtGui.QPixmap('test.jpg')) # <- For put your custom image here
            dragQDrag.setMimeData(dataQMimeData)
            defaultDropAction = QtCore.Qt.IgnoreAction
            if ((supportedActions & QtCore.Qt.CopyAction) and (self.dragDropMode() != QtGui.QAbstractItemV
                defaultDropAction = QtCore.Qt.CopyAction
            dragQDrag.exec_(supportedActions, defaultDropAction)

    def dragMoveEvent(self, event):
        pos = event.pos()
        item = self.itemAt(pos)

        if item:
            index = self.indexFromItem(item)

            rect = self.visualRect(index)
            rect_left = self.visualRect(index.sibling(index.row(), 0))
            rect_right = self.visualRect(index.sibling(index.row(), self.columnCount() - 1))
            self.dropIndicatorPosition = self.position(event.pos(), rect, index)

            if self.dropIndicatorPosition == self.AboveItem:
                self.dropIndicatorRect = QtCore.QRect(rect_left.left(), rect_left.top(), rect_right.right() - rect_lef
                event.accept()
            elif self.dropIndicatorPosition == self.BelowItem:
                self.dropIndicatorRect = QtCore.QRect(rect_left.left(), rect_left.bottom(), rect_right.right() - rec
                event.accept()

            elif self.dropIndicatorPosition == self.OnItem:
                self.dropIndicatorRect = QtCore.QRect(rect_left.left(), rect_left.top(), rect_right.right() - rect_lef
                event.accept()
            else:
                self.dropIndicatorRect = QtCore.QRect()

            self.model().setData(index, self.dropIndicatorPosition, Qt.UserRole)

            # self.setState(QtGui.QAbstractItemView.DraggingState)
        # This is necessary or else the previously drawn rect won't be erased
        self.viewport().update()

    def iterativeChildren(self, nodes):
        results = []
        while True:
            newNodes = []
            if not nodes:
                break
```

```
            for node in nodes:
                results.append(node)
                for i in range(node.childCount()):
                    print 'newNodes:', newNodes
                    newNodes += [node.child(i)]
            nodes = newNodes
        results = nodes + results
        return results

    def keyPressEvent(self, event):
        'delete currently selected item'
        QtGui.QTreeWidget.keyPressEvent(self, event)
        key = event.key()

        if self.currentItem():

            root = self.invisibleRootItem()
            parent = self.currentItem().parent() or root

            if key == Qt.Key_Delete:
                parent.removeChild(self.currentItem())

    def dropEvent(self, event):
        pos = event.pos()
        item = self.itemAt(pos)
        if item:
            index = self.indexFromItem(item)
            self.model().setData(index, 0, Qt.UserRole)

        if item is self.currentItem():
            QtGui.QTreeWidget.dropEvent(self, event)
            event.accept()
            return

        if event.source == self and event.dropAction() == Qt.MoveAction or self.dragDropMode() == QtGui.

            topIndex = QtCore.QModelIndex()
            col = -1
            row = -1

            l = [event, row, col, topIndex]

            if self.dropOn(l):

                event, row, col, topIndex = l

                idxs = self.selectedIndexes()
                indexes = []
                existing_rows = set()
                for i in idxs:
                    if i.row() not in existing_rows:
                        indexes.append(i)
                        existing_rows.add(i.row())

                if topIndex in indexes:
                    return

                # try storing the itemWidgets first
                # we should iterate through all child items,and store itemWidgets for them
                widgets = []

                dropRow = self.model().index(row, col, topIndex)
                taken = []
```

```
        indexes_reverse = indexes[:]
        indexes_reverse.reverse()
        # i = 0
        for index in indexes_reverse:
            parent = self.itemFromIndex(index)
            item_widget = self.itemWidget(parent, 0)

            print 'item_widget:', item_widget, item_widget.parent()

            # item_widget.setParent(self)
            print 'dragging item has child:', parent.childCount()

            # print 'before dragging, child 0 ',self.itemWidget( parent.child(0),0).browseBtn.text()

            # in case it has children , we get all of them
            all_child = []

            all_items = self.iterativeChildren([parent])

            print 'all items:', len(all_items), all_items

            # store cloned widgets in a list
            widgets = [self.itemWidget(i, 0).clone() for i in all_items]

            # widgets.append(item_widget.clone())

            if not parent or not parent.parent():
                # if not parent or not isinstance(parent.parent(),QtGui.QTreeWidgetItem):
                taken.append(self.takeTopLevelItem(index.row()))
            else:
                taken.append(parent.parent().takeChild(index.row()))

            # i += 1
            # break

        taken.reverse()

        print 'itemWidgets:', widgets

        for index in indexes:
            print 'inserting: topIndex:', topIndex.isValid(), row
            if row == -1:  # means index=root
                if topIndex.isValid():  # Returns the model index of the model's root item. The root item is
                    parent = self.itemFromIndex(topIndex)
                    parent.insertChild(parent.childCount(), taken[0])

                    # after insert the itemwidget is gone
                    # print 'after dragging, child 0 ',self.itemWidget( taken[0],0).browseBtn.text()

                    # self.setItemWidget(taken[0],0,QtGui.QLineEdit())
                    # self.setItemWidget(taken[0],0,new_widget)
                    print 'row==-1,if',  # self.itemWidget(taken[0],0),self.itemWidget(taken[0],0).parent()
                    # taken = taken[1:]

                else:
                    self.insertTopLevelItem(self.topLevelItemCount(), taken[0])
                    # taken = taken[1:]
                    print 'row==-1,else'
            else:
                r = dropRow.row() if dropRow.row() >= 0 else row
                if topIndex.isValid():
                    parent = self.itemFromIndex(topIndex)
```

```
                    parent.insertChild(min(r, parent.childCount()), taken[0])
                    # taken = taken[1:]
                    print 'row!=-1,if'
                else:
                    self.insertTopLevelItem(min(r, self.topLevelItemCount()), taken[0])
                    # taken = taken[1:]
                    print 'row!=-1,else'

            all_items = self.iterativeChildren([taken[0]])

            for i, w in zip(all_items, widgets):
                self.setItemWidget(i, 0, w)

            taken = taken[1:]
        event.accept()

    QtGui.QTreeWidget.dropEvent(self, event)
    self.expandAll()
    self.updateGeometry()

def position(self, pos, rect, index):
    r = QtGui.QAbstractItemView.OnViewport
    # margin*2 must be smaller than row height, or the drop onItem rect won't show
    margin = 10
    if pos.y() - rect.top() < margin:
        r = QtGui.QAbstractItemView.AboveItem
    elif rect.bottom() - pos.y() < margin:
        r = QtGui.QAbstractItemView.BelowItem
    # elif rect.contains(pos, True):
    elif pos.y() - rect.top() > margin and rect.bottom() - pos.y() > margin:
        r = QtGui.QAbstractItemView.OnItem

    return r

def dropOn(self, l):

    event, row, col, index = l

    root = self.rootIndex()

    if self.viewport().rect().contains(event.pos()):
        index = self.indexAt(event.pos())
        # if drop on nothing or drop out side of index zone
        print 'in drop on ', index, index.isValid(), self.visualRect(index).contains(event.pos())
        if not index.isValid() or not self.visualRect(index).contains(event.pos()):
            index = root

    if index != root:

        dropIndicatorPosition = self.position(event.pos(), self.visualRect(index), index)
        if self.dropIndicatorPosition == self.AboveItem:
            print 'dropon above'
            row = index.row()
            col = index.column()
            index = index.parent()

        elif self.dropIndicatorPosition == self.BelowItem:
            print 'dropon below'
            row = index.row() + 1
            col = index.column()
            index = index.parent()

        elif self.dropIndicatorPosition == self.OnItem:
```

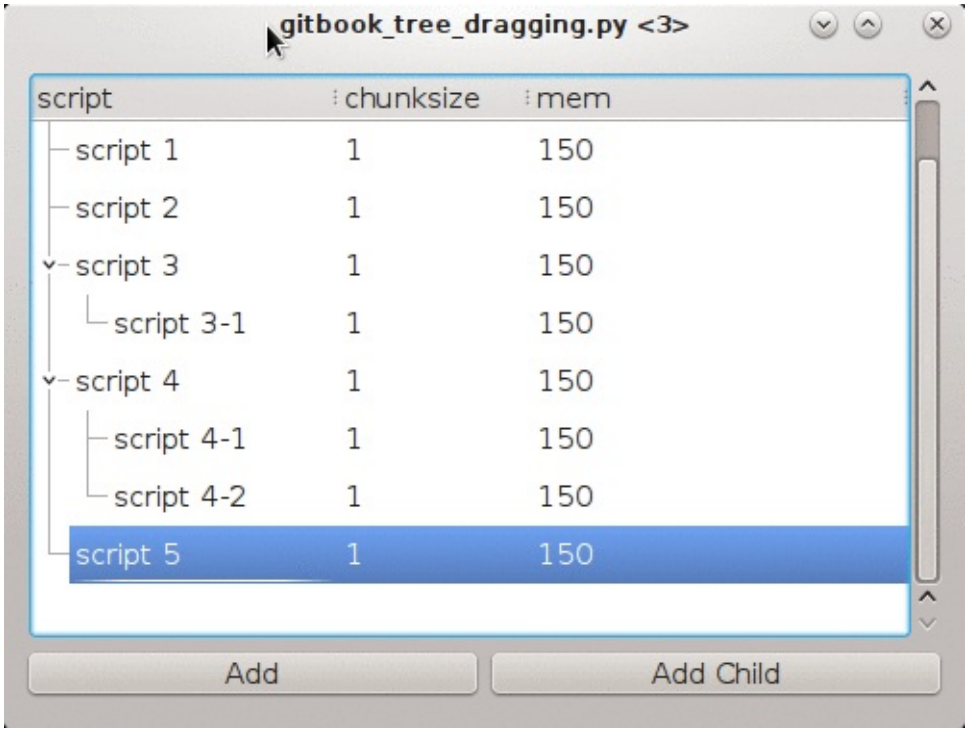
```
                print 'dropon onItem'
                pass
            elif self.dropIndicatorPosition == self.OnViewport:
                pass
            else:
                pass

        else:
            self.dropIndicatorPosition = self.OnViewport

        l[0], l[1], l[2], l[3] = event, row, col, index

        # if not self.droppingOnItself(event, index):
        return True


class TheUI(QtGui.QDialog):

    def __init__(self, args=None, parent=None):
        super(TheUI, self).__init__(parent)
        self.layout1 = QtGui.QVBoxLayout(self)
        treeWidget = MyTreeWidget()

        # treeWidget.setSelectionMode(QtGui.QAbstractItemView.ExtendedSelection)
        # treeWidget.setSelectionRectVisible(True)

        button1 = QtGui.QPushButton('Add')
        button2 = QtGui.QPushButton('Add Child')

        self.layout1.addWidget(treeWidget)

        self.layout2 = QtGui.QHBoxLayout()
        self.layout2.addWidget(button1)
        self.layout2.addWidget(button2)

        self.layout1.addLayout(self.layout2)

        treeWidget.setHeaderHidden(True)

        self.treeWidget = treeWidget
        self.button1 = button1
        self.button2 = button2
        self.button1.clicked.connect(lambda *x: self.addCmd())
        self.button2.clicked.connect(lambda *x: self.addChildCmd())

        HEADERS = ("script", "chunksize", "mem")
        self.treeWidget.setHeaderLabels(HEADERS)
        self.treeWidget.setColumnCount(len(HEADERS))

        self.treeWidget.setColumnWidth(0, 160)
        self.treeWidget.header().show()

        self.treeWidget.setDragDropMode(QtGui.QAbstractItemView.InternalMove)
        self.treeWidget.setStyleSheet('''
                                QTreeView {
                                    show-decoration-selected: 1;
                                }

                                QTreeView::item:hover {
                                    background: qlineargradient(x1: 0, y1: 0, x2: 0, y2: 1, stop: 0 #e7effd, stop
                                }

                                QTreeView::item:selected:active{
```

```
                                background: qlineargradient(x1: 0, y1: 0, x2: 0, y2: 1, stop: 0 #6ea1f1, sto
                            }

                            QTreeView::item:selected:!active {
                                background: qlineargradient(x1: 0, y1: 0, x2: 0, y2: 1, stop: 0 #6b9be8, sto
                            }
                            ''')

        self.resize(500, 350)
        for i in xrange(6):
            item = self.addCmd(i)
            if i in (3, 4):
                self.addChildCmd()
                if i == 4:
                    self.addCmd('%s-2' % i, parent=item)

        self.treeWidget.expandAll()
        self.setStyleSheet("QTreeWidget::item{ height: 30px;  }")

    def addChildCmd(self):
        parent = self.treeWidget.currentItem()
        self.addCmd(parent=parent)
        self.treeWidget.setCurrentItem(parent)

    def addCmd(self, i=None, parent=None):
        'add a level to tree widget'

        root = self.treeWidget.invisibleRootItem()
        if not parent:
            parent = root

        if i is None:
            if parent == root:
                i = self.treeWidget.topLevelItemCount()
            else:
                i = str(parent.text(0)).strip()[7:]
                i = '%s-%s' % (i, parent.childCount() + 1)

        # item = QtGui.QTreeWidgetItem(parent, ['script %s' % i, '1', '150'])

        script = '   script %s' % i
        item = QtGui.QTreeWidgetItem(parent, [script, '1', '150'])

        self.treeWidget.setItemWidget(item, 0, MyWidget(val=script))

        self.treeWidget.setCurrentItem(item)
        self.treeWidget.expandAll()
        return item

if __name__ == '__main__':
    app = QtGui.QApplication(sys.argv)
    gui = TheUI()
    gui.show()
    app.exec_()
```

自定义drop indicator

想实现如下的效果:

- 加粗的drop indicator
- 修改插入的“判定”灵敏度(这一点很重要，因为默认判定是2px，很难轻松的把拖拽的item“插入”两行之间)



其中

- `MyTreeView`里的`paintDropIndicator`用来自定义paint drop indicator
- `position` function用来修改默认的插入“判定”，原始默认值是2,显然`margin*2`必须小于行高，不然“恰好”放在item上的判定就没法发生了
- 在`dragMoveEvent`里通过position返回的“判定”，来决定表示放手位置的dropIndicatorRect的坐标
- `dropEvent`就是把c++版直接翻译了下，应该需要继续改进，很多地方不是python里的恰当写法

代码如下

```
#!/usr/bin/env python2

import os
import sys
import re

from PyQt4 import QtGui, QtCore
from PyQt4.QtCore import Qt, QString


class MyTreeView(QtGui.QTreeView):

    def __init__(self, parent=None):
        super(MyTreeView, self).__init__(parent)
        self.dropIndicatorRect = QtCore.QRect()

    def paintEvent(self, event):
```

```
        painter = QtGui.QPainter(self.viewport())
        self.drawTree(painter, event.region())
        # in original implementation, it calls an inline function paintDropIndicator here
        self.paintDropIndicator(painter)

    def paintDropIndicator(self, painter):

        if self.state() == QtGui.QAbstractItemView.DraggingState:
            opt = QtGui.QStyleOption()
            opt.init(self)
            opt.rect = self.dropIndicatorRect
            rect = opt.rect

            brush = QtGui.QBrush(QtGui.QColor(Qt.black))

            if rect.height() == 0:
                pen = QtGui.QPen(brush, 2, QtCore.Qt.SolidLine)
                painter.setPen(pen)
                painter.drawLine(rect.topLeft(), rect.topRight())
            else:
                pen = QtGui.QPen(brush, 2, QtCore.Qt.SolidLine)
                painter.setPen(pen)
                painter.drawRect(rect)


class MyTreeWidget(QtGui.QTreeWidget, MyTreeView):

    def startDrag(self, supportedActions):
        listsQModelIndex = self.selectedIndexes()
        if listsQModelIndex:
            mimeData = QtCore.QMimeData()
            dataQMimeData = self.model().mimeData(listsQModelIndex)
            dragQDrag = QtGui.QDrag(self)
            # dragQDrag.setPixmap(QtGui.QPixmap('test.jpg')) # <- For put your custom image here
            dragQDrag.setMimeData(dataQMimeData)
            defaultDropAction = QtCore.Qt.IgnoreAction
            if ((supportedActions & QtCore.Qt.CopyAction) and (self.dragDropMode() != QtGui.QAbstractItemV
                defaultDropAction = QtCore.Qt.CopyAction
            dragQDrag.exec_(supportedActions, defaultDropAction)

    def dragMoveEvent(self, event):
        pos = event.pos()
        item = self.itemAt(pos)

        if item:
            index = self.indexFromItem(item)  # this always get the default 0 column index

            rect = self.visualRect(index)
            rect_left = self.visualRect(index.sibling(index.row(), 0))
            rect_right = self.visualRect(index.sibling(index.row(), self.header().logicalIndex(self.columnCount(

            self.dropIndicatorPosition = self.position(event.pos(), rect, index)

            if self.dropIndicatorPosition == self.AboveItem:
                self.dropIndicatorRect = QtCore.QRect(rect_left.left(), rect_left.top(), rect_right.right() - rect_lef
                event.accept()
            elif self.dropIndicatorPosition == self.BelowItem:
                self.dropIndicatorRect = QtCore.QRect(rect_left.left(), rect_left.bottom(), rect_right.right() - rec
                event.accept()
            elif self.dropIndicatorPosition == self.OnItem:
                self.dropIndicatorRect = QtCore.QRect(rect_left.left(), rect_left.top(), rect_right.right() - rect_lef
                event.accept()
            else:
```

```
                self.dropIndicatorRect = QtCore.QRect()

            self.model().setData(index, self.dropIndicatorPosition, Qt.UserRole)

        # This is necessary or else the previously drawn rect won't be erased
        self.viewport().update()

    def dropEvent(self, event):
        pos = event.pos()
        item = self.itemAt(pos)

        if item is self.currentItem():
            QtGui.QTreeWidget.dropEvent(self, event)
            event.accept()
            return

        if item:
            index = self.indexFromItem(item)
            self.model().setData(index, 0, Qt.UserRole)

        if event.source == self and event.dropAction() == Qt.MoveAction or self.dragDropMode() == QtGui.

            topIndex = QtCore.QModelIndex()
            col = -1
            row = -1

            l = [event, row, col, topIndex]

            if self.dropOn(l):

                event, row, col, topIndex = l

                idxs = self.selectedIndexes()
                indexes = []
                existing_rows = set()
                for i in idxs:
                    if i.row() not in existing_rows:
                        indexes.append(i)
                        existing_rows.add(i.row())

                if topIndex in indexes:
                    return

                dropRow = self.model().index(row, col, topIndex)
                taken = []

                indexes_reverse = indexes[:]
                indexes_reverse.reverse()
                i = 0
                for index in indexes_reverse:
                    parent = self.itemFromIndex(index)
                    if not parent or not parent.parent():
                        # if not parent or not isinstance(parent.parent(),QtGui.QTreeWidgetItem):
                        taken.append(self.takeTopLevelItem(index.row()))
                    else:
                        taken.append(parent.parent().takeChild(index.row()))

                    i += 1
                    # break

                taken.reverse()

                for index in indexes:
```

```
                if row == -1:
                    if topIndex.isValid():
                        parent = self.itemFromIndex(topIndex)
                        parent.insertChild(parent.childCount(), taken[0])
                        taken = taken[1:]

                    else:
                        self.insertTopLevelItem(self.topLevelItemCount(), taken[0])
                        taken = taken[1:]
                else:
                    r = dropRow.row() if dropRow.row() >= 0 else row
                    if topIndex.isValid():
                        parent = self.itemFromIndex(topIndex)
                        parent.insertChild(min(r, parent.childCount()), taken[0])
                        taken = taken[1:]
                    else:
                        self.insertTopLevelItem(min(r, self.topLevelItemCount()), taken[0])
                        taken = taken[1:]

            event.accept()

        QtGui.QTreeWidget.dropEvent(self, event)
        self.expandAll()

    def position(self, pos, rect, index):
        r = QtGui.QAbstractItemView.OnViewport
        # margin*2 must be smaller than row height, or the drop onItem rect won't show
        margin = 10
        if pos.y() - rect.top() < margin:
            r = QtGui.QAbstractItemView.AboveItem
        elif rect.bottom() - pos.y() < margin:
            r = QtGui.QAbstractItemView.BelowItem

        # this rect is always the first column rect
        # elif rect.contains(pos, True):
        elif pos.y() - rect.top() > margin and rect.bottom() - pos.y() > margin:
            r = QtGui.QAbstractItemView.OnItem

        return r

    def dropOn(self, l):

        event, row, col, index = l

        root = self.rootIndex()

        if self.viewport().rect().contains(event.pos()):
            index = self.indexAt(event.pos())
            if not index.isValid() or not self.visualRect(index).contains(event.pos()):
                index = root

        if index != root:

            dropIndicatorPosition = self.position(event.pos(), self.visualRect(index), index)
            if self.dropIndicatorPosition == self.AboveItem:
                print 'dropon above'
                row = index.row()
                col = index.column()
                index = index.parent()

            elif self.dropIndicatorPosition == self.BelowItem:
                print 'dropon below'
                row = index.row() + 1
```

```
                col = index.column()
                index = index.parent()

            elif self.dropIndicatorPosition == self.OnItem:
                print 'dropon onItem'
                pass
            elif self.dropIndicatorPosition == self.OnViewport:
                pass
            else:
                pass

        else:
            self.dropIndicatorPosition = self.OnViewport

        l[0], l[1], l[2], l[3] = event, row, col, index

        # if not self.droppingOnItself(event, index):
        return True


class TheUI(QtGui.QDialog):

    def __init__(self, args=None, parent=None):
        super(TheUI, self).__init__(parent)
        self.layout1 = QtGui.QVBoxLayout(self)
        treeWidget = MyTreeWidget()

        treeWidget.setSelectionMode(QtGui.QAbstractItemView.ExtendedSelection)

        button1 = QtGui.QPushButton('Add')
        button2 = QtGui.QPushButton('Add Child')

        self.layout1.addWidget(treeWidget)

        self.layout2 = QtGui.QHBoxLayout()
        self.layout2.addWidget(button1)
        self.layout2.addWidget(button2)

        self.layout1.addLayout(self.layout2)

        treeWidget.setHeaderHidden(True)

        self.treeWidget = treeWidget
        self.button1 = button1
        self.button2 = button2
        self.button1.clicked.connect(lambda *x: self.addCmd())
        self.button2.clicked.connect(lambda *x: self.addChildCmd())

        HEADERS = ("script", "chunksize", "mem")
        self.treeWidget.setHeaderLabels(HEADERS)
        self.treeWidget.setColumnCount(len(HEADERS))

        self.treeWidget.setColumnWidth(0, 160)
        self.treeWidget.header().show()

        self.treeWidget.setDragDropMode(QtGui.QAbstractItemView.InternalMove)
        self.treeWidget.setStyleSheet('''
                                    QTreeView {
                                        show-decoration-selected: 1;
                                    }

                                    QTreeView::item:hover {
                                        background: qlineargradient(x1: 0, y1: 0, x2: 0, y2: 1, stop: 0 #e7effd, stop
```

```
                                }

                                QTreeView::item:selected:active{
                                    background: qlineargradient(x1: 0, y1: 0, x2: 0, y2: 1, stop: 0 #6ea1f1, sto
                                }

                                QTreeView::item:selected:!active {
                                    background: qlineargradient(x1: 0, y1: 0, x2: 0, y2: 1, stop: 0 #6b9be8, sto
                                }
                                ''')

        self.resize(500, 350)
        for i in xrange(6):
            item = self.addCmd(i)
            if i in (3, 4):
                self.addChildCmd()
                if i == 4:
                    self.addCmd('%s-2' % i, parent=item)

        self.treeWidget.expandAll()
        self.setStyleSheet("QTreeWidget::item{ height: 30px;  }")

    def addChildCmd(self):
        parent = self.treeWidget.currentItem()
        self.addCmd(parent=parent)
        self.treeWidget.setCurrentItem(parent)

    def addCmd(self, i=None, parent=None):
        'add a level to tree widget'

        root = self.treeWidget.invisibleRootItem()
        if not parent:
            parent = root

        if i is None:
            if parent == root:
                i = self.treeWidget.topLevelItemCount()
            else:
                i = str(parent.text(0))[7:]
                i = '%s-%s' % (i, parent.childCount() + 1)

        item = QtGui.QTreeWidgetItem(parent, ['script %s' % i, '1', '150'])

        self.treeWidget.setCurrentItem(item)
        self.treeWidget.expandAll()
        return item

if __name__ == '__main__':
    app = QtGui.QApplication(sys.argv)
    gui = TheUI()
    gui.show()
    app.exec_()
```

Table

StyleSheet

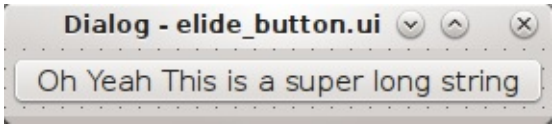
Designer

Promoted Widgets

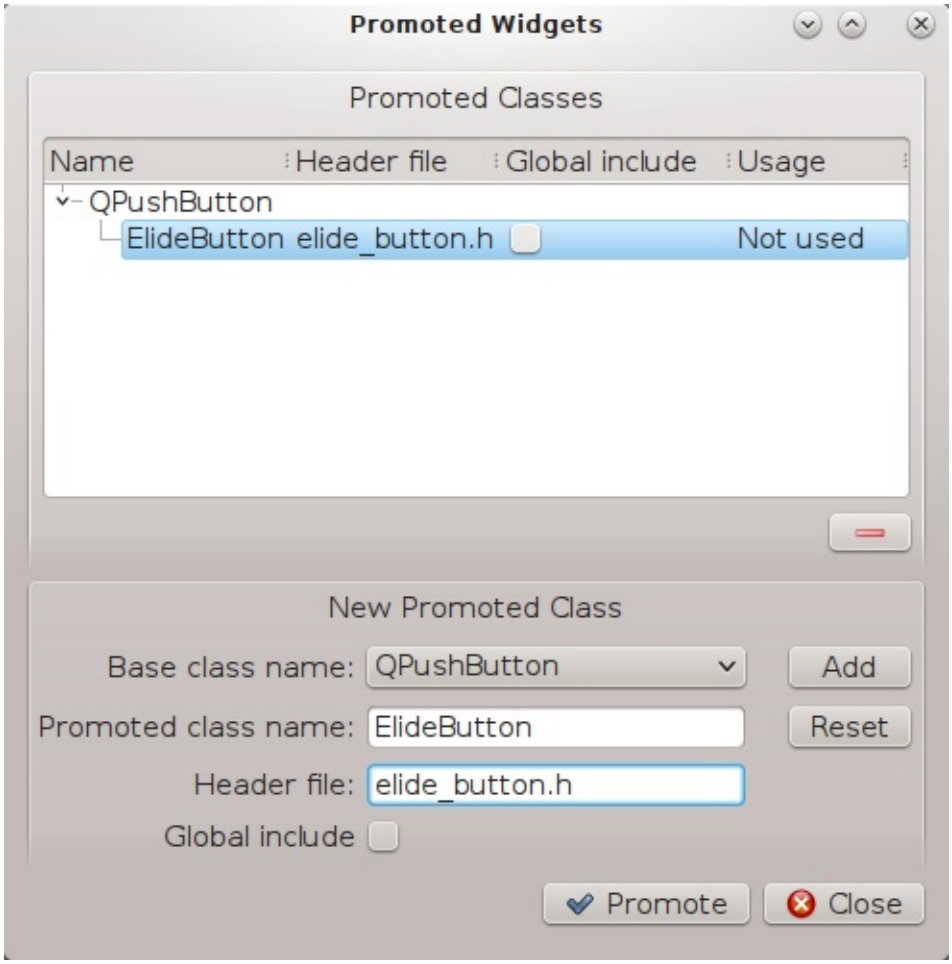
如果你有一些自定义的widgets,但是又希望用designer来画ui，这时有两种做法：

- 把这些widgets做成插件，让他们出现在designer左侧的widget列表里。但这样难度比较高，如果不是需要经常反复使用的widget，没必要这么做
- 使用promoted widgets，操作相对简单

以3.1带overflow效果的按钮为例：



如果你定义了ElideButton这个Subclass，你可以把他保存成单独一个文件elide_button.py，然后在designer里依然用QPushButton，但是创建之后在上面右击，选择Promote to,然后照下图填入



其中ElideButton必须和你的subclass的名字一致，elide_button.h必须和你的.py文件名一致(请无视.h)

这样你就可以达到，虽然designer里画的是QPushButton,但是当运行的时候，他其实使用的是你的ElideButton。

代码如下：

```
#!/usr/bin/env python2
import os
import sys
from PyQt4 import QtGui, QtCore
from PyQt4.QtCore import Qt, QString
from PyQt4 import uic


class TheUI(QtGui.QDialog):

    def __init__(self, args=None, parent=None):
        super(TheUI, self).__init__(parent)
        self.ui = uic.loadUi('elide_button.ui', self)
        self.pushButton.setText('Oh Yeah This is a super long string')
        self.ui.show()
        self.setMinimumWidth(20)

if __name__ == '__main__':
    app = QtGui.QApplication(sys.argv)
    gui = TheUI()
    gui.show()
    app.exec_()
```

综上，你可以随意使用自己定义的widget,与此同时还可以使用designer来画ui，只要你在designer里把相应的widget promote成你自定义的widget即可。

Graphics View