

[PySimpleGUI](#)

NEW for NOV 2018 - Run Qt using PySimpleGUI!

Supports both Python 2.7 & 3 when using tkinter

Supports both PySide2 and PyQt5

PySimpleGUI source code can run either on Qt or tkinter with no changes

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Code Condition
Design
Author
Demo Code Contributors
License

Acknowledgments

How Do I



PySimpleGUI

downloads 34k

downloads 11k

docs passing

Awesome meter 100

Python 2.7 3.x

PySimpleGUI

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PySimpleGUI!

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PYSIMPLEGUI FOR PYTHON 3.X VERSION

3.16.0

PYSIMPLEGUI FOR PYTHON 2.7 VERSION

1.16.0

PYSIMPLEGUIQT FOR PYTHON 3.X VERSION

01.17.0

[Announcements of Latest Developments](#)

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[COOKBOOK!](#)

[Brief Tutorial](#)

[Latest Demos and Master Branch on GitHub](#)

[Docs in PDF Format](#)

Super-simple GUI to use... Powerfully customizable

Home of the 1-line custom GUI & 1-line progress meter

The native GUI framework for perfectionists with deadlines

Note regarding Python versions

As of 9/25/2018 **both Python 3 and Python 2.7 are supported!** The Python 3 version is named `PySimpleGUI`. The Python 2.7 version is `PySimpleGUI27`. They are installed separately and the imports are different. See instructions in Installation section for more info.

Qt Version

Check out the new PySimpleGUI port to the Qt GUI Framework. You can learn more on the [PySimpleGUIQt GitHub site](#). There is a separate Readme file for the Qt version that you'll find there. Give it a shot if you're looking for something a bit more "modern". However be aware that it is in Alpha condition with a number of features partially complete.

Looking for a GUI package?

*Taking your Python code from the world of command lines and into the convenience of a GUI? **

Have a Raspberry Pi with a touchscreen that's going to waste because you don't have the time to learn a GUI SDK?

Into Machine Learning and are sick of the command line?

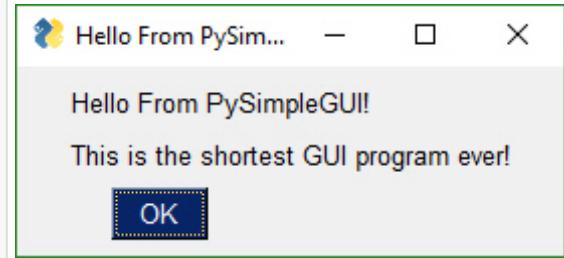
Would like to distribute your Python code to Windows users as a single .EXE file that launches straight into a GUI, much like a WinForms app?

* Want technical support? Looking for an actively maintained package?

Look no further, **you've found your GUI package.**

```
import PySimpleGUI as sg

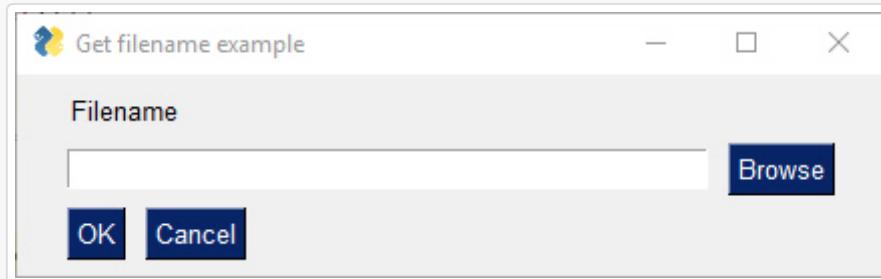
sg.Popup('Hello From PySimpleGUI!', 'This is the shortest GUI program ever!')
```



Or how about a ***custom GUI*** in 1 line of code?

```
import PySimpleGUI as sg

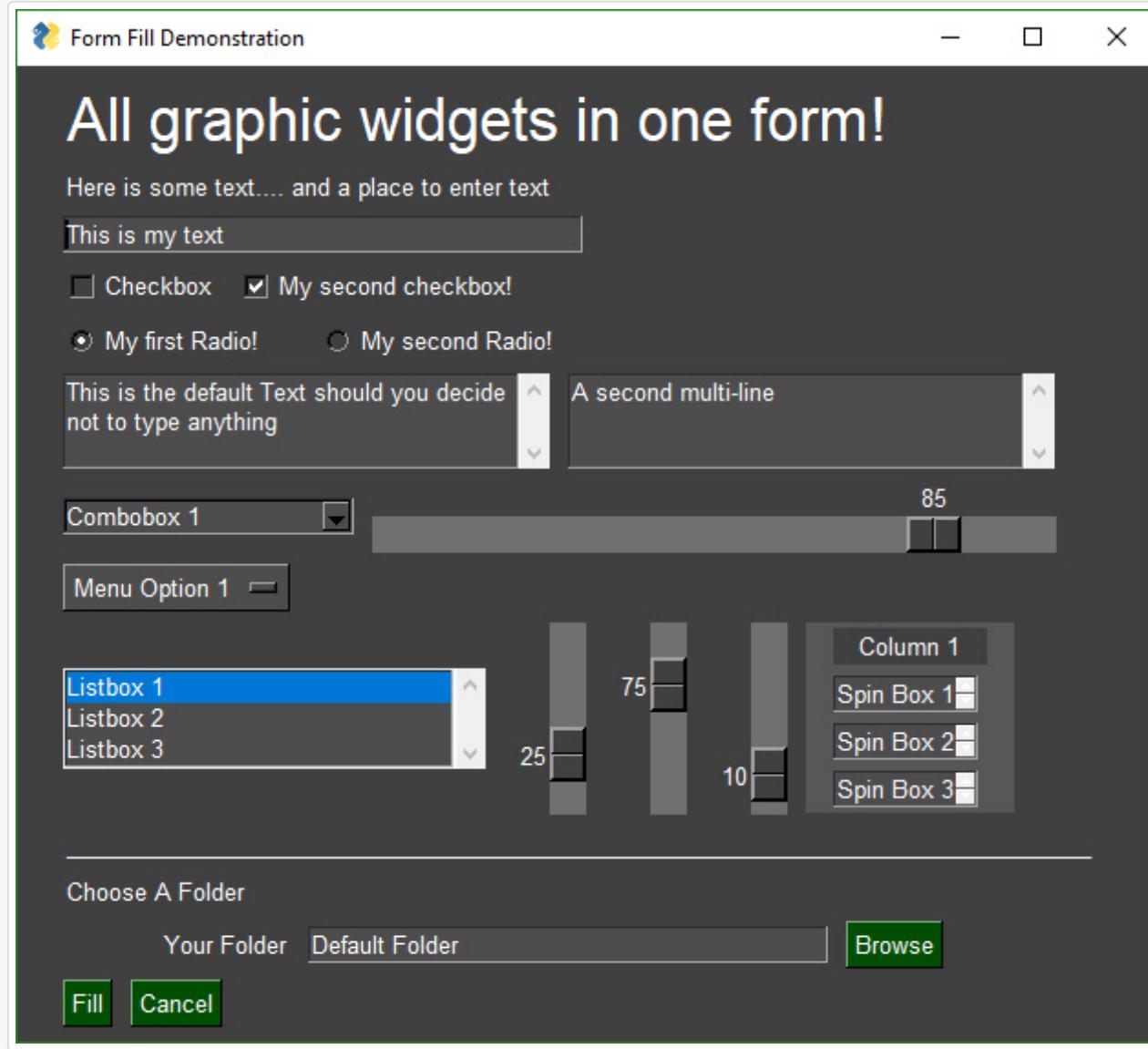
event, (filename,) = sg.Window('Get filename example').Layout([[sg.Text('Filename')], [sg.In
```



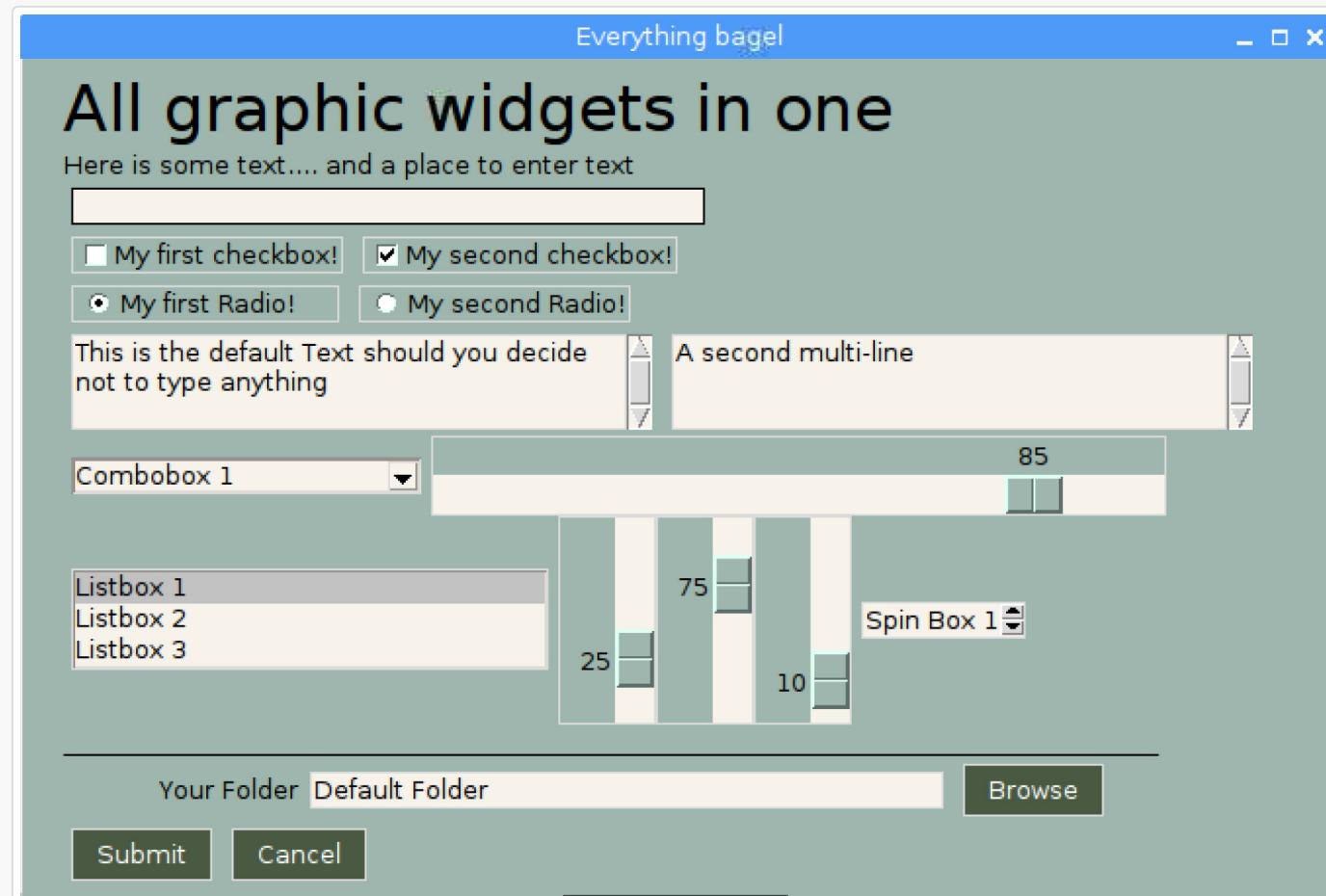
Build beautiful customized windows that fit your specific problem. Let PySimpleGUI solve your GUI problem while you solve your real problems. Look through the Cookbook, find a matching recipe, copy, paste, run within minutes. This is the process PySimpleGUI was designed to facilitate.

The screenshot shows a PySimpleGUI application window with a dark gray background. At the top left, there are two dropdown menus: 'User:' containing 'User 1' and 'Customer:' containing 'Customer 1'. To the right of these dropdowns are their respective values: '0' and '1'. Below these is a text input field labeled 'Notes:' which is currently empty. At the bottom of the window is a horizontal row of five buttons: 'Start' (black), 'Stop' (gray), 'Reset' (red), 'Submit' (green), and 'Exit' (blue).

PySimpleGUI wraps tkinter or Qt so that you get all the same widgets as you would tkinter/Qt, but you interact with them in a more friendly way. It does the layout and boilerplate code for you and presents you with a simple, efficient interface.



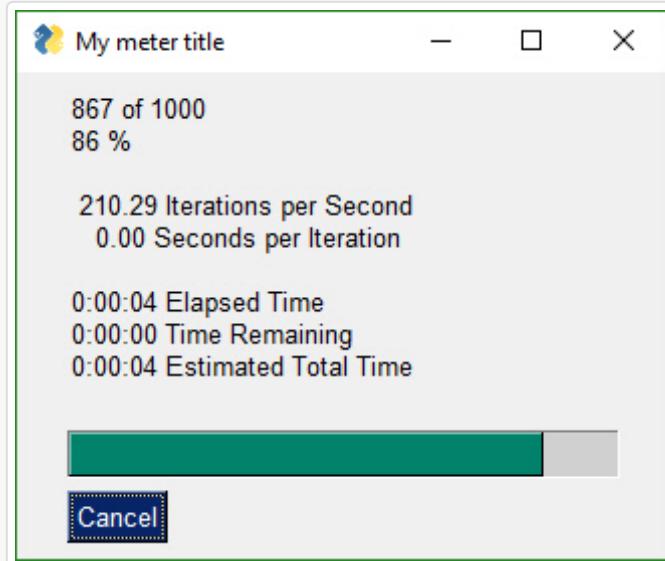
Perhaps you're looking for a way to interact with your **Raspberry Pi** in a more friendly way. The same form shown as on Pi (roughly the same)



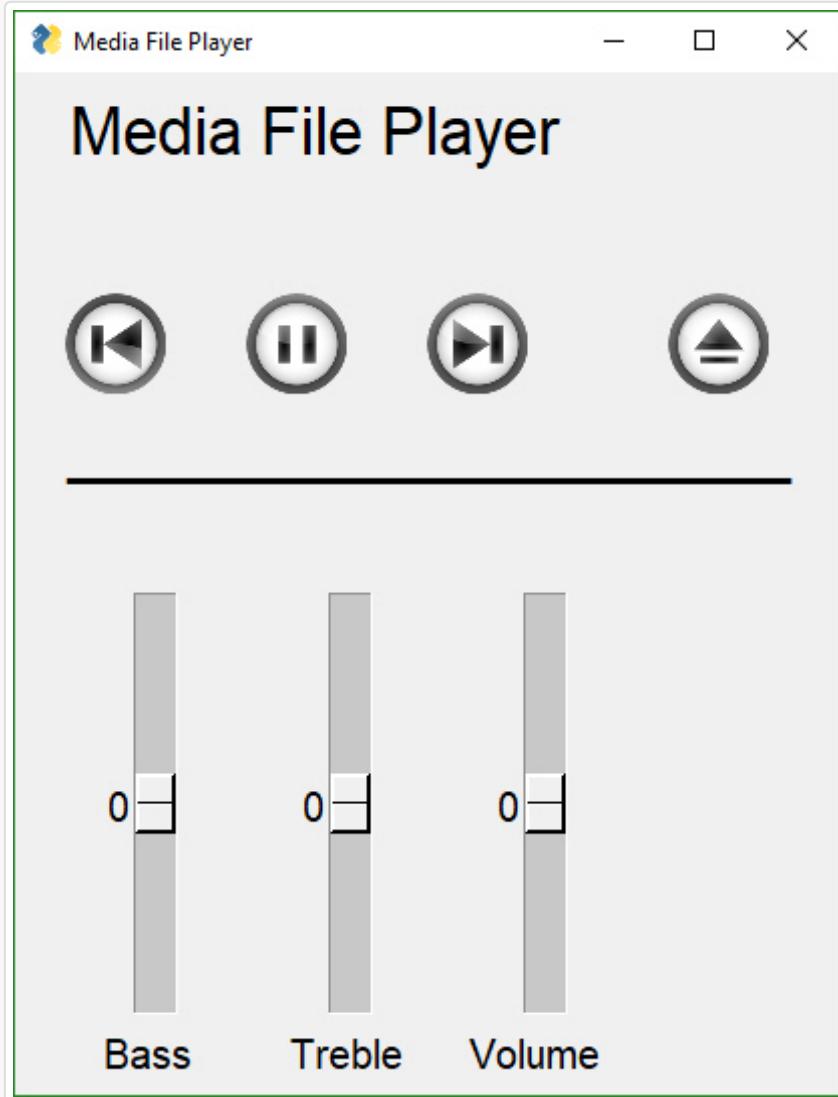
f

In addition to a primary GUI, you can add a Progress Meter to your code with ONE LINE of code. Slide this line into any of your `for` loops and get a nice meter:

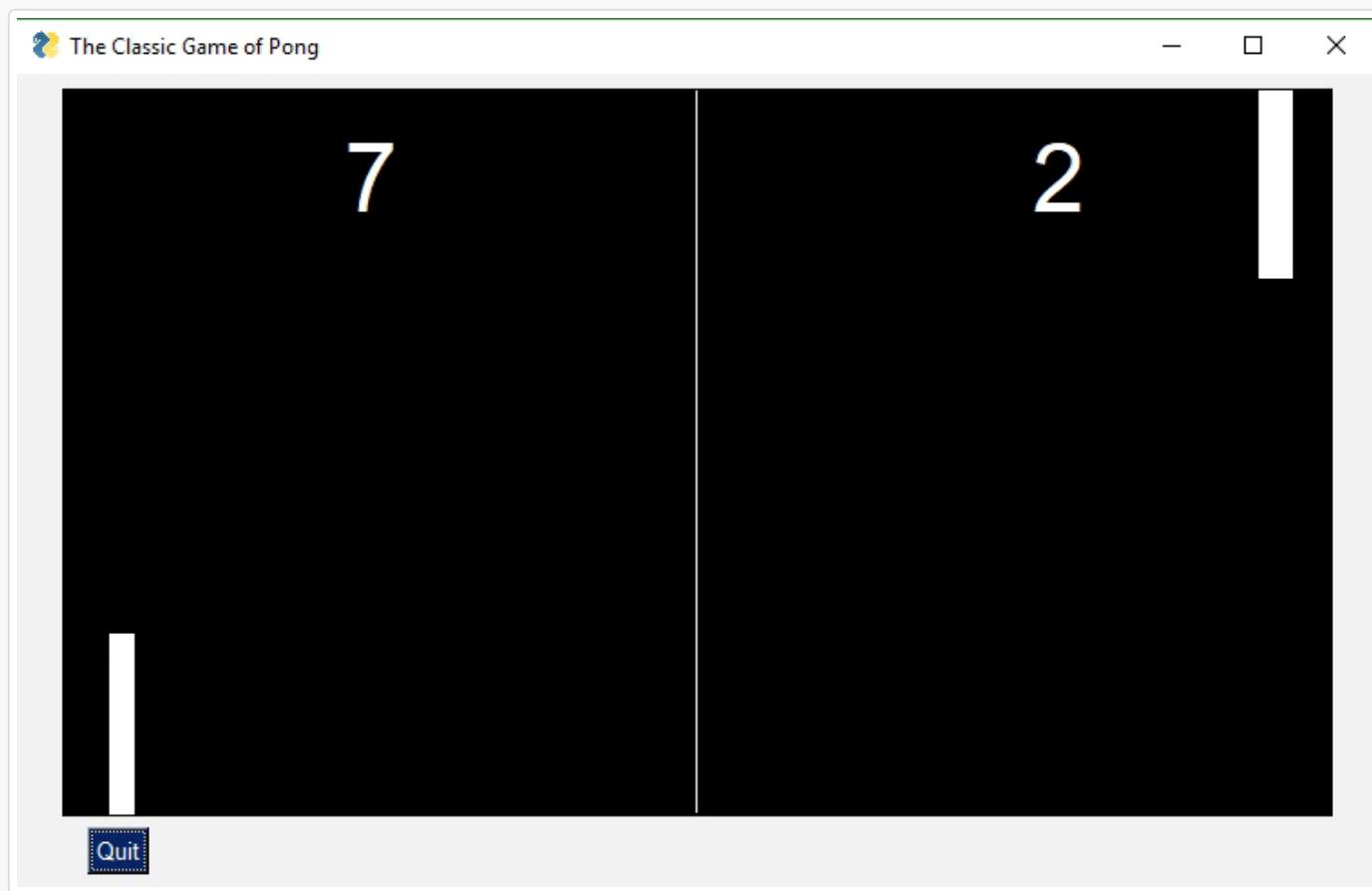
```
OneLineProgressMeter('My meter title', current_value, max_value, 'key')
```



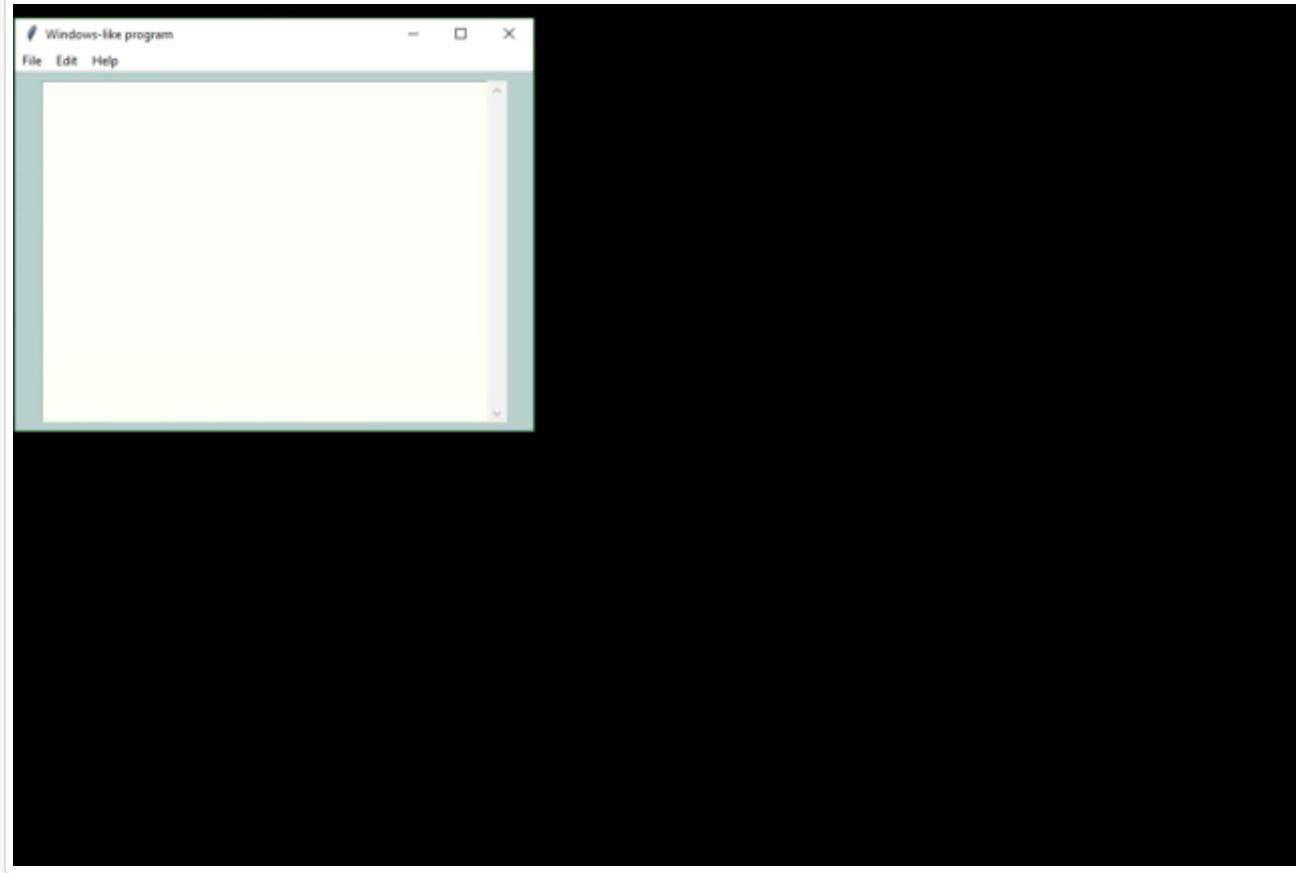
You can build an async media player GUI with custom buttons in 30 lines of code.



How about embedding a game inside of a GUI? This game of Pong is written in tkinter and then dropped into the PySimpleGUI window creating a game that has an accompanying GUI.



Combining PySimpleGUI with PyInstaller creates something truly remarkable and special, a Python program that looks like a Windows WinForms application. This application with working menu was created in 20 lines of Python code. It is a single .EXE file that launches straight into the screen you see. And more good news, the only icon you see on the taskbar is the window itself... there is no pesky shell window.



Background

I was frustrated by having to deal with the dos prompt when I had a powerful Windows machine right in front of me. Why is it SO difficult to do even the simplest of input/output to a window in Python??

There are a number of 'easy to use' Python GUIs, but they were too limited for my requirements. PySimpleGUI aims for the same simplicity found in packages like [EasyGUI](#) and [WxSimpleGUI](#), both really handy but limited, and adds the ability to define your own layouts. This ability to make your own windows using a large palette of widgets is but one difference between the existing "simple" packages and [PySimpleGUI](#).

With a simple GUI, it becomes practical to "associate" .py files with the python interpreter on Windows. Double click a py file and up pops a GUI window, a more pleasant experience than opening a dos Window and typing a command line.

The `PySimpleGUI` package is focused on the *developer*.

Create a custom GUI with as little and as simple code as possible.

This was the primary focus used to create PySimpleGUI.

"Do it in a Python-like way"

was the second.

Features

While simple to use, PySimpleGUI has significant depth to be explored by more advanced programmers. The feature set goes way beyond the requirements of a beginner programmer, and into the required features needed for complex GUIs.

```
Features of PySimpleGUI include:  
Support for Python versions 2.7 and 3  
Text  
Single Line Input  
Buttons including these types:  
    File Browse  
    Files Browse  
    Folder Browse  
    SaveAs  
    Non-closing return  
    Close window  
    Realtime  
    Calendar chooser  
    Color chooser  
    Checkboxes
```

Radio Buttons
Listbox
Option Menu
Slider
Graph
Frame with title
Icons
Multi-line Text Input
Scroll-able Output
Images
Tables
Trees
Progress Bar Async/Non-Blocking Windows
Tabbed windows
Persistent Windows
Redirect Python Output/Errors to scrolling **window**
'Higher level' APIs (e.g. MessageBox, YesNobox, ...)
Single-Line-Of-Code Proress Bar & Debug Print
Complete control of colors, look and feel
Selection of pre-defined palettes
Button images
Verticle Separator
Return values as dictionary
Set focus
Bind **return** key to buttons
Group widgets into a column and place into **window** anywhere
Scrollable columns
Keyboard low-level key **capture**
Mouse scroll-wheel support
Get Listbox values as they are selected
Get slider, spinner, combo as they are changed
Update elements in a live window
Bulk **window-fill** operation
Save / Load window to/from disk
Borderless (no titlebar) windows
Always on top windows
Menus with ALT-hotkey
Tooltips
Clickable links

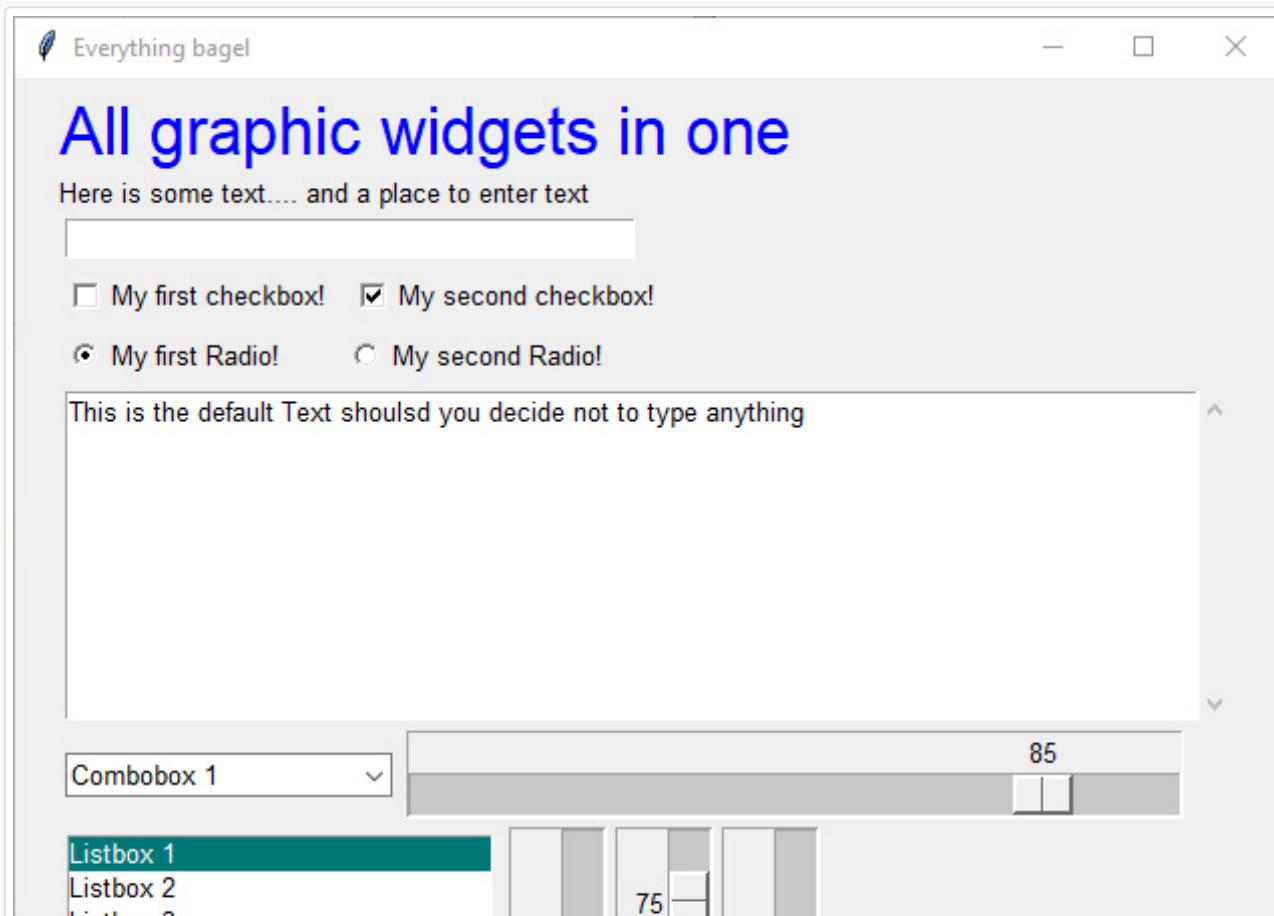
Transparent windows

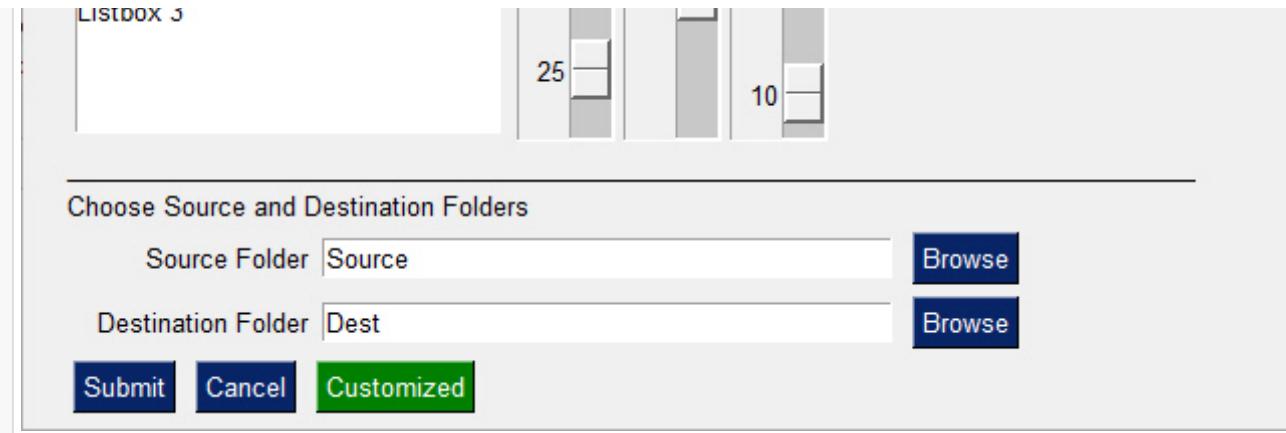
Movable windows

No async programming required (no callbacks to worry about)

An example of many widgets used on a single window. A little further down you'll find the 21 lines of code required to create this complex window. Try it if you don't believe it. Install PySimpleGUI then :

Start Python, copy and paste the code below into the >>> prompt and hit enter.
This will pop up...





```
import PySimpleGUI as sg

layout = [[sg.Text('All graphic widgets in one window!', size=(30, 1), font=("Helvetica", 25)),
           sg.Text('Here is some text.... and a place to enter text')],
          [sg.InputText()],
          [sg.Checkbox('My first checkbox!'), sg.Checkbox('My second checkbox!', default=True)],
          [sg.Radio('My first Radio!', "RADIO01", default=True), sg.Radio('My second Radio!', "RADIO02")],
          [sg.Multiline(default_text='This is the default Text shoulsd you decide not to type anything')],
          [sg.InputCombo(['Combobox 1', 'Combobox 2'], size=(20, 3))],
          [sg.Slider(range=(1, 100), orientation='h', size=(35, 20), default_value=85)],
          [sg.Listbox(values=['Listbox 1', 'Listbox 2', 'Listbox 3'], size=(30, 6)),
           sg.Slider(range=(1, 100), orientation='v', size=(10, 20), default_value=25),
           sg.Slider(range=(1, 100), orientation='v', size=(10, 20), default_value=75),
           sg.Slider(range=(1, 100), orientation='v', size=(10, 20), default_value=10)],
          [sg.Text('_' * 100, size=(70, 1))],
          [sg.Text('Choose Source and Destination Folders', size=(35, 1))],
          [sg.Text('Source Folder', size=(15, 1), auto_size_text=False, justification='right'), sg.InputText(),
           sg.FolderBrowse()],
          [sg.Text('Destination Folder', size=(15, 1), auto_size_text=False, justification='right'), sg.InputText(),
           sg.FolderBrowse()],
          [sg.Submit(), sg.Cancel(), sg.Button('Customized', button_color=('white', 'green'))]]

event, values = sg.Window('Everything bagel', auto_size_text=True, default_element_size=(40,
```

Design Goals

Copy, Paste, Run.

PySimpleGUI's goal with the API is to be easy on the programmer, and to function in a Python-like way.

Since GUIs are visual, it was desirable for the code to visually match what's on the screen. By providing a significant amount of documentation and an easy to use Cookbook, it's possible to see your first GUI within 5 minutes of beginning the installation.

Be Pythonic

Be Pythonic... Attempted to use language constructs in a natural way and to exploit some of Python's interesting features. Python's lists and optional parameters make PySimpleGUI work smoothly.

- windows are represented as Python lists.
 - A window is a list of rows
- A row is a list of elements
- Return values are a list of button presses and input values.
- Return values can also be represented as a dictionary
- The SDK calls collapse down into a single line of Python code that presents a custom GUI and returns values
- Linear programming instead of callbacks

Lofty Goals

Change Python

The hope is not that **this** package will become part of the Python Standard Library.

The hope is that Python will become **the** go-to language for creating GUI programs that run on Windows, Mac, and Linux *for all levels of developer*.

The hope is that beginners that are interested in graphic design will have an easy way to express themselves, right from the start of their Python experience.

There is a noticeable gap in the Python GUI solution. Fill that gap and who knows what will happen.

Maybe there's no "there there". *Or* maybe a simple GUI API will enable Python to dominate yet another computing discipline like it has so many others. This is my attempt to find out.

Getting Started with PySimpleGUI

Installing Python 3

```
pip install --upgrade PySimpleGUI
```

On some systems you need to run pip3.

```
pip3 install --upgrade PySimpleGUI
```

On a Raspberry Pi, this is should work:

```
sudo pip3 install --upgrade pysimplegui
```

Some users have found that upgrading required using an extra flag on the pip `--no-cache-dir`.

```
pip install --upgrade --no-cache-dir
```

On some versions of Linux you will need to first install pip. Need the Chicken before you can get the Egg (get it... Egg?)

```
sudo apt install python3-pip
```

If for some reason you are unable to install using `pip`, don't worry, you can still import PySimpleGUI by downloading the file PySimpleGUI.py and placing it in your folder along with the application that is importing it.

`tkinter` is a requirement for PySimpleGUI (the only requirement). Some OS variants, such as Ubuntu, do not come with `tkinter` already installed. If you get an error similar to:

```
ImportError: No module named tkinter
```

then you need to install `tkinter`. For python 2.7

```
sudo apt-get install python-tk
```

For python 3 `sudo apt-get install python3-tk`

More information about installing tkinter can be found here: <https://www.techinfected.net/2015/09/how-to-install-and-use-tkinter-in-ubuntu-debian-linux-mint.html>

Installing for Python 2.7

```
pip install --upgrade PySimpleGUI27
```

or

```
pip2 install --upgrade PySimpleGUI27
```

You may need to also install "future" for version 2.7

```
pip install future
```

or

```
pip2 install future
```

Python 2.7 support is relatively new and the bugs are still being worked out. I'm unsure what may need to be done to install tkinter for Python 2.7. Will update this readme when more info is available

Like above, you may have to install either pip or tkinter. To do this on Python 2.7:

```
sudo apt install python-pip
```

```
sudo apt install python-tkinter
```

Testing your installation

Once you have installed, or copied the .py file to your app folder, you can test the installation using python. At the command prompt start up Python.

Instructions for Python 2.7:

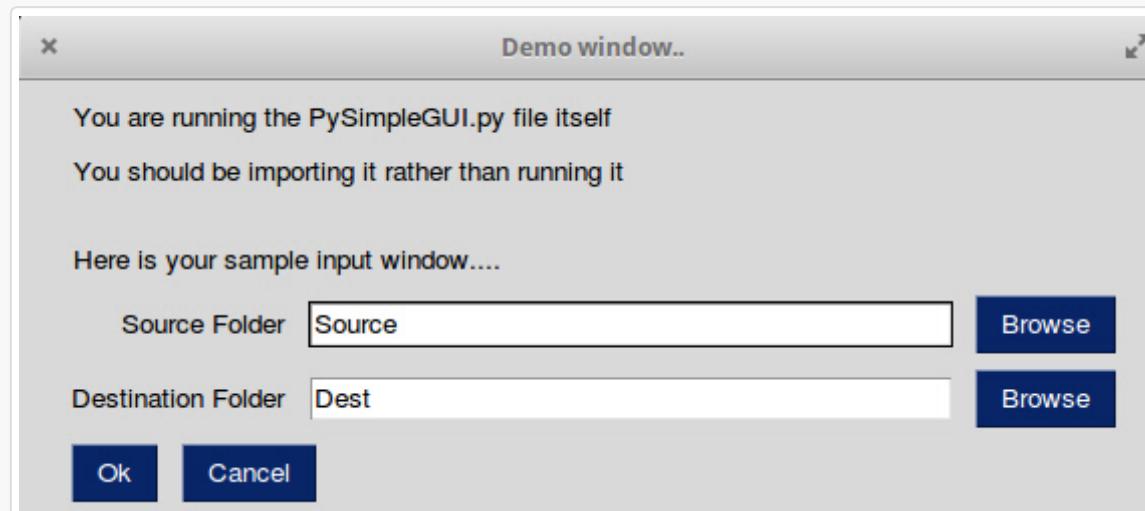
```
python
>>> import PySimpleGUI27
>>> PySimpleGUI27.main()
```

Instructions for Python 3:

```
python3
>>> import PySimpleGUI
>>> PySimpleGUI.main()
```

You will see a sample window in the center of your screen. If it's not installed correctly you are likely to get an error message during one of those commands

Here is the window you should see:



Prerequisites

Python 2.7 or Python 3

tkinter

PySimpleGUI Runs on all Python3 platforms that have tkinter running on them. It has been tested on Windows, Mac, Linux, Raspberry Pi. Even runs on `pypy3`.

EXE file creation

If you wish to create an EXE from your PySimpleGUI application, you will need to install [PyInstaller](#). There are instructions on how to create an EXE at the bottom of this ReadMe

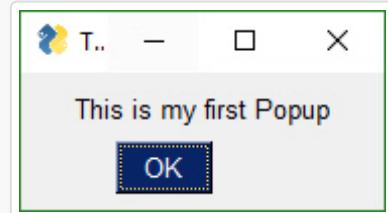
Using - Python 3

To use in your code, simply import....

```
import PySimpleGUI as sg
```

Then use either "high level" API calls or build your own windows.

```
sg.Popup('This is my first Popup')
```



Yes, it's just that easy to have a window appear on the screen using Python. With PySimpleGUI, making a custom window appear isn't much more difficult. The goal is to get you running on your GUI within **minutes**, not hours nor days.

Using - Python 2.7

Those using Python 2.7 will import a different module name

```
import PySimpleGUI27 as sg
```

Code Samples Assume Python 3

While all of the code examples you will see in this Readme and the Cookbook assume Python 3 and thus have an `import PySimpleGUI` at the top, you can run **all** of this code on Python 2.7 by changing the import statement to `import PySimpleGUI27`

APIs

PySimpleGUI can be broken down into 2 types of API's:

- * High Level single call functions (The `Popup` calls)
- * Custom window functions

Python Language Features

There are a number of Python language features that PySimpleGUI utilizes heavily for API access that should be understood...

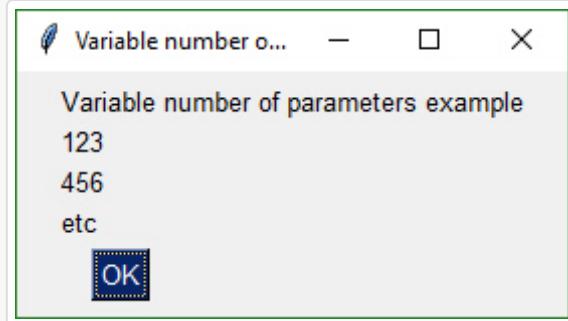
- * Variable number of arguments to a function call
- * Optional parameters to a function call
- * Dictionaries

Variable Number of Arguments

The "High Level" API calls that *output* values take a variable number of arguments so that they match a "print" statement as much as possible. The idea is to make it simple for the programmer to output as many items as desired and in any format. The user need not convert the variables to be output into the strings. The PySimpleGUI functions do that for the user.

```
sg.Popup('Variable number of parameters example', var1, var2, "etc")
```

Each new item begins on a new line in the Popup



Optional Parameters to a Function Call

This feature of the Python language is utilized *heavily* as a method of customizing windows and window Elements. Rather than requiring the programmer to specify every possible option for a widget, instead only the options the caller wants to override are specified.

Here is the function definition for the Popup function. The details aren't important. What is important is seeing that there is a long list of potential tweaks that a caller can make. However, they don't *have* to be specified on each and every call.

```
def Popup(*args,  
         button_color=None,  
         button_type=MSG_BOX_OK,  
         auto_close=False,  
         auto_close_duration=None,  
         icon=DEFAULT_WINDOW_ICON,  
         line_width=MESSAGE_BOX_LINE_WIDTH,  
         font=None):
```

If the caller wanted to change the button color to be black on yellow, the call would look something like this:

```
sg.Popup('This box has a custom button color', button_color=('black', 'yellow'))
```



Dictionaries

Dictionaries are used by more advanced PySimpleGUI users. You'll know that dictionaries are being used if you see a `key` parameter on any Element. Dictionaries are used in 2 ways:

1. To identify values when a window is read
 2. To identify Elements so that they can be "updated"
-

High Level API Calls - Popup's

"High level calls" are those that start with "Popup". They are the most basic form of communications with the user. They are named after the type of window they create, a pop-up window. These windows are meant to be short lived while, either delivering information or collecting it, and then quickly disappearing.

Popup Output

Think of the `Popup` call as the GUI equivalent of a `print` statement. It's your way of displaying results to a user in the windowed world. Each call to `Popup` will create a new `Popup` window.

`Popup` calls are normally blocking. Your program will stop executing until the user has closed the `Popup` window. A non-blocking window of `Popup` discussed in the `async` section.

Just like a `print` statement, you can pass any number of arguments you wish. They will all be turned into strings and displayed in the `popup` window.

There are a number of `Popup` output calls, each with a slightly different look (e.g. different button labels).

The list of Popup output functions are

```
Popup
PopupOk
PopupYesNo
PopupCancel
PopupOkCancel
PopupError
PopupTimed, PopupAutoClose
PopupNoWait, PopupNonBlocking
```

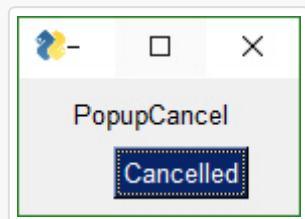
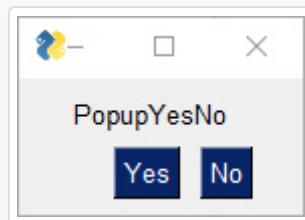
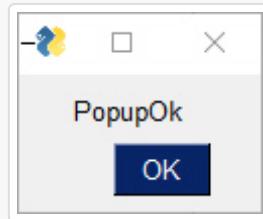
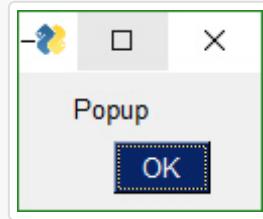
The trailing portion of the function name after Popup indicates what buttons are shown. `PopupYesNo` shows a pair of button with Yes and No on them. `PopupCancel` has a Cancel button, etc.

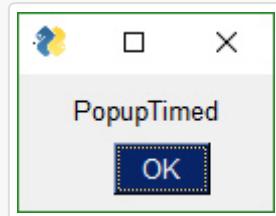
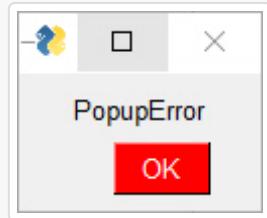
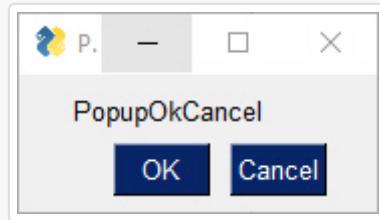
While these are "output" windows, they do collect input in the form of buttons. The Popup functions return the button that was clicked. If the Ok button was clicked, then Popup returns the string 'Ok'. If the user clicked the X button to close the window, then the button value returned is `None`.

The function `PopupTimed` or `PopupAutoClose` are popup windows that will automatically close after come period of time.

Here is a quick-reference showing how the Popup calls look.

```
sg.Popup('Popup') - Shows OK button
sg.PopupOk('PopupOk') - Shows OK button
sg.PopupYesNo('PopupYesNo') - Shows Yes and No buttons
sg.PopupCancel('PopupCancel') - Shows Cancelled button
sg.PopupOKCancel('PopupOKCancel') - Shows OK and Cancel buttons
sg.PopupError('PopupError') - Shows red error button
sg.PopupTimed('PopupTimed') - Automatically closes
sg.PopupAutoClose('PopupAutoClose') - Same as PopupTimed
```





```
Popup(*args, Variable number of arguments you want to display
      button_color=None, Color of buttons (text_color, background_color)
      background_color=None, Color of background
      text_color=None, Color of text
      button_type=POPUP_BUTTONS_OK, Type of button layout
      auto_close=False, If True window will automatically close
      auto_close_duration=None, Number of seconds for autoclose
      non_blocking=False, If True returns immediately
      icon=DEFAULT_WINDOW_ICON, Icon to use on the taskbar
```

```
line_width=None, Width of lines in characters  
font=None, Font to use for characters  
no_titlebar=False, If True no titlebar will be shown  
grab_anywhere=False, If True can move window by grabbing anywhere  
keep_on_top=False, If True window will be on top of other windows  
location=(None,None)): (x,y) coordinates to show the window
```

The other output Popups are variations on parameters. Usually the button_type parameter is the primary one changed.

The choices for button_type are:

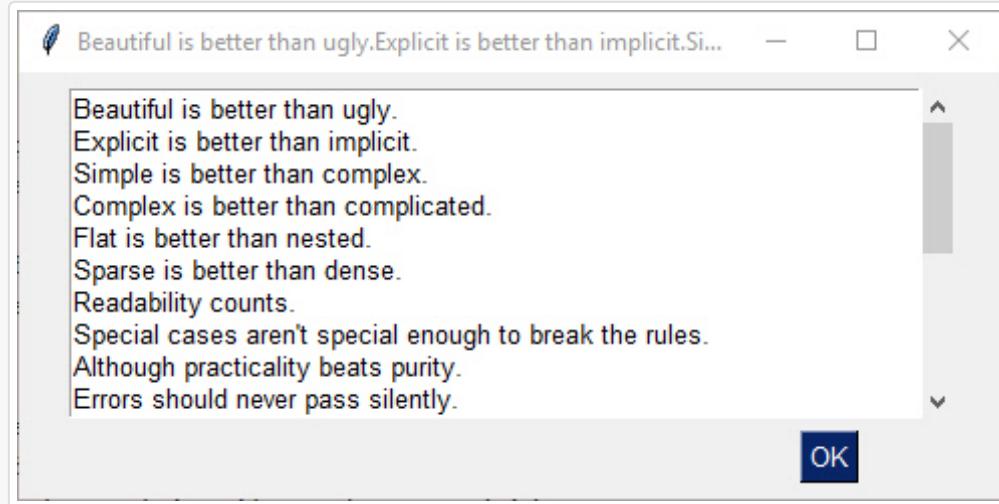
```
POPUP_BUTTONS_YES_NO  
POPUP_BUTTONS_CANCELLED  
POPUP_BUTTONS_ERROR  
POPUP_BUTTONS_OK_CANCEL  
POPUP_BUTTONS_OK  
POPUP_BUTTONS_NO_BUTTONS
```

Note that you should not call Popup yourself with different button_types. Rely on the Popup function named that sets that value for you. For example PopupYesNo will set the button type to POPUP_BUTTONS_YES_NO for you.

Scrolled Output

There is a scrolled version of Popups should you have a lot of information to display.

```
sg.PopupScrolled(my_text)
```



The `PopupScrolled` will auto-fit the window size to the size of the text. Specify `None` in the height field of a `size` parameter to get auto-sized height.

This call will create a scrolled box 80 characters wide and a height dependent upon the number of lines of text.

```
sg.PopupScrolled(my_text, size=(80, None))
```

Note that the default max number of lines before scrolling happens is set to 50. At 50 lines the scrolling will begin.

PopupNoWait

The Popup call `PopupNoWait` or `PopupNonBlocking` will create a popup window and then immediately return control back to you. All other popup functions will block, waiting for the user to close the popup window.

This function is very handy for when you're **debugging** and want to display something as output but don't want to change the program's overall timing by blocking. Think of it like a `print` statement. There are no return values on one of these Popups.

Popup Input

There are Popup calls for single-item inputs. These follow the pattern of `Popup` followed by `Get` and then the type of item to get. There are 3 of these input Popups to choose from, each with settings enabling customization.

- `PopupGetText` - get a single line of text
- `PopupGetFile` - get a filename
- `PopupGetFolder` - get a folder name

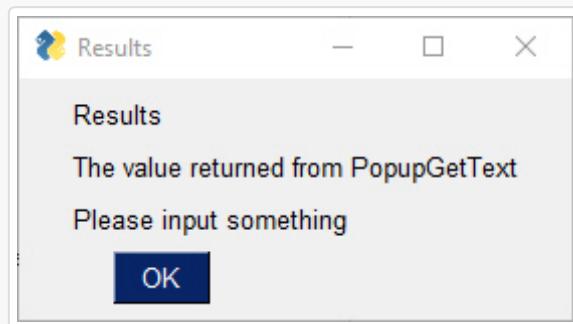
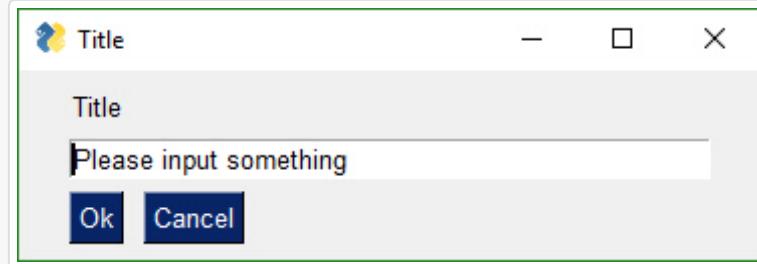
Use these Popups instead of making a custom window to get one data value, call the Popup input function to get the item from the user. If you find the parameters are unable to create the kind of window you are looking for, then it's time for you to create your own window.

PopupGetText

Use this Popup to get a line of text from the user.

```
PopupGetText(message, The message you wish to display with the input field  
    default_text='', Text to initially fill into the input field  
    password_char='', Passwork character if this is a password field  
    size=(None,None), Size of the window  
    button_color=None, Color to use for buttons (foreground, background)  
    background_color=None, Background color for window  
    text_color=None, Text color for window  
    icon=DEFAULT_WINDOW_ICON, Icon to display on taskbar  
    font=None, Font to use for text  
    no_titlebar=False, If True no titlebar will be shown  
    grab_anywhere=False, If True can grab anywhere to move the window  
    keep_on_top=False, If True window will stay on top of other windows  
    location=(None,None)) Location on screen to display window
```

```
import PySimpleGUI as sg  
  
text = sg.PopupGetText('Title', 'Please input something')  
sg.Popup('Results', 'The value returned from PopupGetText', text)
```



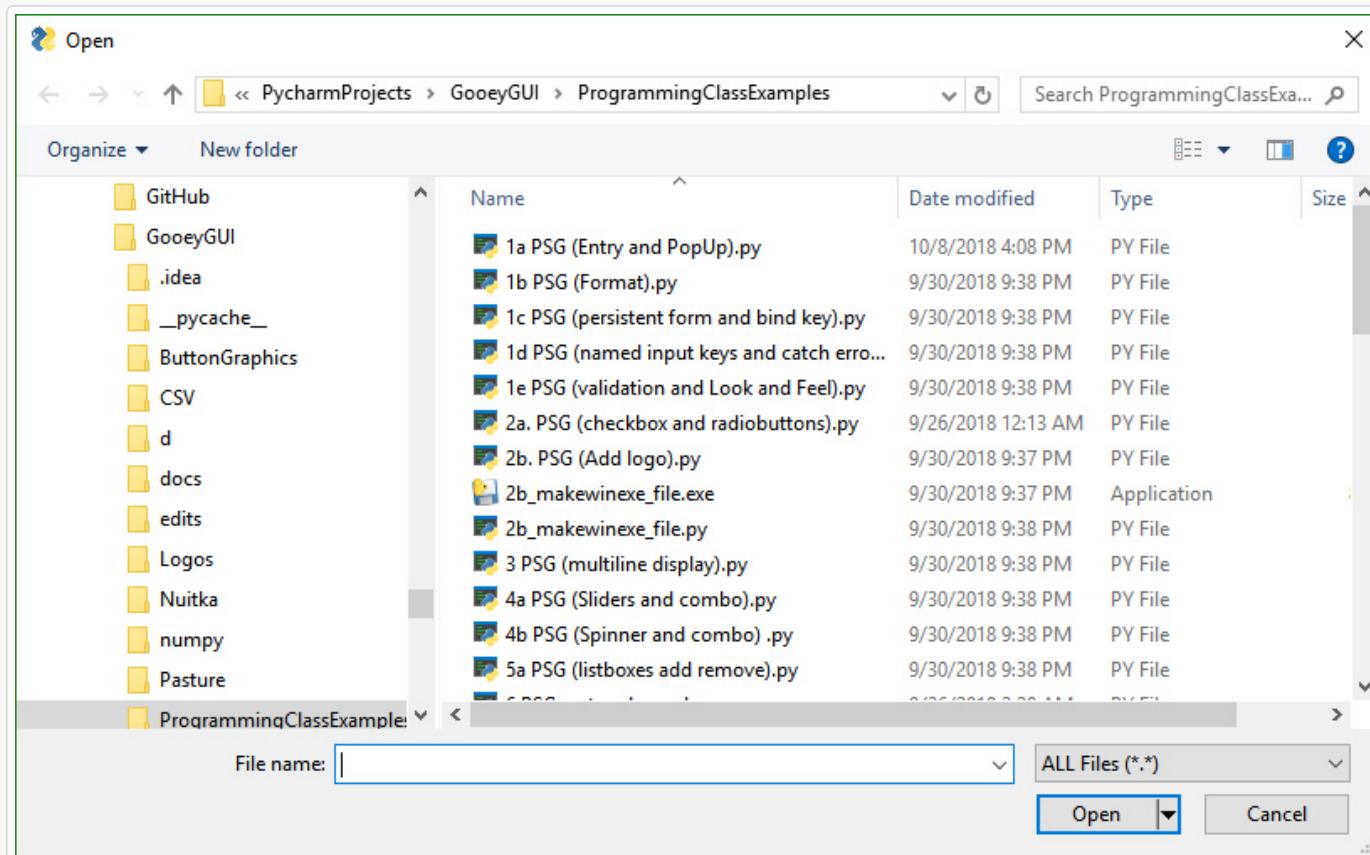
PopupGetFile

Gets a filename from the user. There are options to configure the type of dialog box to show. Normally an "Open File" dialog box is shown

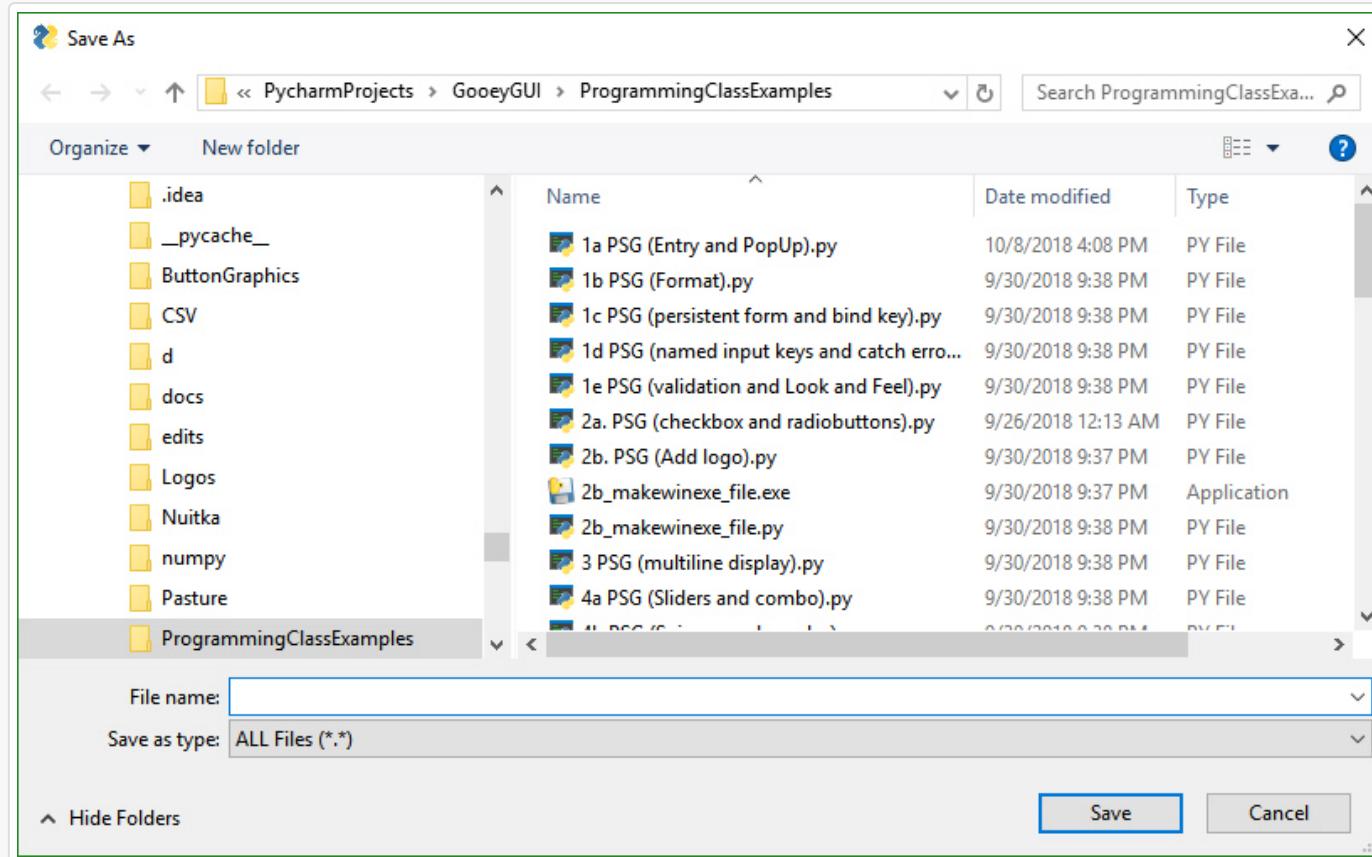
```
PopupGetFile(message, Message to show in the window  
           default_path='', Path browsing should start from  
           default_extension='', Which filetype is the default  
           save_as=False, Determines which dialog box style to show  
           file_types=(("ALL Files", "*.*"),), Which filetypes are displayed  
           no_window=False, if True no window is displayed except the dialog box  
           size=(None,None), Size of window  
           button_color=None, Color of buttons  
           background_color=None, Color of window background
```

```
text_color=None, Color of text in window
icon=DEFAULT_WINDOW_ICON, Icon to show on taskbar
font=None, Font to use
no_titlebar=False, If True does not display a titlebar
grab_anywhere=False, if True can grab window anywhere to move it
keep_on_top=False, if True window will be on top of others
location=(None,None)) Location on screen to show window
```

If configured as an Open File Popup then (save_as is not True) the dialog box will look like this



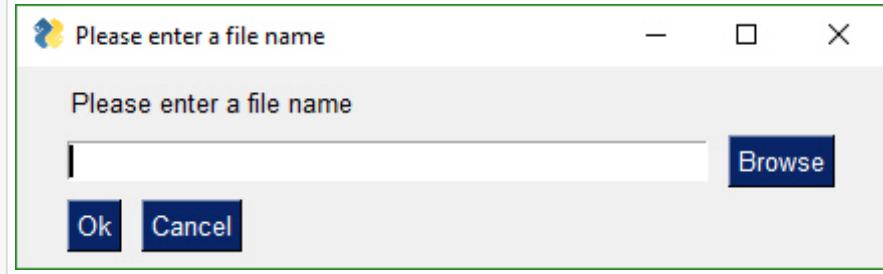
If you set the parameter save_As to True, then the dialog box looks like this:



If you choose a filename that already exists, you'll get a warning popup box asking if it's OK. You can also specify a file that doesn't exist. With an "Open" dialog box you cannot choose a non-existing file.

A typical call produces this window.

```
text = sg.PopupGetFile('Please enter a file name')
sg.Popup('Results', 'The value returned from PopupGetFile', text)
```



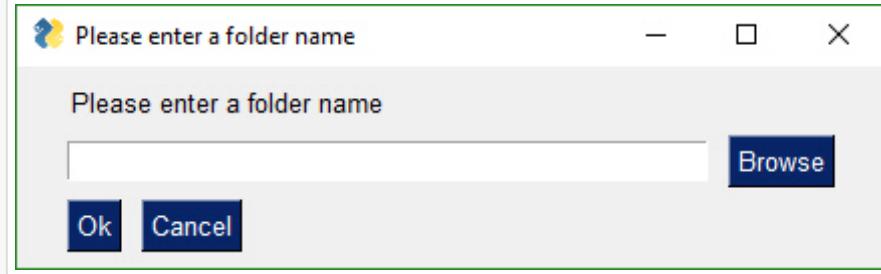
PopupGetFolder

The window created to get a folder name looks the same as the get a file name. The difference is in what the browse button does. `PopupGetFile` shows an Open File dialog box while `PopupGetFolder` shows an Open Folder dialog box.

```
PopupGetFolder(message, Message to display in window
               default_path='', Path to start browsing
               no_window=False, If True no window will be shown
               size=(None,None), Size of window
               button_color=None, Color of buttons
               background_color=None, Background color of window
               text_color=None, Color of window text
               icon=DEFAULT_WINDOW_ICON, Icon to show on taskbar
               font=None, Font to use for window
               no_titlebar=False, If True no titlebar will be shown
               grab_anywhere=False, If True can grab anywhere on window to move
               keep_on_top=False, If True window will be on top
               location=(None, None)) Location on screen to create window
```

This is a typical call

```
text = sg.PopupGetFolder('Please enter a folder name')
sg.Popup('Results', 'The value returned from PopupGetFolder', text)
```



Progress Meters!

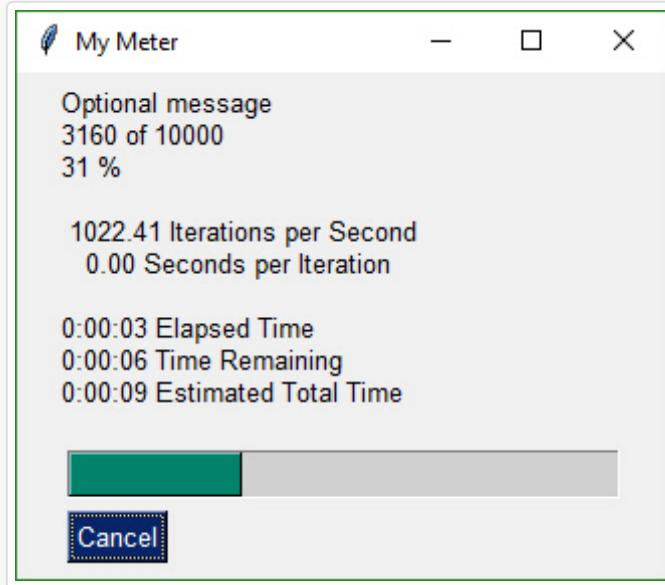
We all have loops in our code. Isn't it joyful waiting, watching a counter scrolling past in a text window? How about one line of code to get a progress meter, that contains statistics about your code?

```
OneLineProgressMeter(title,
                      current_value,
                      max_value,
                      key,
                      *args,
                      orientation=None,
                      bar_color=DEFAULT_PROGRESS_BAR_COLOR,
                      button_color=None,
                      size=DEFAULT_PROGRESS_BAR_SIZE,
                      border_width=DEFAULT_PROGRESS_BAR_BORDER_WIDTH):
```

Here's the one-line Progress Meter in action!

```
for i in range(1,10000):
    sg.OneLineProgressMeter('My Meter', i+1, 10000, 'key', 'Optional message')
```

That line of code resulted in this window popping up and updating.



A meter AND fun statistics to watch while your machine grinds away, all for the price of 1 line of code. With a little trickery you can provide a way to break out of your loop using the Progress Meter window. The cancel button results in a `False` return value from `OneLineProgressMeter`. It normally returns `True`.

Be sure and add one to your loop counter so that your counter goes from 1 to the max value. If you do not add one, your counter will never hit the max value. Instead it will go from 0 to max-1.

Debug Output

Another call in the 'Easy' families of APIs is `EasyPrint`. It will output to a debug window. If the debug window isn't open, then the first call will open it. No need to do anything but stick a 'print' call in your code. You can even replace your 'print' calls with calls to EasyPrint by simply sticking the statement

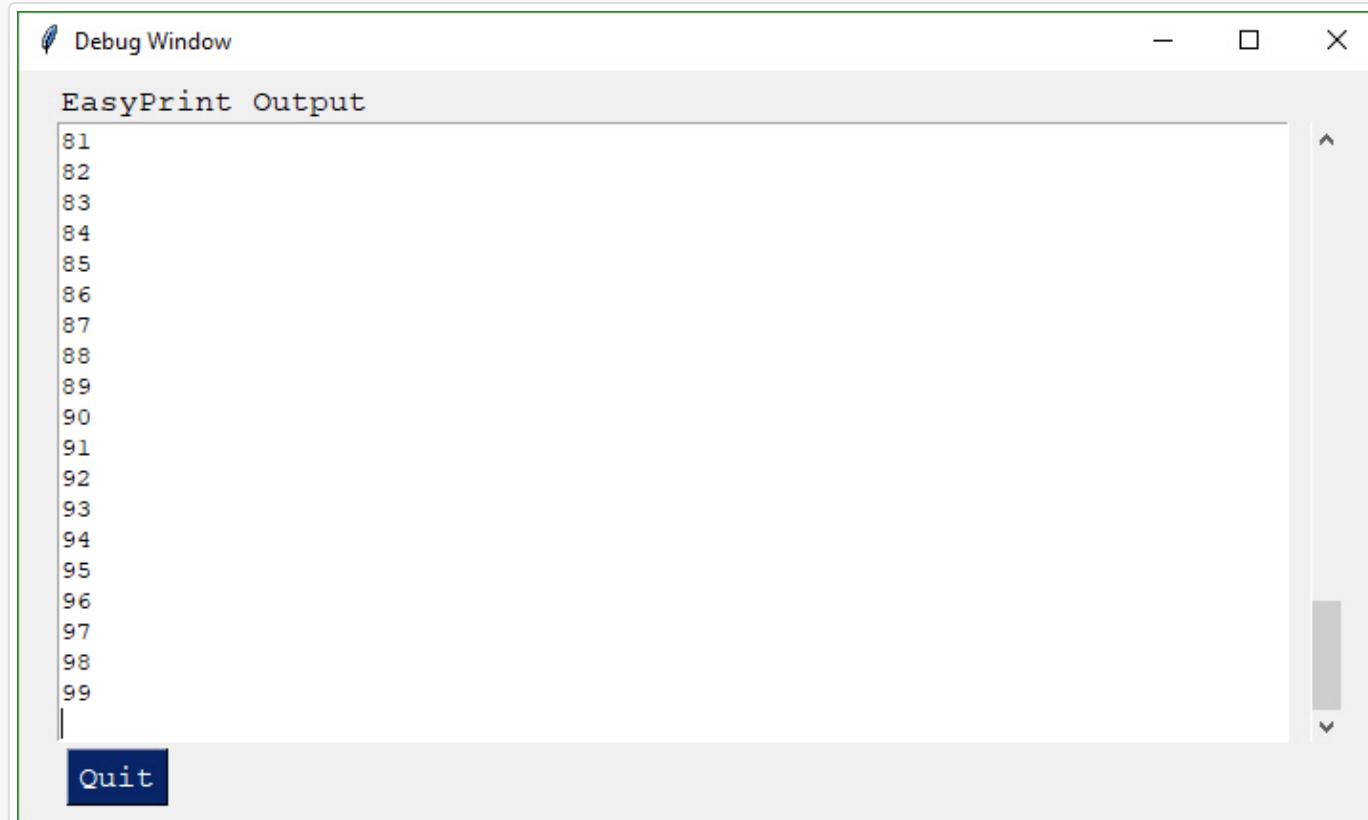
```
print = sg.EasyPrint
```

at the top of your code.

There are a number of names for the same EasyPrint function. `Print` is one of the better ones to use as it's easy to remember. It is simply `print` with a capital P.

```
import PySimpleGUI as sg

for i in range(100):
    sg.Print(i)
```



Or if you didn't want to change your code:

```
import PySimpleGUI as sg

print=sg.Print
for i in range(100):
    print(i)
```

Just like the standard print call, `EasyPrint` supports the `sep` and `end` keyword arguments. Other names that can be used to call `EasyPrint` include `Print`, `eprint`. If you want to close the window, call the function `EasyPrintClose`.

You can change the size of the debug window using the `SetOptions` call with the `debug_win_size` parameter.

A word of caution. There are known problems when multiple PySimpleGUI windows are opened. If you open one of these debug windows, if you close it using the Quit button, it can have the side-effect of causing other visible windows to also close. It's a known architectural issue.

Custom window API Calls (Your First window)

This is the FUN part of the programming of this GUI. In order to really get the most out of the API, you should be using an IDE that supports auto complete or will show you the definition of the function. This will make customizing go smoother.

This first section on custom windows is for your typical, blocking, non-persistent window. By this I mean, when you "show" the window, the function will not return until the user has clicked a button or closed the window. When this happens, the window will be automatically closed.

Two other types of windows exist.

1. Persistent window - rather than closing on button clicks, the show window function returns and the window continues to be visible. This is good for applications like a chat window.
2. Asynchronous window - the trickiest of the lot. Great care must be exercised. Examples are an MP3 player or status dashboard. Async windows are updated (refreshed) on a periodic basis.

It's both not enjoyable nor helpful to immediately jump into tweaking each and every little thing available to you.

The window Designer

The good news to newcomers to GUI programming is that PySimpleGUI has a window designer. Better yet, the window designer requires no training, no downloads, and everyone knows how to use it.



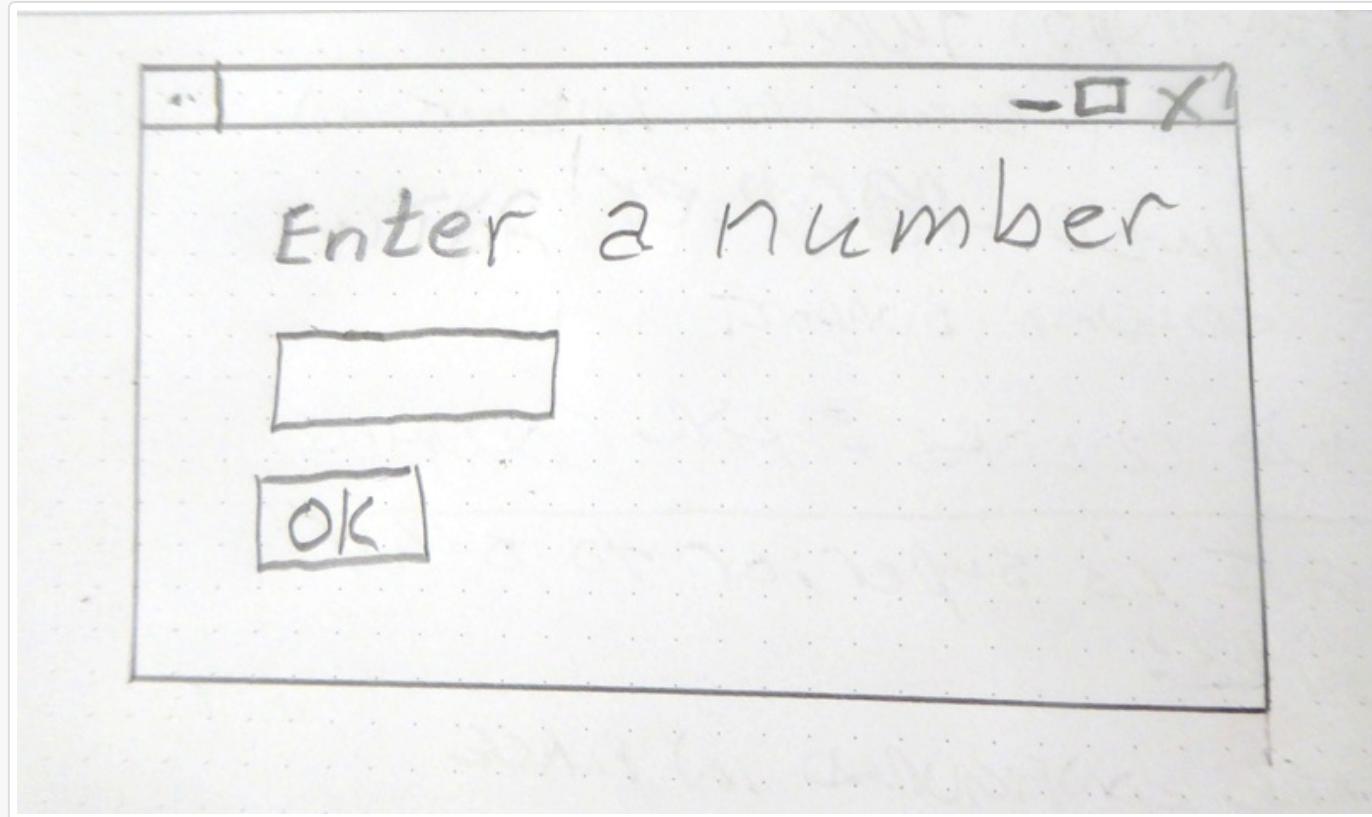
It's a manual process, but if you follow the instructions, it will take only a minute to do and the result will be a nice looking GUI. The steps you'll take are:

1. Sketch your GUI on paper
2. Divide your GUI up into rows
3. Label each Element with the Element name
4. Write your Python code using the labels as pseudo-code

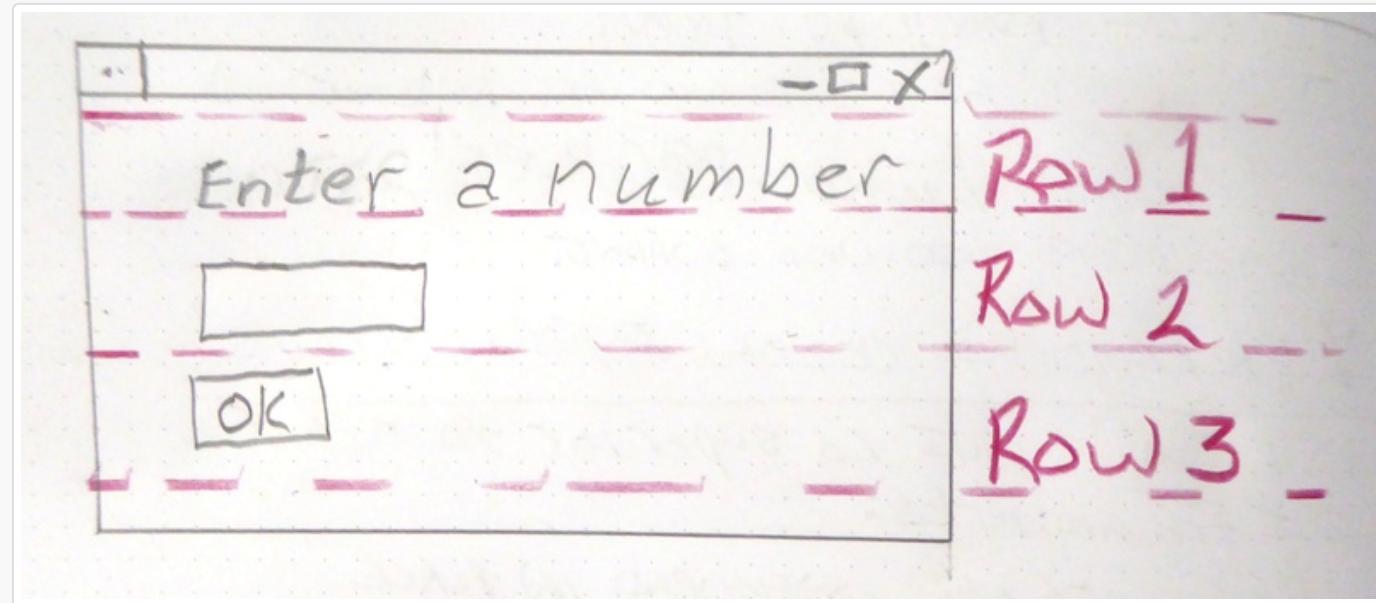
Let's take a couple of examples.

Enter a number.... Popular beginner programs are often based on a game or logic puzzle that requires the user to enter something, like a number. The "high-low" answer game comes to mind where you try to guess the number based on high or low tips.

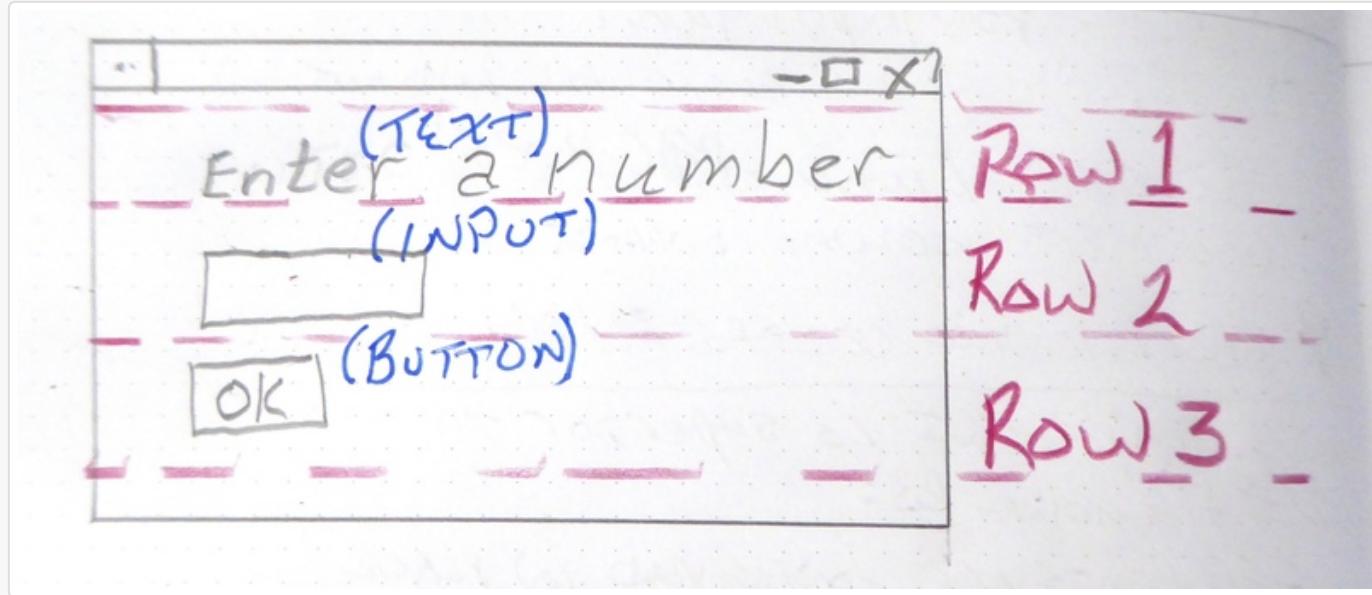
Step 1- Sketch the GUI



Step 2 - Divide into rows



Step 3 - Label elements



Step 4 - Write the code

The code we're writing is the layout of the GUI itself. This tutorial only focuses on getting the window code written, not the stuff to display it, get results.

We have only 1 element on the first row, some text. Rows are written as a "list of elements", so we'll need [] to make a list. Here's the code for row 1

```
[ sg.Text('Enter a number') ]
```

Row 2 has 1 elements, an input field.

```
[ sg.Input() ]
```

Row 3 has an OK button

```
[ sg.OK() ]
```

Now that we've got the 3 rows defined, they are put into a list that represents the entire window.

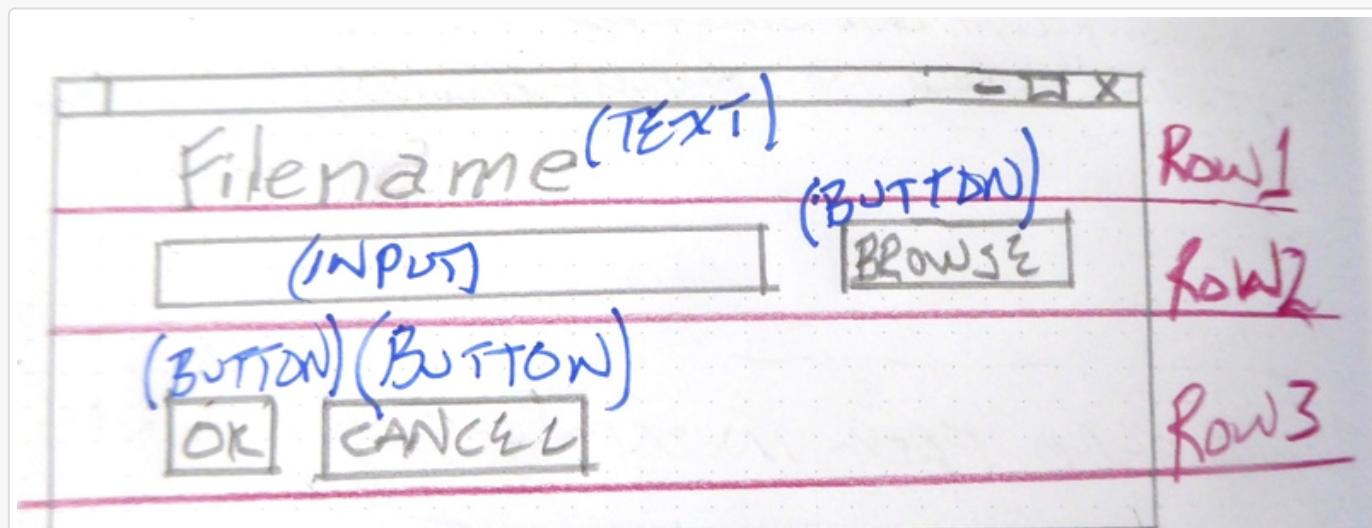
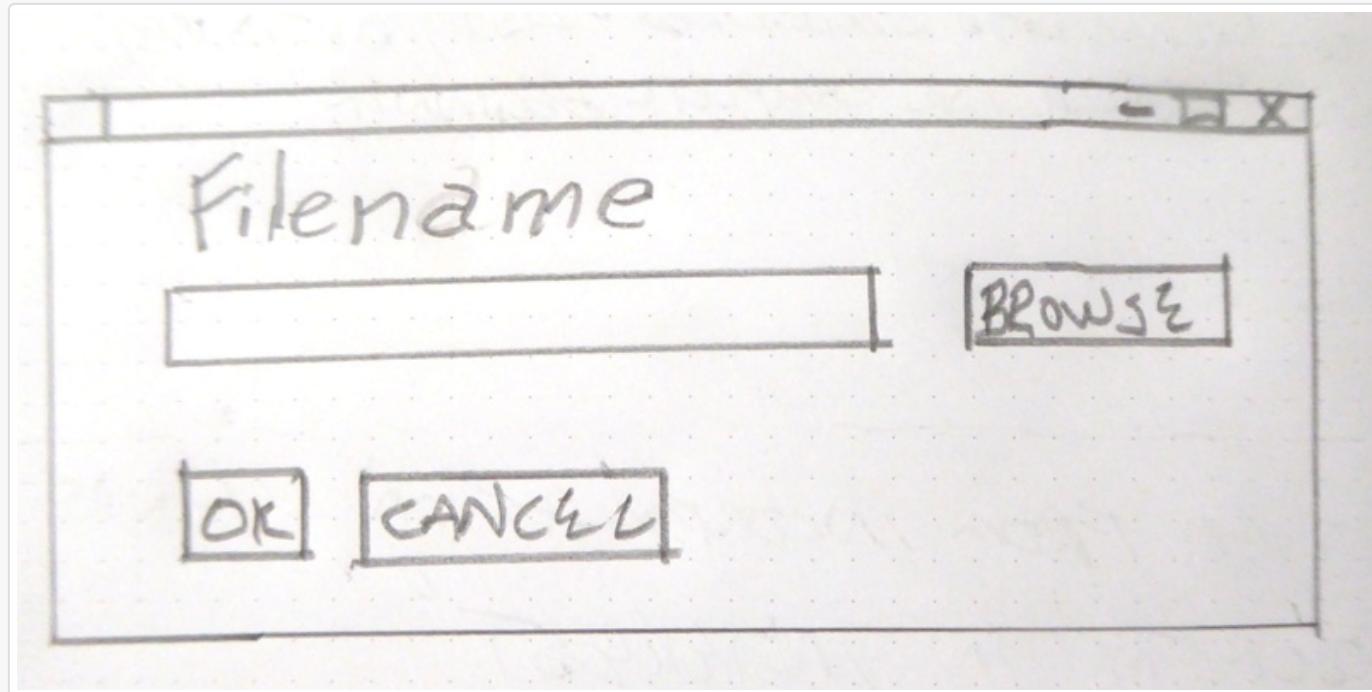
```
layout = [ [sg.Text('Enter a Number')],  
          [sg.Input()],  
          [sg.OK()] ]
```

Finally we can put it all together into a program that will display our window.

```
import PySimpleGUI as sg  
  
layout = [[sg.Text('Enter a Number')],  
          [sg.Input()],  
          [sg.OK()] ]  
  
event, (number,) = sg.Window('Enter a number example').Layout(layout).Read()  
  
sg.Popup(event, number)
```

Example 2 - Get a filename

Let's say you've got a utility you've written that operates on some input file and you're ready to use a GUI to enter than filename rather than the command line. Follow the same steps as the previous example - draw your window on paper, break it up into rows, label the elements.



Writing the code for this one is just as straightforward. There is one tricky thing, that browse for a file button. Thankfully PySimpleGUI takes care of associating it with the input field next to it. As a result, the code looks almost exactly like the window on the paper.

```
import PySimpleGUI as sg

layout = [[sg.Text('Filename')],
          [sg.Input(), sg.FileBrowse()],
          [sg.OK(), sg.Cancel()]]

event, (number,) = sg.Window('Get filename example').Layout(layout).Read()

sg.Popup(event, number)
```

Read on for detailed instructions on the calls that show the window and return your results.

Copy these design patterns!

All of your PySimpleGUI programs will utilize one of these 2 design patterns depending on the type of window you're implementing.

Pattern 1 - "One-shot Window" - Read into list or dictionary (**The Most Common Pattern**)

This will be the most common pattern you'll follow if you are not using an "event loop" (not reading the window multiple times). The window is read and closes.

It's unusual to assign the values returned from the read call directly into user variables. Usually the variables are grouped together into a list or dictionary of multiple return values.

```
import PySimpleGUI as sg

window_rows = [[sg.Text('SHA-1 and SHA-256 Hashes for the file')],
               [sg.InputText(), sg.FileBrowse()],
               [sg.Submit(), sg.Cancel()]]

window = sg.Window('SHA-1 & 256 Hash').Layout(window_rows)

event, values = window.Read()
window.Close()

source_filename = values[0]
```

Pattern 2 A - Persistent window (multiple reads using an event loop)

Some of the more advanced programs operate with the window remaining visible on the screen. Input values are collected, but rather than closing the window, it is kept visible acting as a way to both output information to the user and gather input data.

This code will present a window and will print values until the user clicks the exit button or closes window using an X.

```
import PySimpleGUI as sg

layout = [[sg.Text('Persistent window')],
          [sg.Input(do_not_clear=True)],
          [sg.Button('Read'), sg.Exit()]]

window = sg.Window('Window that stays open').Layout(layout)

while True:
    event, values = window.Read()
    if event is None or event == 'Exit':
        break
    print(event, values)
```

```
window.Close()
```

Pattern 2 B - Persistent window (multiple reads using an event loop + updates data in window)

This is a slightly more complex, but maybe more realistic version that reads input from the user and displays that input as text in the window. Your program is likely to be doing both of those activities so this will give you a big jump-start.

Do not worry yet what all of these statements mean. Just copy it so you can begin to play with it, make some changes. Experiment to see how thing work.

A final note... the parameter `do_not_clear` in the input call determines the action of the input field after a button event. If this value is True, the input value remains visible following button clicks. If False, then the input field is CLEARED of whatever was input. If you are building a "Form" type of window with data entry, you likely want False, the default setting (you can remove the parameter completely).

```
import sys
if sys.version_info[0] >= 3:
    import PySimpleGUI as sg
else:
    import PySimpleGUI27 as sg

layout = [[sg.Text('Your typed chars appear here:'), sg.Text('', key='_OUTPUT_') ],
          [sg.Input(do_not_clear=True, key='_IN_')],
          [sg.Button('Show'), sg.Button('Exit')]]

window = sg.Window('Window Title').Layout(layout)

while True:                  # Event Loop
    event, values = window.Read()
    print(event, values)
    if event is None or event == 'Exit':
        break
    if event == 'Show':
```

```
# change the "output" element to be the value of "input" element
window.FindElement('_OUTPUT_').Update(values['_IN_'])

window.Close()
```

How GUI Programming in Python Should Look? At least for beginners ?

While one goal was making it simple to create a GUI another just as important goal was to do it in a Pythonic manner. Whether it achieved these goals is debatable, but it was an attempt just the same.

The key to custom windows in PySimpleGUI is to view windows as ROWS of GUI Elements. Each row is specified as a list of these Elements. Put the rows together and you've got a window. This means the GUI is defined as a series of Lists, a Pythonic way of looking at things.

Let's dissect this little program

```
```python
```

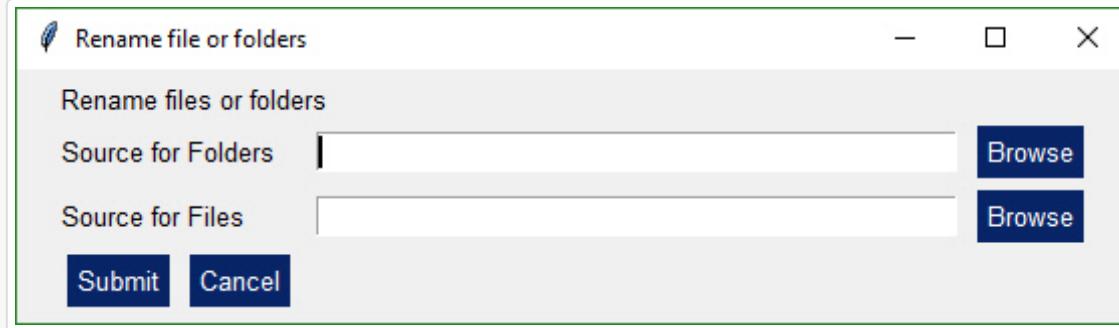
```
import PySimpleGUI as sg
```

```
layout = [[sg.Text('Rename files or folders')],
 [sg.Text('Source for Folders', size=(15, 1)), sg.InputText(), sg.FolderBrowse()],
 [sg.Text('Source for Files ', size=(15, 1)), sg.InputText(), sg.FolderBrowse()],
 [sg.Submit(), sg.Cancel()]]

window = sg.Window('Rename Files or Folders')

event, values = window.Layout(layout).Read()
```

```
...
```



Let's agree the window has 4 rows.

The first row only has **text** that reads `Rename files or folders`

The second row has 3 elements in it. First the **text** `Source for Folders`, then an **input** field, then a **browse** button.

Now let's look at how those 2 rows and the other two row from Python code:

```
layout = [[sg.Text('Rename files or folders')],
 [sg.Text('Source for Folders', size=(15, 1)), sg.InputText(), sg.FolderBrowse()],
 [sg.Text('Source for Files ', size=(15, 1)), sg.InputText(), sg.FolderBrowse()],
 [sg.Submit(), sg.Cancel()]]
```

See how the source code mirrors the layout? You simply make lists for each row, then submit that table to PySimpleGUI to show and get values from.

And what about those return values? Most people simply want to show a window, get the input values and do something with them. So why break up the code into button callbacks, etc, when I simply want my window's input values to be given to me.

For return values the window is scanned from top to bottom, left to right. Each field that's an input field will occupy a spot in the return values.

In our example window, there are 2 fields, so the return values from this window will be a list with 2 values in it.

```
python
event, values = window.Read()
folder_path, file_path = values
```

In one statement we both show the window and read the user's inputs. In the next the *list* of return values is split into individual variables `folder_path` and `file_path`.

Isn't this what a Python programmer looking for a GUI wants? Something easy to work with to get the values and move on to the rest of the program, where the real action is taking place. Why write pages of GUI code when the same layout can be achieved with PySimpleGUI in 3 or 4 lines of code. 4 lines or 40? Most would choose 4.

## Return values

As of version 2.8 there are 2 forms of return values, list and dictionary.

## Two Return Values

All Window Read calls return 2 values. By convention a read statement is written:

```
event, values = window.Read()
```

You don't HAVE to write your reads in this way. You can name your variables however you want. But if you want to code them in a way that other programmers using PySimpleGUI are used to, then use these statements.

The first parameter `event` describes **why** the read completed. What was the 'event' that caused us to return from reading the window. Events are one of these:

For all Windows:

- Button click
- Window closed using X

For Windows that have specifically enabled these. Please see the appropriate section in this document to learn about how to enable these and what the event return values are.

- Keyboard key press
- Mouse wheel up/down
- Menu item selected
- An Element Changed (slider, spinner, etc)
- A list item was clicked
- Return key was pressed in input element

**Most** of the time the event will be a button click or the window was closed.

Another convention to follow is the check for windows being closed with an X. This is an important event to catch. If you don't check for this and you attempt to use the window, your program will crash. Please check for closed window and exit your program gracefully.

To check for a closed window use this line of code:

```
if event is None:
```

Putting it all together we end up with an "event loop" that looks something like this:

```
while True:
 event, values = window.Read()
 if event is None:
 break
```

## The 'values' Variable - Return values as a list

The second parameter from a Read call is either a list or a dictionary of the input fields on the Window.

By default return values are a list of values, one entry for each input field.

Each of the Elements that are Input Elements will have a value in the list of return values. You can unpack your GUI directly into the variables you want to use.

```
event, (filename, folder1, folder2, should_overwrite) = sg.Window('My title').Layout(window_r
```

Or, more commonly, you can unpack the return results separately.

```
event, values = sg.Window('My title').Layout(window_rows).Read()
event, value_list = window.Layout(window_rows).Read()
value1 = value_list[0]
value2 = value_list[1]
...
...
```

However, this method isn't good when you have a lot of input fields. If you insert a new element into your window then you will have to shuffle your unpacks down, modifying each of the statements to reference `value_list[x]`.

The more common / advanced method is to request your values be returned as a dictionary.

## Return values as a dictionary

For those of you that have not encountered a Python dictionary, don't freak out! Just copy and paste this code and modify it. Follow this design pattern and you'll be fine. And you might learn something along the way.

For windows longer than 3 or 4 fields you will want to use a dictionary to help you organize your return values. In almost all (if not all) of the demo programs you'll find the return values being passed as a dictionary. It is not a difficult concept to grasp, the syntax is easy to understand, and it makes for very readable code.

The most common window read statement you'll encounter looks something like this:

```
window = sg.Window("My title").Layout(layout).Read()
```

To use a dictionary, you will need to:

\* Mark each input element you wish to be in the dictionary with the keyword `key`.

If **any** element in the window has a `key`, then **all** of the return values are returned via a dictionary. If some elements do not have a key, then they are numbered starting at zero.

Let's take a look at your first dictionary-based window.

```
import PySimpleGUI as sg
window = sg.Window('Simple data entry window')
layout = [
```

```

[sg.Text('Please enter your Name, Address, Phone')],
[sg.Text('Name', size=(15, 1)), sg.InputText('1', key='_name_')],
[sg.Text('Address', size=(15, 1)), sg.InputText('2', key='_address_')],
[sg.Text('Phone', size=(15, 1)), sg.InputText('3', key='_phone_')],
[sg.Submit(), sg.Cancel()]
]

event, values = window.Layout(layout).Read()

sg.Popup(event, values, values['_name_'], values['_address_'], values['_phone_'])

```

To get the value of an input field, you use whatever value used as the `key` value as the index value. Thus to get the value of the name field, it is written as

```
values['name']
```

Think of the variable `values` in the same way as you would a list, however, instead of using 0,1,2, to reference each item in the list, use the values of the key. The Name field in the window above is referenced by

```
values['_name_'].
```

You will find the key field used quite heavily in most PySimpleGUI windows unless the window is very simple.

Another convention you'll see in some of the demo programs is keys being named with an underscore at the beginning and the end. You don't HAVE to do this... your key value may look like this:

```
key = 'name'
```

The reason for this naming convention is that when you are scanning the code, these key values jump out at you. You instantly know it's a key. Try scanning the code above and see if those keys pop out.

```
key = '_name_'
```

## Button Event Return Values

The button value from a Read call will be one of 3 values:

1. The Button's text
2. The Button's key

If a button has a key set for it when it's created, then that key will be returned. If no key is set, then the button text is returned. If no button was clicked, but the window returned anyway, the button value is None.

None is returned when the user clicks the X to close a window.

If your window has an event loop where it is read over and over, remember to give your user an "out". You should always check for a None value and it's a good practice to provide an Exit button of some kind. Thus design patterns often resemble this Event Loop:

```
while True:
 event, values = window.Read()
 if event is None or event == 'Quit':
 break
```

## The Event Loop / Callback Functions

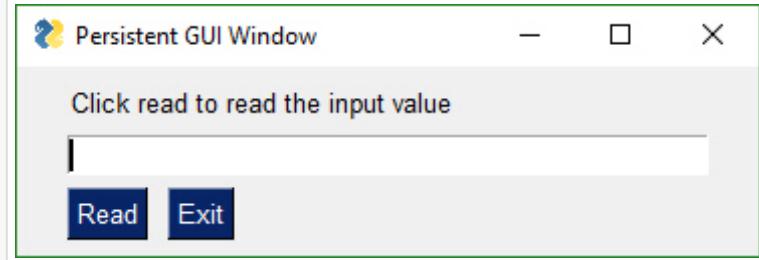
All GUIs have one thing in common, an "event loop". Usually the GUI framework runs the event loop for you, but sometimes you want greater control and will run your own event loop. You often hear the term event loop when discussing embedded systems or on a Raspberry Pi.

With PySimpleGUI if your window will remain open following button clicks, then your code will have an event loop. If your program shows a single "one-shot" window, collects the data and then has no other GUI interaction, then you don't need an event loop.

There's nothing mysterious about event loops... they are loops where you take care of.... wait for it..... *events*. Events are things like button clicks, key strokes, mouse scroll-wheel up/down.

Let's take a Pi demo program as an example. This program shows a GUI window, gets button presses, and uses them to control some LEDs. It loops, reading user input and doing something with it.

This little program has a typical Event Loop



```
import PySimpleGUI as sg

layout = [[sg.Text('Click read to read the input value')],
 [sg.Input()],
 [sg.RButton('Read'), sg.Exit()]]

window = sg.Window('Persistent GUI Window').Layout(layout)

while True:
 event, values = window.Read()
 if event is None or event == 'Exit':
 break
 print(event, values)
window.Close()
```

In the Event Loop we are reading the window and then doing a series of button compares to determine what to do based on the button that was clicked (value of `button` variable)

The way buttons are presented to the caller in PySimpleGUI is *not* how *most* GUI frameworks handle button clicks. Most GUI frameworks, including tkinter, use **callback** functions, a function you define would be called when a button is clicked. This requires you to write asynchronous code, a concept beginners often stumble on and one that presents a barrier.

There is more communications that have to happen between parts of your program when using callbacks. Callbacks break apart your program's logic apart and scatter it. One of the larger hurdles for beginners to GUI programming are these callback functions.

PySimpleGUI was specifically designed in a way so that callbacks would not be required. There is no coordination between one function and another required. You simply read your button click and take appropriate action at the same location in the code as when you read the button value.

Whether or not this is a "proper" design for GUI programs can be debated. It's not a terrible trade-off to run your own event loop and having a functioning GUI application versus one that maybe never gets written because callback functions were too much to grasp.

---

## All Widgets / Elements

This code utilizes many of the common Elements. It does not include Tabs/Tab Groups.

```
import PySimpleGUI as sg

sg.ChangeLookAndFeel('GreenTan')

----- Menu Definition -----
menu_def = [[['File', ['Open', 'Save', 'Exit', 'Properties']],
 ['Edit', ['Paste', ['Special', 'Normal',], 'Undo'],],
 ['Help', 'About...'],]]

----- Column Definition -----
column1 = [[sg.Text('Column 1', background_color='#F7F3EC', justification='center', size=[sg.Spin(values=('Spin Box 1', '2', '3'), initial_value='Spin Box 1')], [sg.Spin(values=('Spin Box 1', '2', '3'), initial_value='Spin Box 2')], [sg.Spin(values=('Spin Box 1', '2', '3'), initial_value='Spin Box 3')])]

layout = [
 [sg.Menu(menu_def, tearoff=True)],
 [sg.Text('All graphic widgets in one window!', size=(30, 1), justification='center', [sg.Text('Here is some text.... and a place to enter text')], [sg.InputText('This is my text')], [sg.Frame(layout=[[sg.Checkbox('Checkbox', size=(10,1)), sg.Checkbox('My second checkbox!', default=True, [sg.Radio('My first Radio!', 'RADIO1', default=True, size=(10,1)), sg.Radio('My [sg.Multiline(default_text='This is the default Text should you decide not to type ar
```

```

 sg.Multiline(default_text='A second multi-line', size=(35, 3)),
 [sg.InputCombo(['Combobox 1', 'Combobox 2'), size=(20, 1)),
 sg.Slider(range=(1, 100), orientation='h', size=(34, 20), default_value=85)],
 [sg.InputOptionMenu(['Menu Option 1', 'Menu Option 2', 'Menu Option 3'])],
 [sg.Listbox(values=['Listbox 1', 'Listbox 2', 'Listbox 3'), size=(30, 3)),
 sg.Frame('Labelled Group', [
 sg.Slider(range=(1, 100), orientation='v', size=(5, 20), default_value=25),
 sg.Slider(range=(1, 100), orientation='v', size=(5, 20), default_value=75),
 sg.Slider(range=(1, 100), orientation='v', size=(5, 20), default_value=10),
 sg.Column(column1, background_color='#F7F3EC')])]),
 [sg.Text('_' * 80)],
 [sg.Text('Choose A Folder', size=(35, 1))],
 [sg.Text('Your Folder', size=(15, 1), auto_size_text=False, justification='right'),
 sg.InputText('Default Folder'), sg.FolderBrowse()],
 [sg.Submit(tooltip='Click to submit this window'), sg.Cancel()]
]
]

window = sg.Window('Everything bagel', default_element_size=(40, 1), grab_anywhere=False)
event, values = window.Read()

sg.Popup('Title',
 'The results of the window.',
 'The button clicked was "{}".format(event)',
 'The values are', values)

```

This is a somewhat complex window with quite a bit of custom sizing to make things line up well. This is code you only have to write once. When looking at the code, remember that what you're seeing is a list of lists. Each row contains a list of Graphical Elements that are used to create the window.



Here is some text.... and a place to enter text

This is my text

Options

Checkbox  My second checkbox!

My first Radio!  My second Radio!

This is the default Text should you decide  
not to type anything

A second multi-line

Combobox 1

85

Menu Option 1

Listbox 1

Listbox 2

Listbox 3

Labelled Group

25 75 10

Column 1

Spin Box 1

Spin Box 2

Spin Box 3

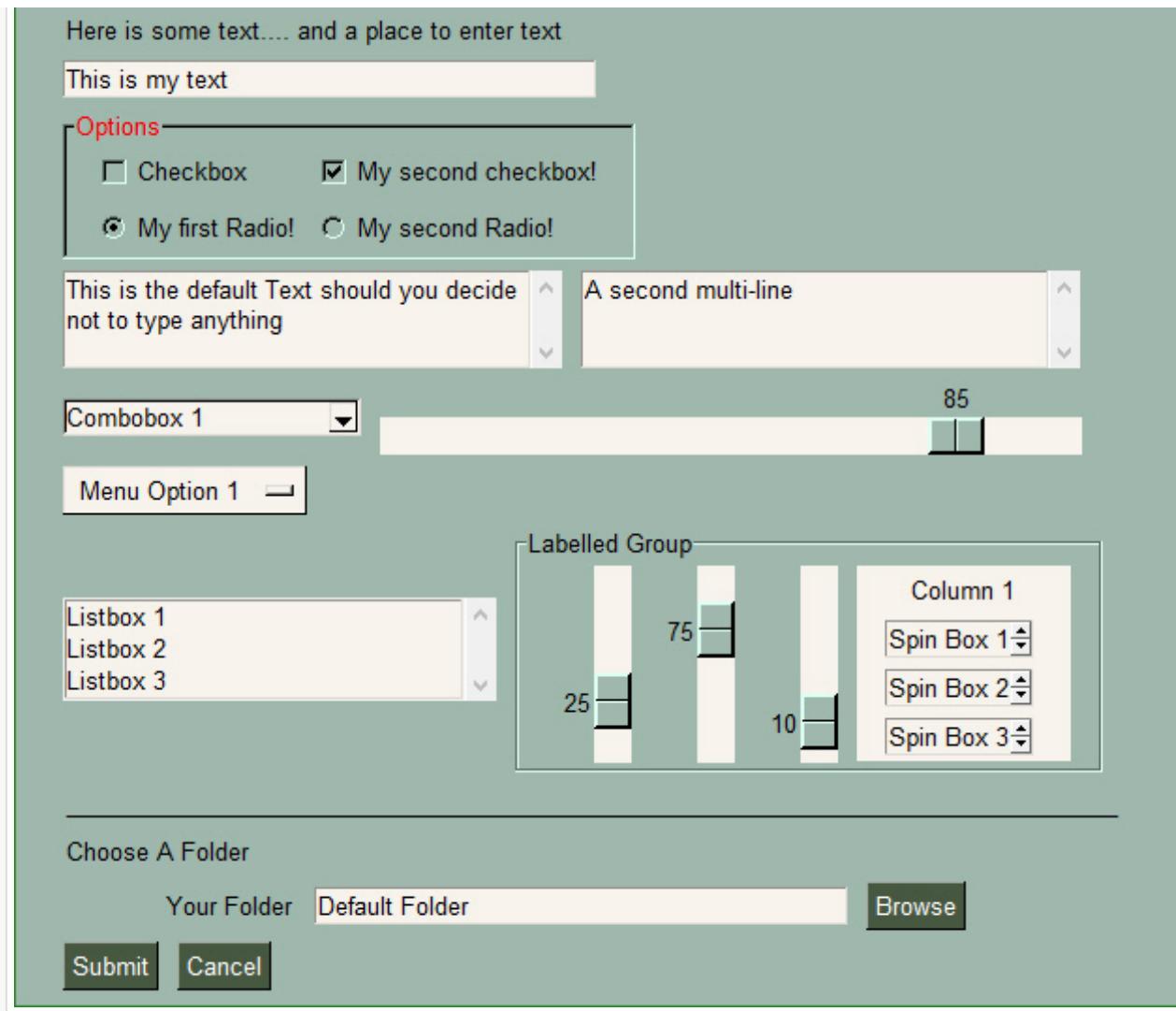
---

Choose A Folder

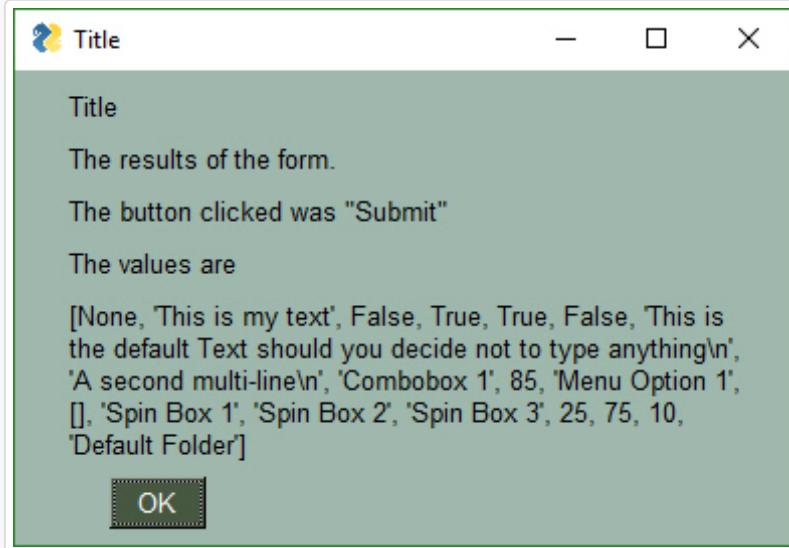
Your Folder Default Folder

Browse

Submit Cancel



Clicking the Submit button caused the window call to return. The call to Popup resulted in this window.



`Note, button value can be None`. The value for `button` will be the text that is displayed on the button element when it was created. If the user closed the window using something other than a button, then `button` will be `None`. It is **vitally important** that your code contain the proper checks for `None`. Always give your users a way out of the window. Otherwise you'll end up with windows that never properly close.

You can see in the results Popup window that the values returned are a list. Each input field in the window generates one item in the return values list. All input fields return a `string` except for Check Boxes and Radio Buttons. These return `bool`.

---

## Building Custom Windows

You will find it ***much easier*** to write code using PySimpleGUI if you use an IDE such as PyCharm. The features that show you documentation about the API call you are making will help you determine which settings you want to change, if any. In PyCharm, two commands are particularly helpful.

Control-Q (when cursor is on function name) brings up a box with the function definition  
Control-P (when cursor inside function call "()") shows a list of parameters and their default values

## Synchronous windows

The most common use of PySimpleGUI is to display and collect information from the user. The most straightforward way to do this is using a "blocking" GUI call. Execution is "blocked" while waiting for the user to close the GUI window/dialog box.

You've already seen a number of examples above that use blocking windows. A truly non-blocking Read call looks like this:

```
event, values = window.Read(timeout=0)
```

You can learn more about these async / non-blocking windows toward the end of this document.

## Window Object - Beginning a window

The first step is to create the window object using the desired window customization.

This is the definition of the Window object:

```
def Window(title,
 default_element_size=(DEFAULT_ELEMENT_SIZE[0], DEFAULT_ELEMENT_SIZE[1]),
 default_button_element_size = (None, None),
 auto_size_text=None,
 auto_size_buttons=None,
 location=(None, None),
 font=None,
 button_color=None, Font=None,
 progress_bar_color=(None,None),
 background_color=None)
```

```
border_depth=None,
auto_close=False,
auto_close_duration=DEFAULT_AUTOCLOSE_TIME,
icon=DEFAULT_WINDOW_ICON,
force_toplevel=False,
alpha_channel=1,
return_keyboard_events=False,
use_default_focus=True,
text_justification=None,
no_titlebar=False,
grab_anywhere=False
keep_on_top=False):
```

Parameter Descriptions. You will find these same parameters specified for each `Element` and some of them in `Row` specifications. The `Element` specified value will take precedence over the `Row` and `window` values.

```
default_element_size - Size of elements in window in characters (width, height)
default_button_element_size - Size of buttons on this window
auto_size_text - Bool. True if elements should size themselves according to contents. Default
auto_size_buttons - Bool. True if button elements should size themselves according to their
location - (x,y) Location to place window in pixels
font - Font name and size for elements of the window
button_color - Default color for buttons (foreground, background). Can be text or hex
progress_bar_color - Foreground and background colors for progress bars
background_color - Color of the window background
border_depth - Amount of 'bezel' to put on input boxes, buttons, etc.
auto_close - Bool. If True window will autoclose
auto_close_duration - Duration in seconds before window closes
icon - .ICO file that will appear on the Task Bar and end of Title Bar
force_top_level - Bool. If set causes a tk.Tk window to be used as primary window rather than tk.Toplevel
alpha_channel - Float 0 to 1. 0 is invisible, 1 is fully visible, Anything between will be semi-transparent
return_keyboard_events - if True key presses are returned as buttons
use_default_focus - if True and no focus set, then automatically set a focus
text_justification - Justification to use for Text Elements in this window
no_titlebar - Create window without a titlebar
grab_anywhere - Grab any location on the window to move the window
keep_on_top - if True then window will always stop on top of other windows on the screen.
```

## Window Location

PySimpleGUI computes the exact center of your window and centers the window on the screen. If you want to locate your window elsewhere, such as the system default of (0,0), if you have 2 ways of doing this. The first is when the window is created. Use the `location` parameter to set where the window. The second way of doing this is to use the `SetOptions` call which will set the default window location for all windows in the future.

## Sizes

Note several variables that deal with "size". Element sizes are measured in characters. A Text Element with a size of 20,1 has a size of 20 characters wide by 1 character tall.

The default Element size for PySimpleGUI is `(45, 1)`.

Sizes can be set at the element level, or in this case, the size variables apply to all elements in the window. Setting `size=(20, 1)` in the window creation call will set all elements in the window to that size.

There are a couple of widgets where one of the size values is in pixels rather than characters. This is true for Progress Meters and Sliders. The second parameter is the 'height' in pixels.

## No Titlebar

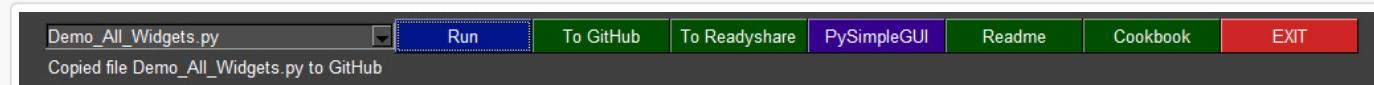
Should you wish to create cool looking windows that are clean with no windows titlebar, use the `no_titlebar` option when creating the window.

Be sure an provide your user an "exit" button or they will not be able to close the window! When no titlebar is enabled, there will be no icon on your taskbar for the window. Without an exit button you will need to kill via taskmanager... not fun.

Windows with no titlebar rely on the grab anywhere option to be enabled or else you will be unable to move the window.

Windows without a titlebar can be used to easily create a floating launcher.

Linux users! Note that this setting has side effects for some of the other Elements. Multi-line input doesn't work at all, for example So, use with caution.



## Grab Anywhere

This is a feature unique to PySimpleGUI.

Note - there is a warning message printed out if the user closes a non-blocking window using a button with `grab_anywhere` enabled. There is no harm in these messages, but it may be distressing to the user. Should you wish to enable for a non-blocking window, simply get `grab_anywhere = True` when you create the window.

## Always on top

To keep a window on top of all other windows on the screen, set `keep_on_top = True` when the window is created. This feature makes for floating toolbars that are very helpful and always visible on your desktop.

## Window Methods (things you can do with a Window object)

There are a few methods (functions) that you will see in this document that act on Windows. The ones you will primarily be calling are:

```
window.Layout(layout) - Turns your definition of the Window into Window
window.Finalize() - creates the tkinter objects for the Window. Normally you do not call this
window.Read() - Read the Windows values and get the button / key that caused the Read to return
window.ReadNonBlocking() - NO LONGER USED!
window.Refresh() - Use if updating elements and want to show the updates prior to the next Read
window.Fill(values_dict) - Fill each Element with entry from the dictionary passed in
window.SaveToDisk(filename) - Save the Window's values to disk
window.LoadFromDisk(filename) - Load the Window's values from disk
window.Close() - To close your window, if a button hasn't already closed it
window.Disable() - Use to disable the window input when opening another window on top of the
```

```
window.Enable() - Re-enable a Disabled window
window.FindElement(key) - Returns the element that has a matching key value
window.Move(x,y) - Moves window to location x,y on screen
window.SetAlpha(alpha) - Changes window transparency
window.BringToFront() - Brings the window to the top of other windows on the screen
```

## Window Methods

There are a number of operations you can do on a window after you've created the window. You call these after creating your Windows object.

### Layout(rows)

Call to set the window layout. Must be called prior to Read. Most likely "chained" in line with the Window creation.

```
window = sg.Window('My window title').Layout(layout)
```

### Finalize()

Call to force a window to go through the final stages of initialization. This will cause the tkinter resources to be allocated so that they can then be modified.

### Read(timeout=None, timeout\_key='\_\_timeout\_\_')

Read the Window's input values and button clicks in a blocking-fashion

Returns event, values. Adding a timeout can be achieved by setting timeout=number of milliseconds before the Read times out after which a "timeout event" is returned. The value of timeout\_key will be returned as the event.

If you set the timeout = 0, then the Read will immediately return rather than waiting for input or for a timeout.  
This is the same as the old ReadNonBlocking call.

### ReadNonBlocking() (NO LONGER USED)

While this call will technically still work, it is being removed. If you want to get the same result, call Read with timeout = 0.

Read the Window's input values and button clicks but without blocking. It will immediately return. **Consider using Read with timeout instead!**

Will consume 100% of your CPU if you do not have other blocking calls in your event loop.

### Refresh()

Cause changes to the window to be displayed on the screen. Normally not needed unless the changes are immediately required or if it's going to be a while before another call to Read.

### SetIcon(icon, pngbase64)

Sets the window's icon that will be shown on the titlebar. Can either be a filename or a base64 string.

### Fill(values\_dict)

Populates the windows fields with the values shown in the dictionary.

### FindElement(key)

Returns the Element that has a matching key. If the key is not found, an Error Element is returned so that the program will not crash should the user try to perform an "update". A Popup message will be shown

### FindElementWithFocus()

Returns the Element that currently has the focus. Returns None if no Elements were found.

### SaveToDisk(filename)

Saves the window's values to disk

### LoadFromDisk(filename)

Fills in a window's fields based on previously saved file

### GetScreenDimensions()

Returns the size (w,h) of the screen in pixels

### Move(x, y)

Move window to (x,y) position on the screen

### Minimize()

Sends the window to the taskbar

### **Close()**

Closes a window, blocking or non-blocking

### **CloseNonBlocking() (NO LONGER USED.. use Close instead)**

Closes a non-blocking window

### **Disable()**

Stops a window from responding until Enable is called

### **Enable()**

Re-enables a previously disabled window

### **Hide()**

Completely hides a window, including removing from the taskbar

### **UnHide()**

Restores a window hidden using Hide

### **Disappear()**

Makes a window disappear while leaving the icon on the taskbar

### **Reappear()**

Makes a window reappear that was previously made to disappear using Disappear()

### **SetAlpha(alpha)**

Sets the window's transparency. 0 is completely transparent. 1 is fully visible, normal . Can also use the property Window.AlphaChannel instead of method function call

# **Elements**

"Elements" are the building blocks used to create windows. Some GUI APIs use the term "Widget" to describe these graphic elements.

**Text**

**Single Line Input**

Buttons including these types:

**File** Browse

Folder Browse

Calendar picker

**Date** Chooser

**Read** window

**Close** window ("Button" & all shortcut buttons)

Realtime

Checkboxes

Radio Buttons

Listbox

**Slider**

**Multi-line Text Input**

Scroll-able Output

**Vertical Separator**

Progress Bar

Option Menu

Menu

Frame

Column

Graph

Image

Table

Tree

**Tab**, TabGroup

## Common Element Parameters

Some parameters that you will see on almost all Elements are:

- key - Used with window.FindElement and with return values
- tooltip - Hover your mouse over the element and you'll get a popup with this text

- size - (width, height) - usually measured in characters-wide, rows-high. Sometimes they mean pixels
- font - specifies the font family, size, etc
- colors - Color name or #RRGGBB string
- pad - Amount of padding to put around element

## Tooltip

Tooltips are text boxes that popup next to an element if you hold your mouse over the top of it. If you want to be extra kind to your window's user, then you can create tooltips for them by setting the parameter `tooltip` to some text string. You will need to supply your own line breaks / text wrapping. If you don't want to manually add them, then take a look at the standard library package `textwrap`.

Tooltips are one of those "polish" items that really dress-up a GUI and show's a level of sophistication. Go ahead, impress people, throw some tooltips into your GUI.

## Size

Specifies the amount of room reserved for the Element. For elements that are character based, such a Text, it is (# characters, # rows). Sometimes it is a pixel measurement such as the Image element. And sometimes a mix like on the Slider element (characters long by pixels wide).

## Colors

A string representing color. Anytime colors are involved, you can specify the tkinter color name such as 'lightblue' or an RGB hex value '#RRGGBB'. For buttons, the color parameter is a tuple (text color, background color)

## Pad

The amount of room around the element in pixels. The default value is (5,3) which means leave 5 pixels on each side of the x-axis and 3 pixels on each side of the y-axis. You can change this on a global basis using a call to SetOptions, or on an element basis.

If you want more pixels on one side than the other, then you can split the number into 2 number. If you want 200 pixels on the left side, and 3 pixels on the right, the pad would be ((200,3), 3). In this example, only the x-axis is split.

## Font

Specifies the font family, size, and style. Font families on Windows include:

*Arial*  
*Courier*  
*Comic*,  
*Fixedsys*  
*Times*  
*Verdana*  
\* *Helvetica* (the default I think)

The fonts will vary from system to system, however, Tk 8.0 automatically maps Courier, Helvetica and Times to their corresponding native family names on all platforms. Also, font families cannot cause a font specification to fail on Tk 8.0 and greater.

If you wish to leave the font family set to the default, you can put anything not a font name as the family. The PySimpleGUI Demo programs and documentation use the family 'Any' to demonstrate this fact.. You could use "default" if that's more clear to you.

There are 2 formats that can be used to specify a font... a string, and a tuple

Tuple - (family, size, styles)  
String - "Family Size Styles"

To specify an underlined, Helvetica font with a size of 15 the values:

('Helvetica', 15, 'underline italics')  
'Helvetica 15 underline italics'

## Key

If you are going to do anything beyond the basic stuff with your GUI, then you need to understand keys.

Keys are a way for you to "tag" an Element with a value that will be used to identify that element. After you put a key in an element's definition, the values returned from Read will use that key to tell you the value. For example, if you have an input field:

Input(key='mykey')

And your read looks like this:

event, values = Read()

Then to get the input value from the read it would be:

values['mykey']

You also use the same key if you want to call Update on an element. Please see the section below on Updates to understand that usage.

## Output Elements

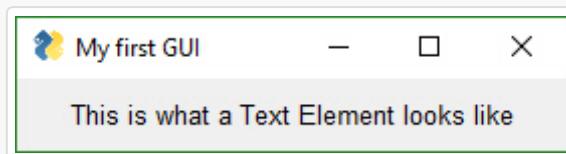
Building a window is simply making lists of Elements. Each list is a row in the overall GUI dialog box. The definition looks something like this:

```
layout = [[row 1 element, row 1 element],
 [row 2 element, row 2 element, row 2 element]]
```

The code is a crude representation of the GUI, laid out in text.

## Text Element

```
layout = [[sg.Text('This is what a Text Element looks like')]]
```



The most basic element is the Text element. It simply displays text. Many of the 'options' that can be set for a Text element are shared by other elements.

```
Text(text
 size=(None, None)
 auto_size_text=None
 click_submits=None
 relief=None
 font=None
 text_color=None
 background_color=None)
```

```
 justification=None
 pad=None
 key=None
 tooltip=None)
```

Text - The text that's displayed  
size - Element's size  
click\_submits - if clicked will cause a read **call to return** they **key value** as the button  
relief - relief **to use** around the **text**  
auto\_size\_text - Bool. **Change width to match size of text**  
font - Font name **and size to use**  
text\_color - **text color**  
background\_color - background color  
justification - Justification **for the text. String - 'left', 'right', 'center'**  
**pad** - (x,y) amount **of padding in pixels to use** around element **when packing**  
**key** - used **to identify element**. This **value will return as button if click\_submits True**  
tooltip - **string representing tooltip**

Some commonly used elements have 'shorthand' versions of the functions to make the code more compact.  
The functions `T` and `Txt` are the same as calling `Text`.

**Fonts** in PySimpleGUI are always in this format:

```
(font_name, point_size)
```

The default font setting is

```
("Helvetica", 10)
```

**Color** in PySimpleGUI are in one of two formats - color name or RGB value.

Individual colors are specified using either the color names as defined in tkinter or an RGB string of this format:

```
"#RRGGBB"
```

### auto\_size\_text

A `True` value for `auto_size_text`, when placed on Text Elements, indicates that the width of the Element should be shrunk do the width of the text. The default setting is True.

### Shortcut functions

The shorthand functions for `Text` are `Txt` and `T`

## Text Methods

### Update

```
Update(value = None, background_color=None, text_color=None, font=None)
```

`value` - new value to set text element to

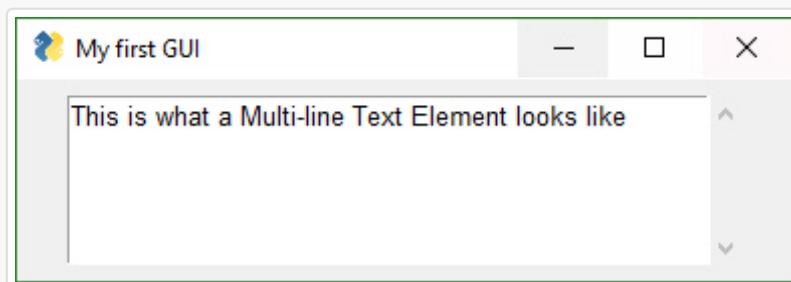
`background_color` - new background color

`text_color` - text color to display

`font` - font to use to display

## Multiline Text Element

```
layout = [[sg.Multiline('This is what a Multi-line Text Element looks like', size=(45,5))]]
```



This Element doubles as both an input and output Element.

```
Multiline(default_text='',
 enter_submits = False,
 disabled=False,
 autoscroll=False,
 size=(None, None),
 auto_size_text=None,
 background_color=None,
 text_color=None,
 do_not_clear=False,
 key=None,
 focus=False,
 pad=None,
 tooltip=None)
```

default\_text - Text to display in the text box  
enter\_submits - Bool. If True, pressing Enter key submits window  
size - Element's size  
auto\_size\_text - Bool. Change width to match size of text

## Multiline Methods

```
Update(value=None, disabled=None, append=False):
```

value - string to set the text field to  
disabled - set to True to disable the element  
append - rather than replacing the current text with new text, add the new text onto the end

## Output Element

Output re-routes `stdout` to a scrolled text box.

Whatever you print will show up in this window.

Note that you will NOT see what you print until you call either window.Read or window.Refresh. If you want to immediately see what was printed, call window.Refresh() immediately after your print statement.

```
layout = [[sg.Output(size=(80,10))]]
```



```
Output(size=(None, None))
```

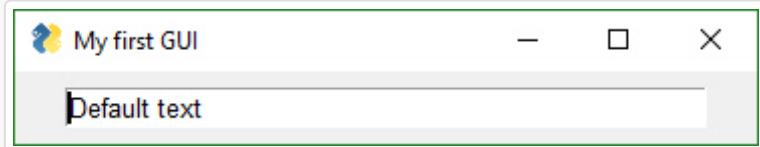
size - Size of Output Element (width, height) in characters

## Input Elements

These make up the majority of the window definition. Optional variables at the Element level override the window level values (e.g. `size` is specified in the Element). All input Elements create an entry in the list of return values. A Text Input Element creates a string in the list of items returned.

# Text Input Element

```
layout = [[sg.InputText('Default text')]]
```



```
def InputText(default_text='',
 size=(None, None),
 disabled=False,
 auto_size_text=None,
 password_char=' ',
 justification=None,
 background_color=None,
 text_color=None,
 font=None,
 tooltip=None,
 change_submits=False,
 do_not_clear=False,
 key=None,
 focus=False,
 pad=None):
 ...

```

default\_text - Text initially shown in the input box  
size - (width, height) of element in characters  
auto\_size\_text- Bool. True is element should be sized to fit text  
disabled - Bool If True the input is disabled  
password\_char - Character that will be used to replace each entered character. Setting to a  
background\_color - color to use for the input field background

```
text_color - color to use for the typed text
font - font used for the element
tooltip - what is shown when hovered over element (doesn't appear to work)
change_submits - if True, will cause a Window.Read to return if a button fills in the value
do_not_clear - Bool. Normally windows clear when read, turn off clearing with this flag.
key = Dictionary key to use for return values
focus = Bool. True if this field should capture the focus (moves cursor to this field)
pad - amount of room in pixels to leave around the element
```

There are two methods that can be called:

```
InputText.Update(new_Value) - sets the input value
Input.Text(Get()) - returns the current value of the field.
```

Shorthand functions that are equivalent to InputText are Input and In

## TextInput Methods

```
Update(value=None, disabled=None):
Get()
```

Update - Change the Element

value - new value to display in field

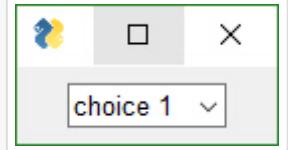
disabled - if True will disable the element

Get - Returns the current value for the element (you can get also from a call to Read)

## Combo Element

Also known as a drop-down list. Only required parameter is the list of choices. The return value is a string matching what's visible on the GUI.

```
layout = [[sg.InputCombo(['choice 1', 'choice 2'])]]
```



```
InputCombo(values, ,
 default_value=None
 size=(None, None)
 auto_size_text=None
 background_color=None
 text_color=None
 change_submits=False
 readonly=True
 disabled=False
 key=None
 pad=None
 tooltip=None
```

values - Choices to be displayed. List of strings  
default\_value - which value should be initially chosen  
size - (width, height) of element in characters  
auto\_size\_text - Bool. True if size should fit the text length  
background\_color - color to use for the **input field** background  
text\_color - color to use for the typed **text**  
change\_submits - Bool. If set causes **Read** to immediately **return** if the selected **value** changes  
disabled - Bool. If set will disable changes  
readonly - Bool. If set user cannot change the **values to choose from**  
key - Dictionary key to use for return values  
pad - (x,y) Amount of padding to put around element in pixels  
tooltip - Text string. If set, hovering over **field** will popup the **text**

Shortcut functions - Combo, DropDown, Drop

## Combo Methods

```
Update(value=None, values=None, set_to_index=None, disabled=None, readonly=None)
```

value - change which value is current selected

values - change list of choices

set\_to\_index - change selection to a particular choice

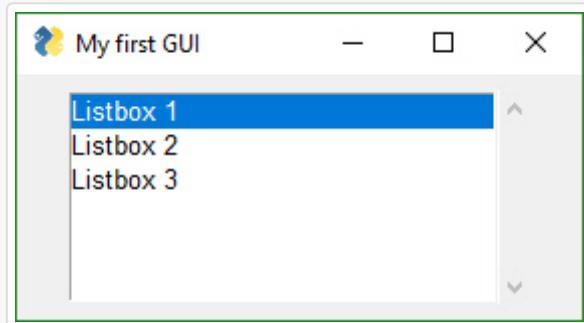
disable - if True will disable element

readonly - if True will make element readonly

## Listbox Element

The standard listbox like you'll find in most GUIs. Note that the return values from this element will be a *list of results, not a single result*. This is because the user can select more than 1 item from the list (if you set the right mode).

```
layout = [[sg.Listbox(values=['Listbox 1', 'Listbox 2', 'Listbox 3'], size=(30, 6))]]
```



```
Listbox(values
 default_values=None
 select_mode=None
 change_submits=False)
```

```
 bind_return_key=False
 size=(None, None)
 disabled = False,
 auto_size_text=None
 font=None
 background_color=None
 text_color=None
 key=None
 pad=None
 tooltip=None):
```

values - Choices **to** be displayed. List **of** strings  
select\_mode - Defines how **to** list **is to** operate.  
    Choices include constants **or** strings:  
    Constants version:  
        LISTBOX\_SELECT\_MODE\_BROWSE  
        LISTBOX\_SELECT\_MODE\_EXTENDED  
        LISTBOX\_SELECT\_MODE\_MULTIPLE  
        LISTBOX\_SELECT\_MODE\_SINGLE - the **default**  
    Strings version:  
        'browse'  
        'extended'  
        'multiple'  
        'single'  
change\_submits - **if** True, the window read will **return with** a button value **of** ''  
bind\_return\_key - **if** the focus **is on** the listbox **and** the user presses **return key**, **or if** the **u**  
size - (width, height) **of** element **in** characters  
disabled - Bool. **If** True element **is** disabled  
auto\_size\_text - Bool. True **if** size should fit the **text** length  
background\_color - color **to** use **for** the input field background  
font - font **to** use **for** items **in** list  
text\_color - color **to** use **for** the typed **text**  
key - Dictionary **key** **to** use **for** return values **and to** find element  
pad - amount **of** padding **to** use **when** packing  
tooltip - tooltip **text**



The `select_mode` option can be a string or a constant value defined as a variable. Generally speaking strings are used for these kinds of options.

ListBoxes can cause a window to return from a Read call. If the flag `change_submits` is set, then when a user makes a selection, the Read immediately returns.

Another way ListBoxes can cause Reads to return is if the flag `bind_return_key` is set. If True, then if the user presses the return key while an entry is selected, then the Read returns. Also, if this flag is set, if the user double-clicks an entry it will return from the Read.

## Listbox Methods

```
Update(values=None, disabled=None)
SetValue(values)
GetListValues()
```

Update - Change element

values - new list of choices

disabled - if True disables the element

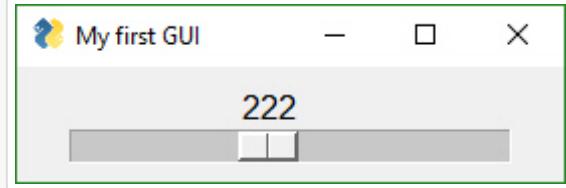
SetValue - Sets selection to one or more values

GetListValues - Return the list of values to choose from

## Slider Element

Sliders have a couple of slider-specific settings as well as appearance settings. Examples include the `orientation` and `range` settings.

```
layout = [[sg.Slider(range=(1, 500), default_value=222, size=(20,15), orientation='horizontal')]]
```



```
Slider(range=(None, None),
 default_value=None,
 resolution=None,
 orientation=None,
 border_width=None,
 relief=None,
 change_submits=False,
 disabled=False,
 size=(None, None),
 font=None,
 background_color=None,
 text_color=None,
 key=None,
 pad=None,
 tooltip=None)
```

```
range - (min, max) slider's range
default_value - default setting (within range)
resolution - how much each 'tick' should represent. Default = 1
orientation - 'horizontal' or 'vertical' ('h' or 'v' work)
border_width - how deep the widget looks
relief - relief style. Values are same as progress meter relief values. Can be a constant
 RELIEF_RAISED= 'raised'
 RELIEF_SUNKEN= 'sunken'
 RELIEF_FLAT= 'flat'
 RELIEF_RIDGE= 'ridge'
 RELIEF_GROOVE= 'groove'
```

```
RELIEF_SOLID = 'solid'
size - (width, height) of element in characters
disabled - Bool If True slider is disabled
auto_size_text - Bool. True if size should fit the text
background_color - color to use for the input field background
text_color - color to use for the typed text
change_submits - causes window read to immediately return if the checkbox value changes
key- Dictionary key to use for return values
tooltip - Tooltip to display when hovered over wlement
```

## Slider Methods

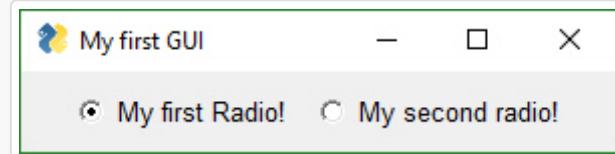
```
Update(self, value=None, range=(None, None), disabled=None):
```

value - set current selection to value  
range - change range of valid values  
disabled - if True disables element

## Radio Button Element

Creates one radio button that is assigned to a group of radio buttons. Only 1 of the buttons in the group can be selected at any one time.

```
layout = [[sg.Radio('My first Radio!', "RADIO1", default=True), sg.Radio('My second radio!',
```



```
Radio(text,
 group_id,
 default=False,
 size=(None, None),
 disabled = False,
 auto_size_text=None,
 font=None,
 background_color = None,
 text_color = None,
 key = None,
 pad = None,
 tooltip = None)
```

**text** - Text **to** display next **to** button  
**group\_id** - Groups together multiple Radio Buttons. Can be **any value**  
**default** - Bool. Initial state  
**size** - (width, height) size of **element** in **characters**  
**auto\_size\_text** - Bool. True **if** should size width **to** fit **text**  
**font** - Font type and size **for** **text** display  
**background\_color** - color **to** use **for** the background  
**text\_color** - color **to** use **for** the **text**  
**key** - Dictionary key **to** use **for** return values  
**pad** - padding around **element**  
**tooltip** - tooltip **to** show when mouse hovered over **element**

## Radio Button Methods

```
Update(value=None, disabled=None)
```

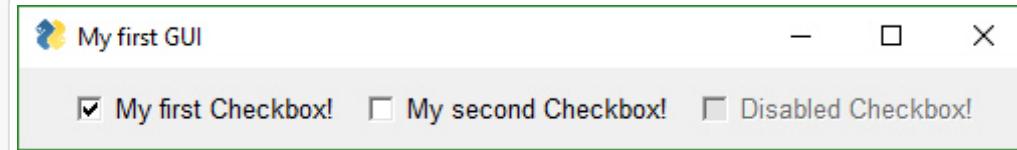
**value** - bool - if True change to selected  
**disabled** - if True disables the element

## Checkbox Element

Checkbox elements are like Radio Button elements. They return a bool indicating whether or not they are checked.

```
layout = [[sg.Checkbox('My first Checkbox!', default=True), sg.Checkbox('My second Checkbox!',
```

```
< ----- >
```



```
Checkbox(text,
 default=False,
 size=(None, None),
 auto_size_text=None,
 font=None,
 background_color = None,
 text_color = None,
 change_submits = False
 disabled = False,
 key = None,
 pad = None,
 tooltip = None):
```

```
text - Text to display next to checkbox
default- Bool + None. Initial state. True = Checked, False = unchecked, None = Not available
size - (width, height) size of element in characters
auto_size_text- Bool. True if should size width to fit text
disabled - Bool. If True element is disabled
font- Font type and size for text display
background_color - color to use for the background
text_color - color to use for the typed text
```

```
change_submits - causes window read to immediately return if the checkbox value changes
key = Dictionary key to use for return values
pad - Padding around element in window
tooltip - text to show when mouse is hovered over element
```

Shortcut functions - CBox, CB, Check

## Checkbox Methods

```
Update(value=None, disabled=None)
Get()
```

Update - changes the element

value - Bool if True checks the checkbox

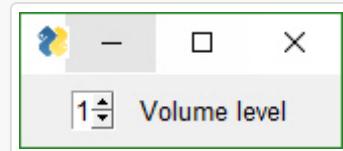
disabled - if True disables the element

Get - returns current state

## Spin Element

An up/down spinner control. The valid values are passed in as a list.

```
layout = [[sg.Spin([i for i in range(1,11)], initial_value=1), sg.Text('Volume level')]]
```



```
Spin(values,
 initial_value=None,
 disabled = False,
```

```
 size=(None, None),
 change_submits = False,
 auto_size_text=None,
 font=None,
 background_color = None,
 text_color = None,
 key = None.
 pad = None,
 tooltip = None):
```

#### Parameter definitions

```
values - List of valid values
initial_value - String with initial value
size - (width, height) size of element in characters
auto_size_text - Bool. True if should size width to fit text
font - Font type and size for text display
disabled - Bool. If True element is disabled
background_color - color to use for the background
text_color - color to use for the typed text
change_submits - causes window read to immediately return if the spinner value changes
key = Dictionary key to use for return values
pad - padding around element in the window
tooltip - text to show when mouse hovered over element
```

## Spin Methods

```
Update(value=None, values=None, disabled=None)
```

value - set the current value

values - set available choices

disabled - if True disables the element

## Image Element

Images can be placed in your window provide they are in PNG, GIF, PPM/PGM format. JPGs cannot be shown because tkinter does not naively support JPGs. You can use the Python Imaging Library (PIL) package to convert your image to PNG prior to calling PySimpleGUI if your images are in JPG format.

```
Image(filename=None,
 data=None,
 background_color=None,
 size=(None, None),
 pad=None,
 key=None,
 tooltip=None)
```

Parameter definitions

```
filename - file name if the image is in a file
data - if image is in RAM (PIL format?)
background_color - Color of background
size - Size (Width, Height) of image in pixels
pad - Padding around Element in the window
key - Key used to find the element
tooltip - text to show when mouse if hovered over image
```

## Image Methods

Like other Elements, the Image Element has an update method. Call Update if you want to change the image.

```
def Update(self, filename=None, data=None):
```

Choose either a filename or in-ram data image to use to replace current image

## Button Element

Buttons are the most important element of all! They cause the majority of the action to happen. After all, it's a button press that will get you out of a window, whether it be Submit or Cancel, one way or another a button is

involved in all windows. The only exception is to this is when the user closes the window using the "X" in the upper corner which means no button was involved.

The Types of buttons include:

*Folder Browse*

File Browse

*Files Browse*

File SaveAs

*File Save*

Close window (normal button)

*Read window*

Realtime

*Calendar Chooser*

Color Chooser

Close window - Normal buttons like Submit, Cancel, Yes, No, do NOT close the window... they used to. Now to close a window you need to use a CloseButton / CButton.

Folder Browse - When clicked a folder browse dialog box is opened. The results of the Folder Browse dialog box are written into one of the input fields of the window.

File Browse - Same as the Folder Browse except rather than choosing a folder, a single file is chosen.

Calendar Chooser - Opens a graphical calendar to select a date.

Color Chooser - Opens a color chooser dialog

Read window - This is a window button that will read a snapshot of all of the input fields, but does not close the window after it's clicked.

Realtime - This is another async window button. Normal button clicks occur after a button's click is released. Realtime buttons report a click the entire time the button is held down.

Most programs will use a combination of shortcut button calls (Submit, Cancel, etc), normal Buttons which leave the windows open and CloseButtons that close the window when clicked.

Sometimes there are multiple names for the same function. This is simply to make the job of the programmer quicker and easier. Or they are old names that are no longer used but kept around so that existing programs

don't break.

The 4 primary windows of PySimpleGUI buttons and their names are:

1. `Button` = `ReadButton` = `RButton` = `ReadFormButton` (old style... use `Button` instead)
2. `CloseButton` = `CButton`
3. `RealtimeButton`
4. `DummyButton`

You will find the long-form names in the older programs. `ReadButton` for example.

In Oct 2018, the definition of `Button` changed. Previously `Button` would CLOSE the window when clicked. It has been changed so the `Button` calls will leave the window open in exactly the same way as a `ReadButton`. They are the same calls now. To enable windows to be closed using buttons, a new button was added...

`CloseButton` or `CButton`.

The most basic `Button` element call to use is `Button`

```
Button(button_text=''
 button_type=BUTTON_TYPE_CLOSES_WIN
 target=(None, None)
 tooltip=None
 file_types=(("ALL Files", "*.*"),)
 initial_folder=None
 disabled = False
 image_filename=None
 image_data=None
 image_size=(None, None)
 image_subsample=None
 border_width=None
 size=(None, None)
 auto_size_button=None
 button_color=None
 default_value = None
 font=None
 bind_return_key=False
 focus=False
 pad=None
 key=None) :
```

## Parameters

```
button_text - Text to be displayed on the button
button_type - You should NOT be setting this directly
target - key or (row,col) target for the button
tooltip - tooltip text for the button
file_types - the filetypes that will be used to match files
initial_folder - starting path for folders and files
disabled = Bool If True button is disabled
image_filename - image filename if there is a button image
image_data - in-RAM image to be displayed on button
image_size - size of button image in pixels
image_subsample - amount to reduce the size of the image
border_width - width of border around button in pixels
size - size in characters
auto_size_button - True if button size is determined by button text
button_color - (text color, background color)
default_value - initial value for buttons that hold information
font - font to use for button text
bind_return_key - If True the return key will cause this button to fire
focus - if focus should be set to this button
pad - (x,y) padding in pixels for packing the button
key - key used for finding the element
```

## Shortcut, Pre-defined Buttons

These Pre-made buttons are some of the most important elements of all because they are used so much. They all basically do the same thing, set the button text to match the function name and set the parameters to commonly used values. If you find yourself needing to create a custom button often because it's not on this list, please post a request on GitHub. . They include:

```
OK
Ok
Submit
Cancel
Yes
```

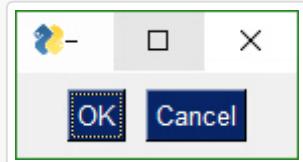
```
No
Exit
Quit
Help
Save
SaveAs
FileBrowse
FilesBrowse
FileSaveAs
FolderBrowse
```

**IMPORT NOTE ABOUT SHORTCUT BUTTONS** Prior to release 3.11.0, these buttons closed the window. Starting with 3.11 they will not close the window. They act like RButtons (return the button text and do not close the window)

If you are having trouble with these buttons closing your window, please check your installed version of PySimpleGUI by typing `pip list` at a command prompt. Prior to 3.11 these buttons close your window.

Using older versions, if you want a Submit() button that does not close the window, then you would instead use RButton('Submit'). Using the new version, if you want a Submit button that closes the window like the old Submit() call did, you would write that as `CloseButton('Submit')` or `CButton('Submit')`

```
layout = [[sg.OK(), sg.Cancel()]]
```



## Button targets

The `FileBrowse`, `FolderBrowse`, `FileSaveAs`, `FileSaveAs`, `CalendarButton`, `ColorChooserButton` buttons all fill-in values into another element located on the window. The target can be

a Text Element or an InputText Element. The location of the element is specified by the `target` variable in the function call.

The Target comes in two forms.

1. Key
2. (row, column)

Targets that are specified using a key will find its target element by using the target's key value. This is the "preferred" method.

If the Target is specified using (row, column) then it utilizes a grid system. The rows in your GUI are numbered starting with 0. The target can be specified as a hard coded grid item or it can be relative to the button.

The (row, col) targeting can only target elements that are in the same "container". Containers are the Window, Column and Frame Elements. A File Browse button located inside of a Column is unable to target elements outside of that Column.

The default value for `target` is `(ThisRow, -1)`. `ThisRow` is a special value that tells the GUI to use the same row as the button. The Y-value of -1 means the field one value to the left of the button. For a File or Folder Browse button, the field that it fills are generally to the left of the button in most cases. `(ThisRow, -1)` means the Element to the left of the button, on the same row.

If a value of `(None, None)` is chosen for the target, then the button itself will hold the information. Later the button can be queried for the value by using the button's key.

Let's examine this window as an example:



The `InputText` element is located at (1,0)... row 1, column 0. The `Browse` button is located at position (2,0). The Target for the button could be any of these values:

```
Target = (1,0)
Target = (-1,0)
```

The code for the entire window could be:

```
layout = [[sg.T('Source Folder')],
 [sg.In()],
 [sg.FolderBrowse(target=(-1, 0)), sg.OK()]]
```

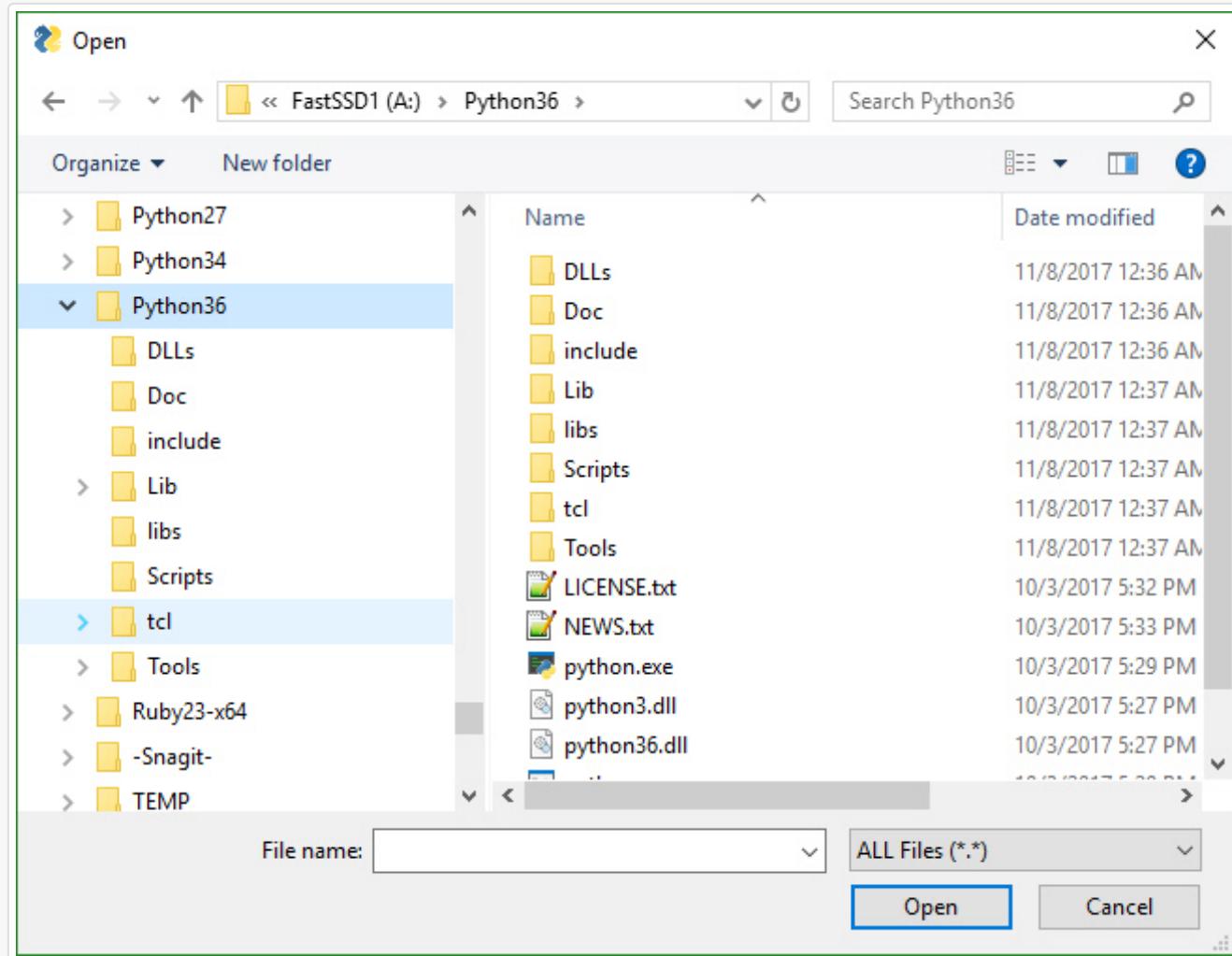
or if using keys, then the code would be:

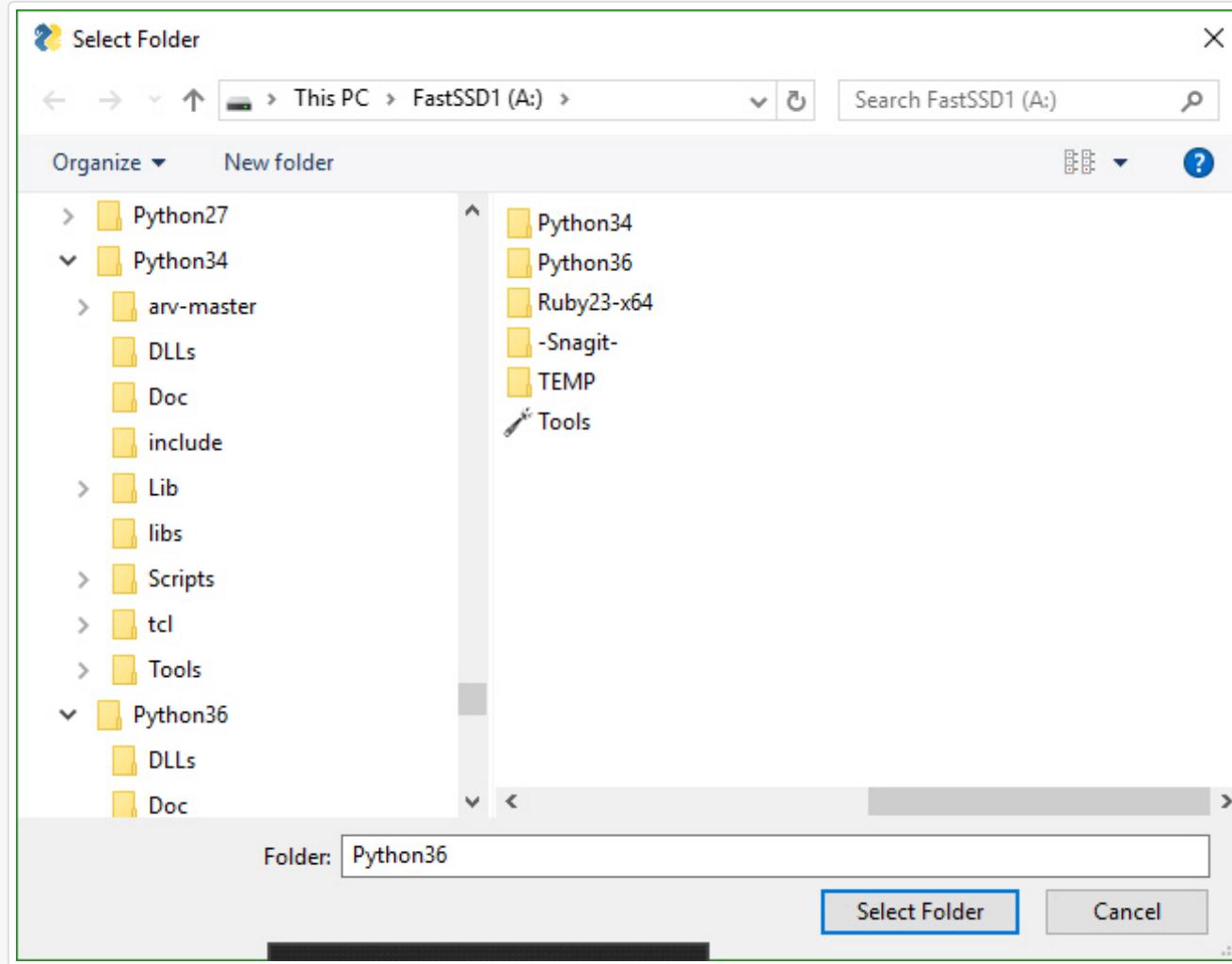
```
layout = [[sg.T('Source Folder')],
 [sg.In(key='input')],
 [sg.FolderBrowse(target='input'), sg.OK()]]
```

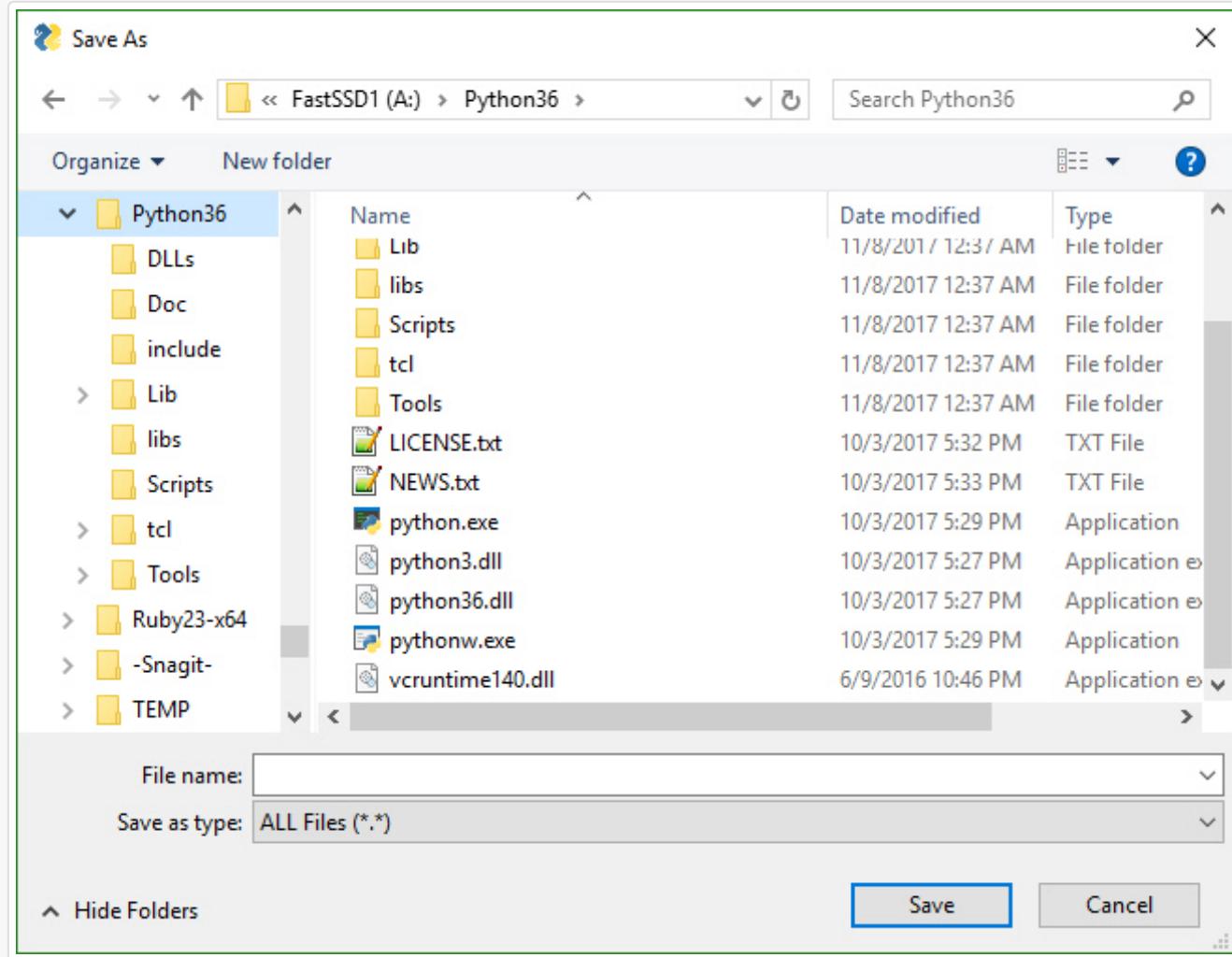
See how much easier the key method is?

### Save & Open Buttons

There are 4 different types of File/Folder open dialog box available. If you are looking for a file to open, the `FileBrowse` is what you want. If you want to save a file, `SaveAs` is the button. If you want to get a folder name, then `FolderBrowse` is the button to use. To open several files at once, use the `FilesBrowse` button. It will create a list of files that are separated by ','

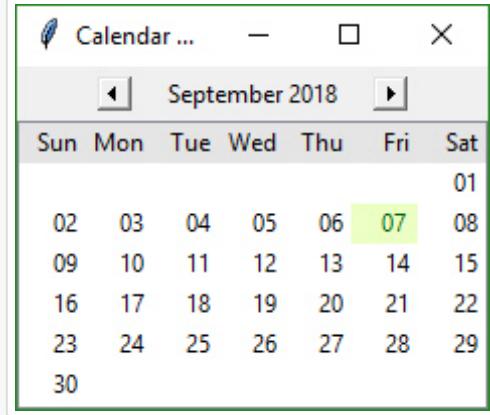






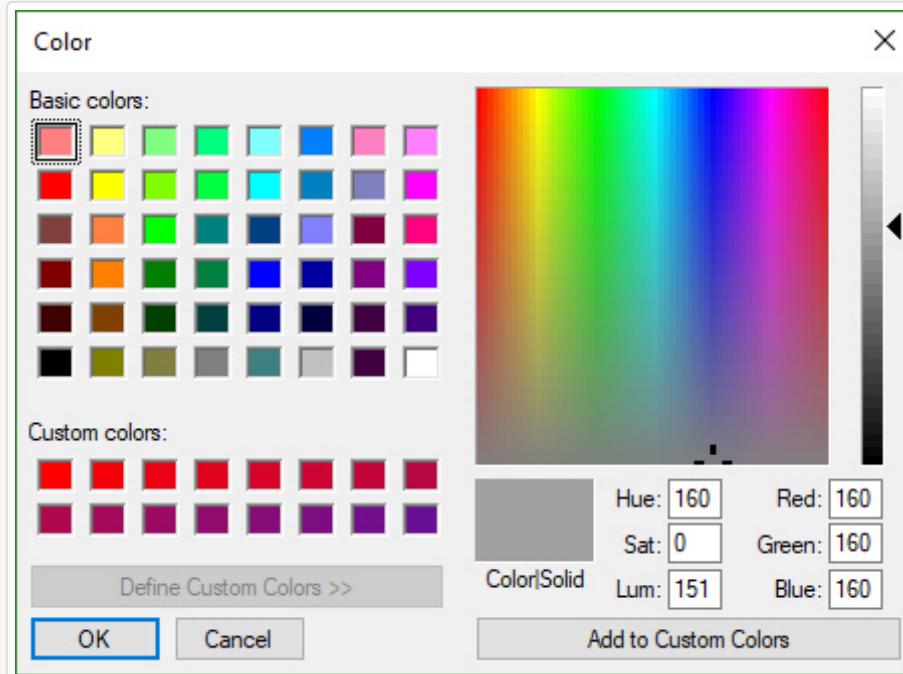
## Calendar Buttons

These buttons pop up a calendar chooser window. The chosen date is returned as a string.



### Color Chooser Buttons

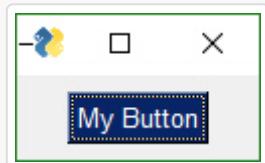
These buttons pop up a standard color chooser window. The result is returned as a tuple. One of the returned values is an RGB hex representation.



## Custom Buttons

Not all buttons are created equal. A button that closes a window is different than a button that returns from the window without closing it. If you want to define your own button, you will generally do this with the Button Element `sg.Button`, which closes the window when clicked.

```
layout = [[sg.Button('My Button')]]
```



All buttons can have their text changed by changing the `button_text` variable in the button call. It is this text that is returned when a window is read. This text will be what tells you which button is called so make it unique. Most of the convenience buttons (Submit, Cancel, Yes, etc) are all Buttons. Some that are not are `FileBrowse`, `FolderBrowse`, `FileSaveAs`. They clearly do not close the window. Instead they bring up a file or folder browser dialog box.

### Button Images

Now this is an exciting feature not found in many simplified packages.... images on buttons! You can make a pretty spiffy user interface with the help of a few button images.

Your button images need to be in PNG or GIF format. When you make a button with an image, set the button background to the same color as the background. There's a button color `TRANSPARENT_BUTTON` that you can set your button color to in order for it to blend into the background. Note that this value is currently the same as the color as the default system background on Windows. If you want to set the button background color to the current system default, use the value `COLOR_SYSTEM_DEFAULT` as the background color.

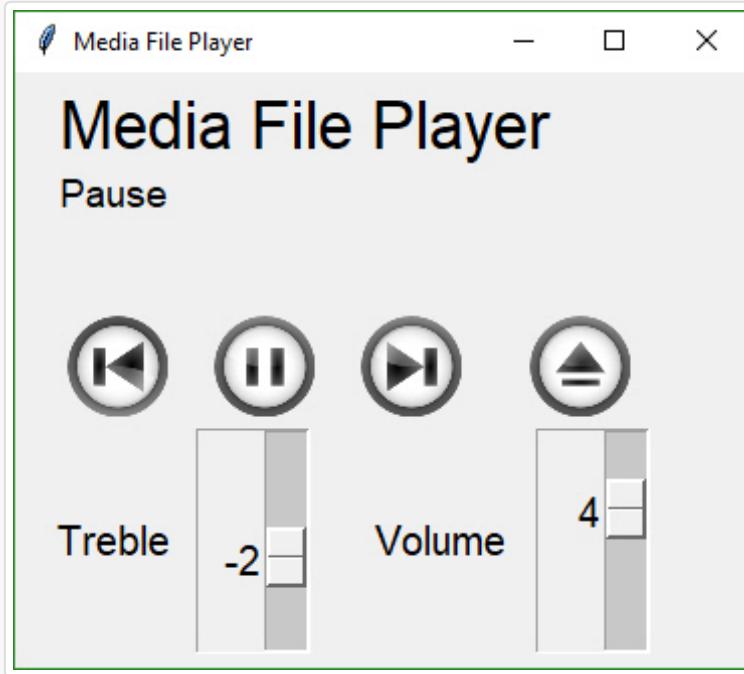
This example comes from the `Demo Media Player.py` example program. Because it's a non-blocking button, it's defined as `RButton`. You also put images on blocking buttons by using `Button`.

```
sg.RButton('Restart Song', button_color=sg.TRANSPARENT_BUTTON,
 image_filename=image_restart, image_size=(50, 50), image_subsample=2, brc
```

Three parameters are used for button images.

```
image_filename - Filename. Can be a relative path
image_size - Size of image file in pixels
image_subsample - Amount to divide the size by. 2 means your image will be 1/2 the size. 3
```

Here's an example window made with button images.



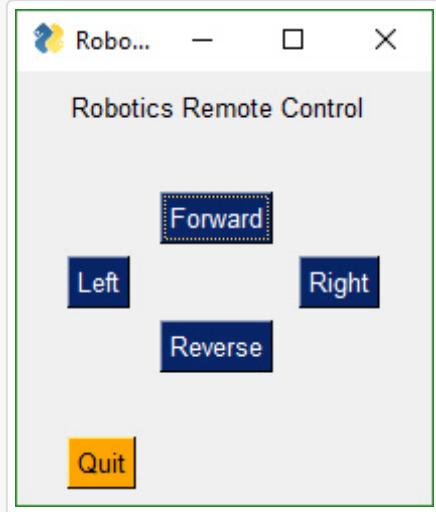
You'll find the source code in the file Demo Media Player. Here is what the button calls look like to create media player window

```
python
 sg.RButton('Pause', button_color=sg.TRANSPARENT_BUTTON,
 image_filename=image_pause,
 image_size=(50, 50),
 image_subsample=2,
 border_width=0) This is one you'll have to experiment with at this point. Not up
for an exhaustive explanation.
```

### Realtime Buttons

Normally buttons are considered "clicked" when the mouse button is let UP after a downward click on the button. What about times when you need to read the raw up/down button values. A classic example for this is a

robotic remote control. Building a remote control using a GUI is easy enough. One button for each of the directions is a start. Perhaps something like this:



This window has 2 button types. There's the normal "Read Button" (Quit) and 4 "Realtime Buttons".

Here is the code to make, show and get results from this window:

```
import PySimpleGUI as sg

gui_rows = [[sg.Text('Robotics Remote Control')],
 [sg.T(' ' * 10), sg.RealtimeButton('Forward')],
 [sg.RealtimeButton('Left'), sg.T(' ' * 15), sg.RealtimeButton('Right')],
 [sg.T(' ' * 10), sg.RealtimeButton('Reverse')],
 [sg.T('')],
 [sg.Quit(button_color=('black', 'orange'))]
]

window = sg.Window('Robotics Remote Control', auto_size_text=True).Layout(gui_rows)

#
Some place later in your code...
```

```

You need to perform a Read or Refresh call on your window every now and then or
else it will appear as if the program has locked up.
#
your program's main loop
while (True):
 # This is the code that reads and updates your window
 event, values = window.Read(timeout=0)
 if event is not None:
 print(event)
 if event == 'Quit' or values is None:
 break

window.Close() # Don't forget to close your window!

```

This loop will read button values and print them. When one of the Realtime buttons is clicked, the call to `window.Read` will return a button name matching the name on the button that was depressed or the key if there was a key assigned to the button. It will continue to return values as long as the button remains depressed. Once released, the Read will return timeout events until a button is again clicked.

### File Types

The `FileBrowse` & `SaveAs` buttons have an additional setting named `file_types`. This variable is used to filter the files shown in the file dialog box. The default value for this setting is

```
FileTypes=(("ALL Files", "*.*"),)
```

This code produces a window where the Browse button only shows files of type .TXT

```
layout = [[sg.In(), sg.FileBrowse(file_types=(("Text Files", "*.txt"),))]]
```

NOTE - Mac users will not be able to use the `file_types` parameter. tkinter has a bug on Macs that will crash the program if a `file_type` is attempted so that feature had to be removed. Sorry about that!

### *The ENTER key*

The ENTER key is an important part of data entry for windows. There's a long tradition of the enter key being used to quickly submit windows. PySimpleGUI implements this by tying the ENTER key to the first button that closes or reads a window.

The Enter Key can be "bound" to a particular button so that when the key is pressed, it causes the window to return as if the button was clicked. This is done using the `bind_return_key` parameter in the button calls. If there are more than 1 button on a window, the FIRST button that is of type Close window or Read window is used. First is determined by scanning the window, top to bottom and left to right.

## Button Methods

```
Update(text=None, button_color=(None, None), disabled=None, image_data=None, image_filename=N
```

```
GetText()
```

Update - Change the button element

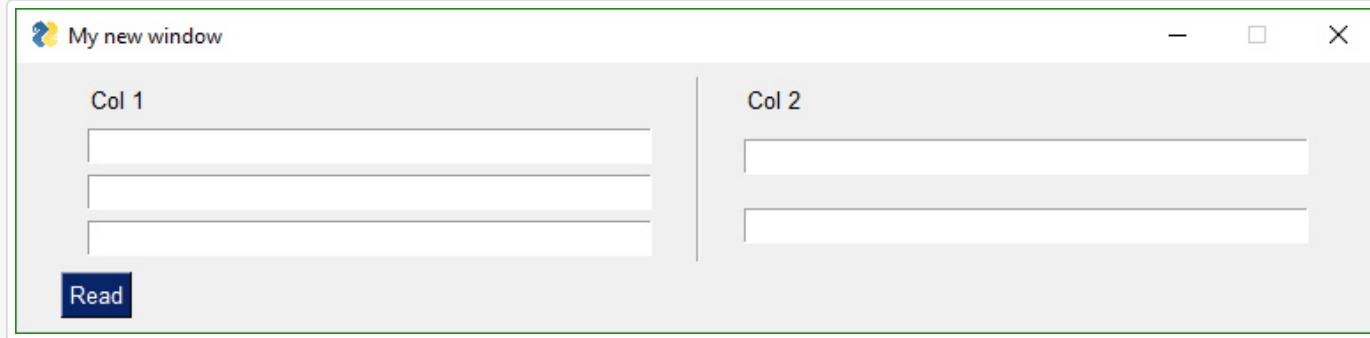
```
text - sets button text
button color - (text, background)
disabled - if True disables the button
image_data - sets button image to in-ram image
image_filename - sets button image using a file
```

GetText - Returns the current text shown on a button

## Vertical Separator Element

This element has limited usefulness and is being included more for completeness than anything else. It will draw a line between elements.

```
VerticalSeparator(pad=None)
```



It works best when placed between columns or elements that span multiple rows. If on a "normal" row with elements that are only 1 row high, then it will only span that one row.

## ProgressBar Element

The `ProgressBar` element is used to build custom Progress Bar windows. It is HIGHLY recommended that you use `OneLineProgressMeter` that provides a complete progress meter solution for you. Progress Meters are not easy to work with because the windows have to be non-blocking and they are tricky to debug.

The **easiest** way to get progress meters into your code is to use the `OneLineProgressMeter` API. This consists of a pair of functions, `OneLineProgressMeter` and `OneLineProgressMeterCancel`. You can easily cancel any progress meter by calling it with the current value = max value. This will mark the meter as expired and close the window.

You've already seen `OneLineProgressMeter` calls presented earlier in this readme.

```
sg.OneLineProgressMeter('My Meter', i+1, 1000, 'key', 'Optional message')
```

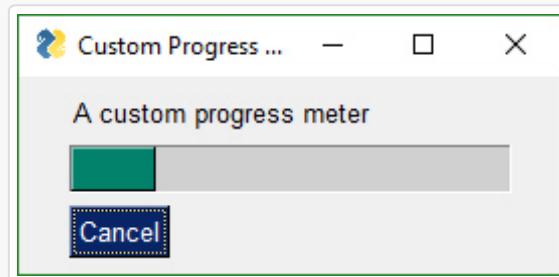
The return value for `OneLineProgressMeter` is:

`True` if meter updated correctly

`False` if user clicked the Cancel button, closed the window, or value reached the max value.

### Progress Mater in Your window

Another way of using a Progress Meter with PySimpleGUI is to build a custom window with a `ProgressBar` Element in the window. You will need to run your window as a non-blocking window. When you are ready to update your progress bar, you call the `UpdateBar` method for the `ProgressBar` element itself.



```
import PySimpleGUI as sg

layout the window
layout = [[sg.Text('A custom progress meter')],
 [sg.ProgressBar(10000, orientation='h', size=(20, 20), key='progressbar')],
 [sg.Cancel()]]

create the window
window = sg.Window('Custom Progress Meter').Layout(layout)
progress_bar = window.FindElement('progressbar')
loop that would normally do something useful
for i in range(10000):
 # check to see if the cancel button was clicked and exit loop if clicked
 event, values = window.Read(timeout=0)
 if event == 'Cancel' or event is None:
 break
 # update bar with loop value +1 so that bar eventually reaches the maximum
 progress_bar.UpdateBar(i + 1)
done with loop... need to destroy the window as it's still open
window.Close()
```

## Output

The Output Element is a re-direction of Stdout. Anything "printed" will be displayed in this element.

```
Output(size=(None, None))
```

Here's a complete solution for a chat-window using an Async window with an Output Element

```
import PySimpleGUI as sg

Blocking window that doesn't close
def ChatBot():
 layout = [[[sg.Text('This is where standard out is being routed', size=[40, 1])],
 [sg.Output(size=(80, 20))],
 [sg.Multiline(size=(70, 5), enter_submits=True),
 sg.RButton('SEND', button_color=(sg.YELLOWS[0], sg.BLUES[0])),
 sg.Button('EXIT', button_color=(sg.YELLOWS[0], sg.GREENS[0]))]]]

 window = sg.Window('Chat Window', default_element_size=(30, 2)).Layout(layout)

 # ----- Loop taking in user input and using it to query HowDoI web oracle --- #
 while True:
 event, value = window.Read()
 if event == 'SEND':
 print(value)
 else:
 break

ChatBot()
```

## ProgressBar Methods

```
UpdateBar(current_count, max=None)
```

current\_count - sets the current value  
max - changes the max value

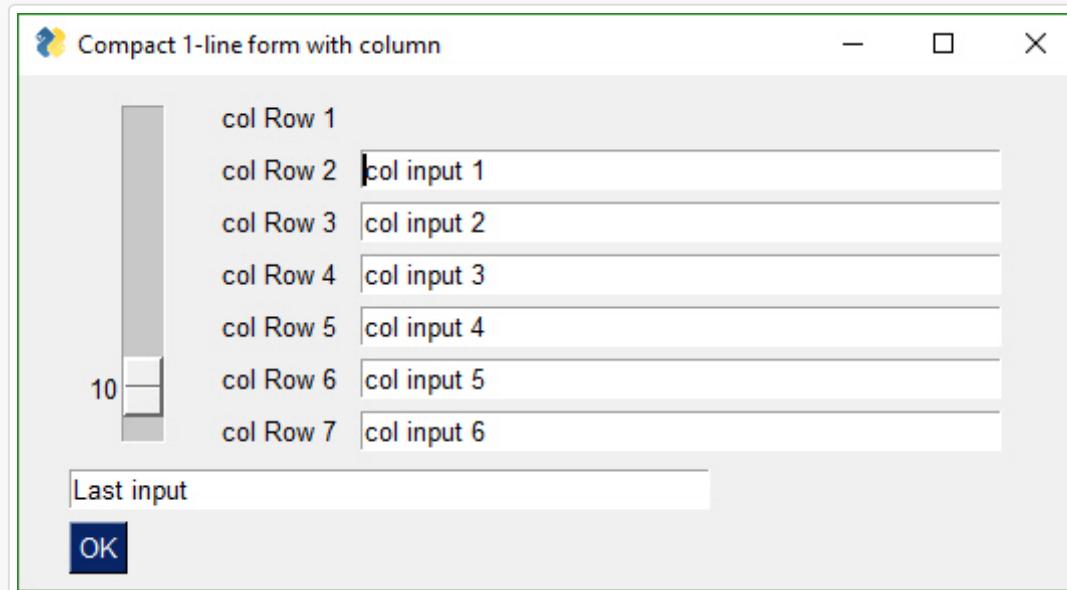
# Column Element

Starting in version 2.9 you'll be able to do more complex layouts by using the Column Element. Think of a Column as a window within a window. And, yes, you can have a Column within a Column if you want.

Columns are specified in exactly the same way as a window is, as a list of lists.

```
def Column(layout - the list of rows that define the layout
 background_color - color of background
 size - size of visible portion of column
 pad - element padding to use when packing
 scrollable - bool. True if should add scrollbars
```

Columns are needed when you have an element that has a height > 1 line on the left, with single-line elements on the right. Here's an example of this kind of layout:



This code produced the above window.

```
import PySimpleGUI as sg

Demo of how columns work
window has on row 1 a vertical slider followed by a COLUMN with 7 rows
Prior to the Column element, this layout was not possible
Columns layouts look identical to window layouts, they are a list of lists of elements.

window = sg.Window('Columns') # blank window

Column layout
col = [[sg.Text('col Row 1')],
 [sg.Text('col Row 2'), sg.Input('col input 1')],
 [sg.Text('col Row 3'), sg.Input('col input 2')],
 [sg.Text('col Row 4'), sg.Input('col input 3')],
 [sg.Text('col Row 5'), sg.Input('col input 4')],
 [sg.Text('col Row 6'), sg.Input('col input 5')],
 [sg.Text('col Row 7'), sg.Input('col input 6')]

layout = [[sg.Slider(range=(1,100), default_value=10, orientation='v', size=(8,20)), sg.Column(
 [sg.In('Last input')], [sg.OK()])]

Display the window and get values
If you're willing to not use the "context manager" design pattern, then it's possible
to collapse the window display and read down to a single line of code.
event, values = sg.Window('Compact 1-line window with column').Layout(layout).Read()

sg.Popup(event, values, line_width=200)
```

The Column Element has 1 required parameter and 1 optional (the layout and the background color). Setting the background color has the same effect as setting the window's background color, except it only affects the column rectangle.

**Column**(layout, background\_color=None)

The default background color for Columns is the same as the default window background color. If you change the look and feel of the window, the column background will match the window background automatically.

# Frame Element (Labelled Frames, Frames with a title)

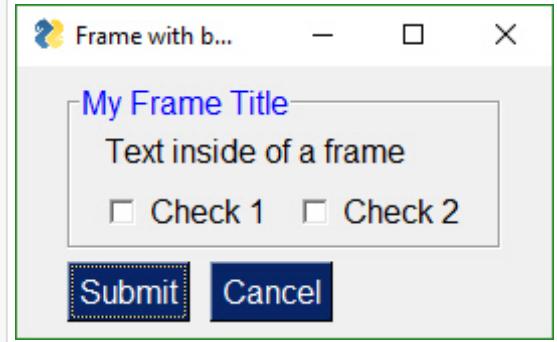
Frames work exactly the same way as Columns. You create layout that is then used to initialize the Frame.

```
def Frame(title - the label / title to put on frame
 layout - list of rows of elements the frame contains
 title_color - color of the title text
 background_color - color of background
 title_location - locations to put the title
 relief - type of relief to use
 size - size of Frame in characters. Do not use if you want frame to autosize
 font - font to use for title
 pad - element padding to use when packing
 border_width - how thick the line going around frame should be
 key - key used to location the element
 tooltip - tooltip text
```

This code creates a window with a Frame and 2 buttons.

```
frame_layout = [
 [sg.T('Text inside of a frame')],
 [sg.CB('Check 1'), sg.CB('Check 2')],
]
layout = [
 [sg.Frame('My Frame Title', frame_layout, font='Any 12', title_color='blue')],
 [sg.Submit(), sg.Cancel()]
]

window = sg.Window('Frame with buttons', font=("Helvetica", 12)).Layout(layout)
```



Notice how the Frame layout looks identical to a window layout. A window works exactly the same way as a Column and a Frame. They all are "container elements". Elements that contain other elements.

*These container Elements can be nested as deep as you want.* That's a pretty spiffy feature, right? Took a lot of work so be appreciative. Recursive code isn't trivial.

## Canvas Element

In my opinion, the tkinter Canvas Widget is the most powerful of the tkinter widget. While I try my best to completely isolate the user from anything that is tkinter related, the Canvas Element is the one exception. It enables integration with a number of other packages, often with spectacular results.

## Matplotlib, Pyplot Integration

One such integration is with Matplotlib and Pyplot. There is a Demo program written that you can use as a design pattern to get an understanding of how to use the Canvas Widget once you get it.

```
def Canvas(canvas - a tkinter canvas if you created one. Normally not set
 background_color - canvas color
 size - size in pixels
 pad - element padding for packing
 key - key used to lookup element
 tooltip - tooltip text
```

The order of operations to obtain a tkinter Canvas Widget is:

```
figure_x, figure_y, figure_w, figure_h = fig.bbox.bounds
define the window layout
layout = [[sg.Text('Plot test')],
 [sg.Canvas(size=(figure_w, figure_h), key='canvas')],
 [sg.OK(pad=((figure_w / 2, 0), 3), size=(4, 2))]]

create the window and show it without the plot
window = sg.Window('Demo Application - Embedding Matplotlib In PySimpleGUI').Layout(layout).Finalize()

add the plot to the window
fig_photo = draw_figure(window.FindElement('canvas').TKCanvas, fig)

show it all again and get buttons
event, values = window.Read()
```

To get a tkinter Canvas Widget from PySimpleGUI, follow these steps:

Add *Canvas Element* to your window

Layout your window

Call `window.Finalize()` - this is a critical step you must not forget

Find the Canvas Element by looking up using key

Your Canvas Widget Object will be the `found_element.TKCanvas`

Draw on your canvas to your heart's content

\* Call `window.Read()` - Nothing will appear on your canvas until you call Read

See `Demo_Matplotlib.py` for a Recipe you can copy.

## Canvas Methods

TKCanvas - not a method but a property. Returns the tkinter Canvas Widget

## Graph Element

All you math fans will enjoy this Element... and all you non-math fans will enjoy it too.

I've found nothing to be less fun than dealing with a graphic's coordinate system from a GUI Framework. It's always upside down from what I want. (0,0) is in the upper left hand corner. In short, it's a **pain in the ass**.

Graph Element to the rescue. A Graph Element creates a pixel addressable canvas using YOUR coordinate system. You get to define the units on the X and Y axis.

There are 3 values you'll need to supply the Graph Element. They are:

*Size of the canvas in pixels*

The lower left (x,y) coordinate of your coordinate system

\* The upper right (x,y) coordinate of your coordinate system

After you supply those values you can scribble all of over your graph by creating Graph Figures. Graph Figures are created, and a Figure ID is obtained by calling:

*DrawCircle*

*DrawLine*

*DrawPoint*

*DrawRectangle*

\* *DrawOval*

You can move your figures around on the canvas by supplying the Figure ID the x,y amount to move.

```
graph.MoveFigure(my_circle, 10, 10)
```

This Element is relatively new and may have some parameter additions or deletions. It shouldn't break your code however.

```
def Graph(canvas_size - size of canvas in pixels
 graph_bottom_left - the x,y location of your coordinate system's bottom left
 graph_top_right - the x,y location of your coordinate system's top right position
 background_color - color to use for background
 pad - element padding for pack
 key - key used to lookup element
 tooltip - tooltip text
```

## Graph Methods

```
DrawLine(self, point_from, point_to, color='black', width=1)
DrawPoint(self, point, size=2, color='black')
DrawCircle(self, center_location, radius, fill_color=None, line_color='black')
DrawOval(self, top_left, bottom_right, fill_color=None, line_color=None)
DrawArc(self, top_left, bottom_right, extent, start_angle, style=None, arc_color='black')
DrawRectangle(self, top_left, bottom_right, fill_color=None, line_color=None)
DrawText(self, text, location, color='black', font=None, angle=0)
Erase(background_color)
Update()
Move(self, x_direction, y_direction)
MoveFigure(self, figure, x_direction, y_direction)
TKCanvas
```

All of the Drawing methods return a "figure" that can be used move the figure

- DrawLine - draws a line
- DrawPoint - draws a single point
- DrawCircle - draws a circle
- DrawOval - draws an oval
- DrawArc - draws an arc
- DrawRectangle - draws a rectangle
- DrawText - draws text
- Erase - erases entire graph
- Update - changes background color
- Move - moves everything an x,y direction
- MoveFigure - moves an individual figure

## Table Element

Let me say up front that the Table Element has Beta status. The reason is that some of the parameters are not quite right and will change. Be warned one or two parameters may change. The `size` parameter in particular is going to change. Currently the number of rows to allocate for the table is set by the height parameter of size.

The problem is that the width is not used. The plan is to instead have a parameter named `number_of_rows` or something like it.

```
def Table(values - Your table's array
 headings - list of strings representing your headings, if you have any
 visible_column_map - list of bools. If True, column in that position is shown. Def
 col_widths - list of column widths
 def_col_width - default column width. defaults to 10
 auto_size_columns - bool. If True column widths are determined by table contents
 max_col_width - maximum width of a column. defaults to 25
 select_mode - table rows can be selected, but doesn't currently do anything
 display_row_numbers - bool. If True shows numbers next to rows
 scrollable - if True table will be scrolled
 font - font for table entries
 justification - left, right, center
 text_color - color of text
 background_color - cell background color
 size - (None, number of rows).
 pad - element padding for packing
 key - key used to lookup element
 tooltip - tooltip text
```

## Read return values from Table Element

The values returned from a `Window.Read` call for the Tree Element are a list of row numbers that are currently highlighted.

## Update Call

The Update method can be used to make changes to a table that's already been displayed. The call takes a single parameter, `values`, which is the new table to display. The entire table is replaced.

```
def Update(self, values=None):
```

`values` is a table containing your rows just like you passed in when creating the Table Element.

# Tree Element

The Tree Element and Table Element are close cousins. Many of the parameters found in the Table Element apply to Tree Elements. In particular the heading information, column widths, etc.

```
class Tree(data=None - data in TreeData format
 headings=None - list of strings representing your headings
 visible_column_map=None - list of bools indicating which columns to display
 col_widths=None - list of column widths
 col0_width=10 - width of the first column which has the text data
 def_col_width=10 - default column width
 auto_size_columns=True - if true will autosize columns (currently only sizes to col 0)
 max_col_width=20 - max width for columns in characters
 select_mode=None - not yet used
 show_expanded - Bool - if True the tree will be fully expanded when shown
 font=None - the display font
 justification='right' - justification for data display
 text_color=None - color of text to display
 background_color=None - background color
 num_rows=None - number of rows to display
 pad=None - element padding
 key=None - key for element
 tooltip=None - tooltip
```

Unlike Tables there is no standard format for trees. Thus the data structure passed to the Tree Element must be constructed. This is done using the TreeData class. The process is as follows:

*Get a TreeData Object*

"Insert" data into the tree

\* Pass the filled in TreeData object to Tree Element

To "insert" data into the tree the TreeData method Insert is called.

```
Insert(parent_key, key, display_text, values)
```

To indicate insertion at the head of the tree, use a parent key of "". So, every top-level node in the tree will have a parent node = ""

This code creates a TreeData object and populates with 3 values

```
treedata = sg.TreeData()

treedata.Insert("", '_A_', 'A', [1,2,3])
treedata.Insert("", '_B_', 'B', [4,5,6])
treedata.Insert("_A_", '_A1_', 'A1', ['can','be','anything'])
```

Note that you **can** use the same values for display\_text and keys. The only thing you have to watch for is that you cannot repeat keys.

When Reading a window the Table Element will return a list of rows that are selected by the user. The list will be empty if no rows are selected.

## Tab and Tab Group Elements

Tabs have been a part of PySimpleGUI since the initial release. However, the initial implementation applied tabs at the top level only. The entire window had to be tabbed. There were other limitations that came along with that implementation. That all changed in version 3.8.0 with the new elements - Tab and TabGroup. The old implementation of Tabs was removed in version 3.8.0 as well.

Tabs are another "Container Element". The other Container Elements include:

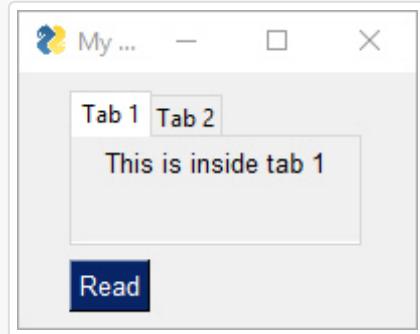
*Frame*

*Column*

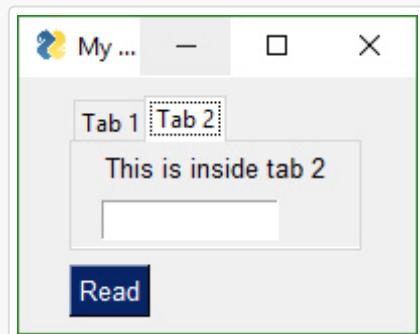
You layout a Frame in exactly the same way as a Frame or Column elements, by passing in a list of elements.

How you place a Tab into a Window is different than Graph or Frame elements. You cannot place a tab directly into a Window's layout. It must first be placed into a TabGroup. The TabGroup can then be placed into the Window.

Let's look at this Window as an example:



View of second tab:



First we have the Tab layout definitions. They mirror what you see in the screen shots. Tab 1 has 1 Text Element in it. Tab 2 has a Text and an Input Element.

```
tab1_layout = [[sg.T('This is inside tab 1')]]

tab2_layout = [[sg.T('This is inside tab 2')],
 [sg.In(key='in')]]
```

The layout for the entire window looks like this:

```
layout = [[sg.TabGroup([[sg.Tab('Tab 1', tab1_layout), sg.Tab('Tab 2', tab2_layout)]]),
 [sg.RButton('Read')]]]
```

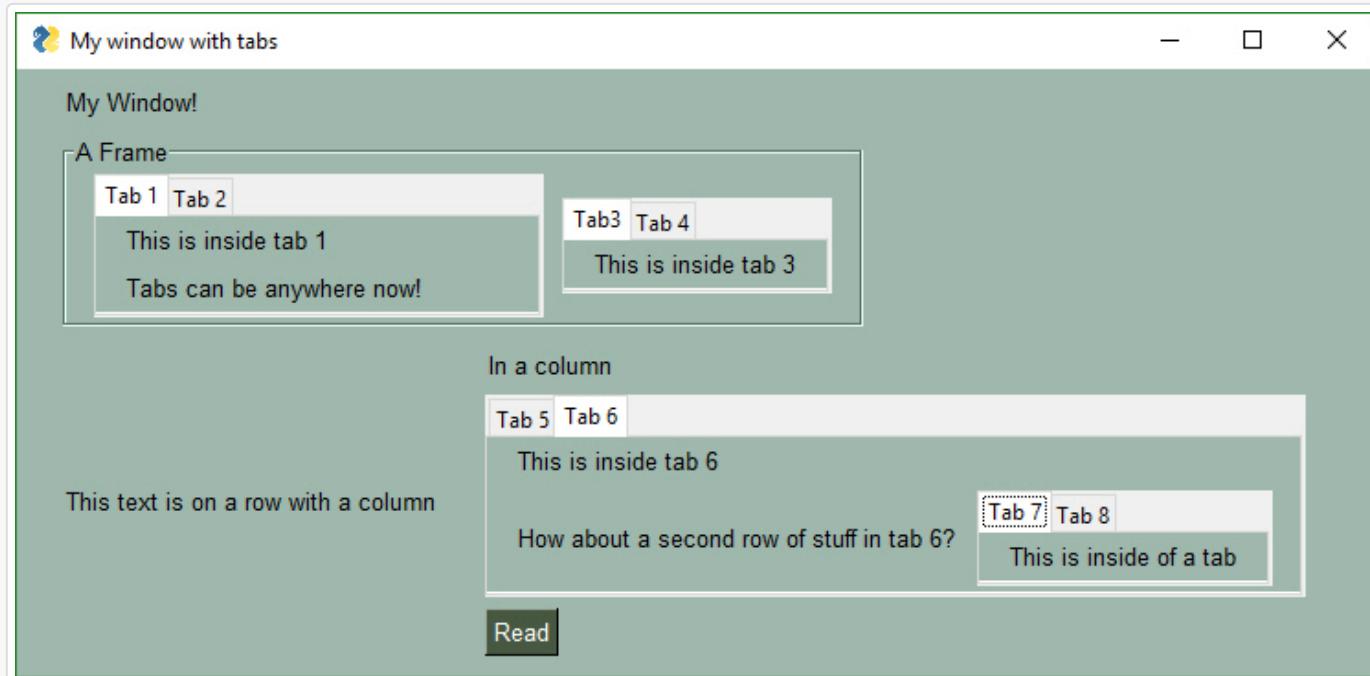
The Window layout has the TabGroup and within the tab Group are the two Tab elements.

One important thing to notice about all of these container Elements... they all take a "list of lists" at the layout. They all have a layout that starts with `[[`

You will want to keep this `[[ ]]` construct in your head as you're debugging your tabbed windows. It's easy to overlook one or two necessary `[`'s

As mentioned earlier, the old-style Tabs were limited to being at the Window-level only. In other words, the tabs were equal in size to the entire window. This is not the case with the "new-style" tabs. This is why you're not going to be upset when you discover your old code no longer works with the new PySimpleGUI release. It'll be worth the few moments it'll take to convert your code.

Check out what's possible with the NEW Tabs!



Check out Tabs 7 and 8. We've got a Window with a Column containing Tabs 5 and 6. On Tab 6 are... Tabs 7 and 8.

As of Release 3.8.0, not all of *options* shown in the API definitions of the Tab and TabGroup Elements are working. They are there as placeholders.

The definition of a TabGroup is

```
TabGroup(layout,
 title_color=None
 background_color=None
 font=None
 pad=None
 border_width=None
 change_submits = False
```

```
key=None
tooltip=None)
```

The definition of a Tab Element is

```
Tab(title,
 layout,
 title_color=None,
 background_color=None,
 font=None,
 pad=None
 disabled=False
 border_width=None
 key=None
 tooltip=None)
```

## Reading Tab Groups

Tab Groups now return a value when a Read returns. They return which tab is currently selected. There is also a change\_submits parameter that can be set that causes a Read to return if a Tab in that group is selected / changed. The key or title belonging to the Tab that was switched to will be returned as the value

## Tab Element Methods

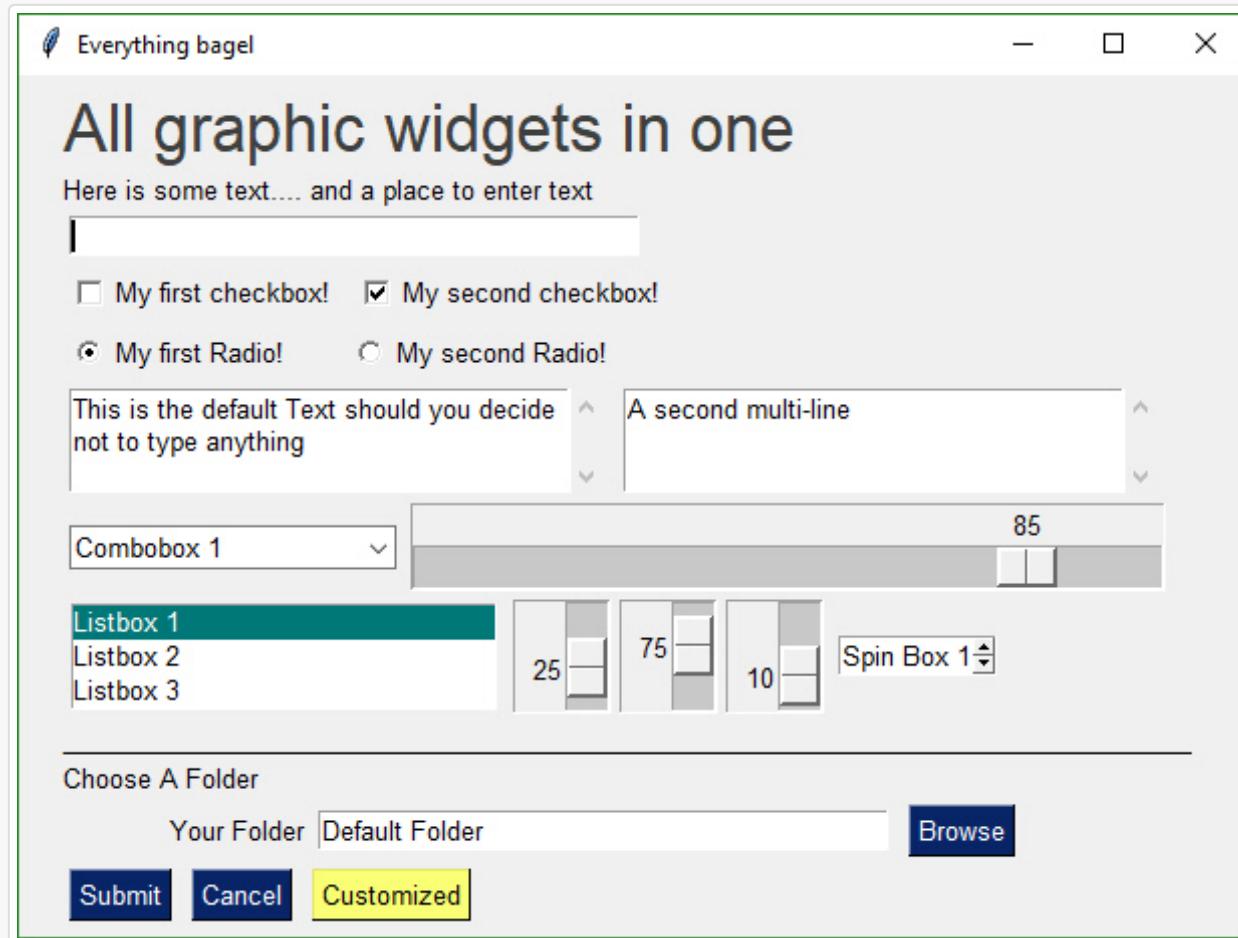
```
Update(disabled = None)
```

WARNING - This Update method does not yet work!

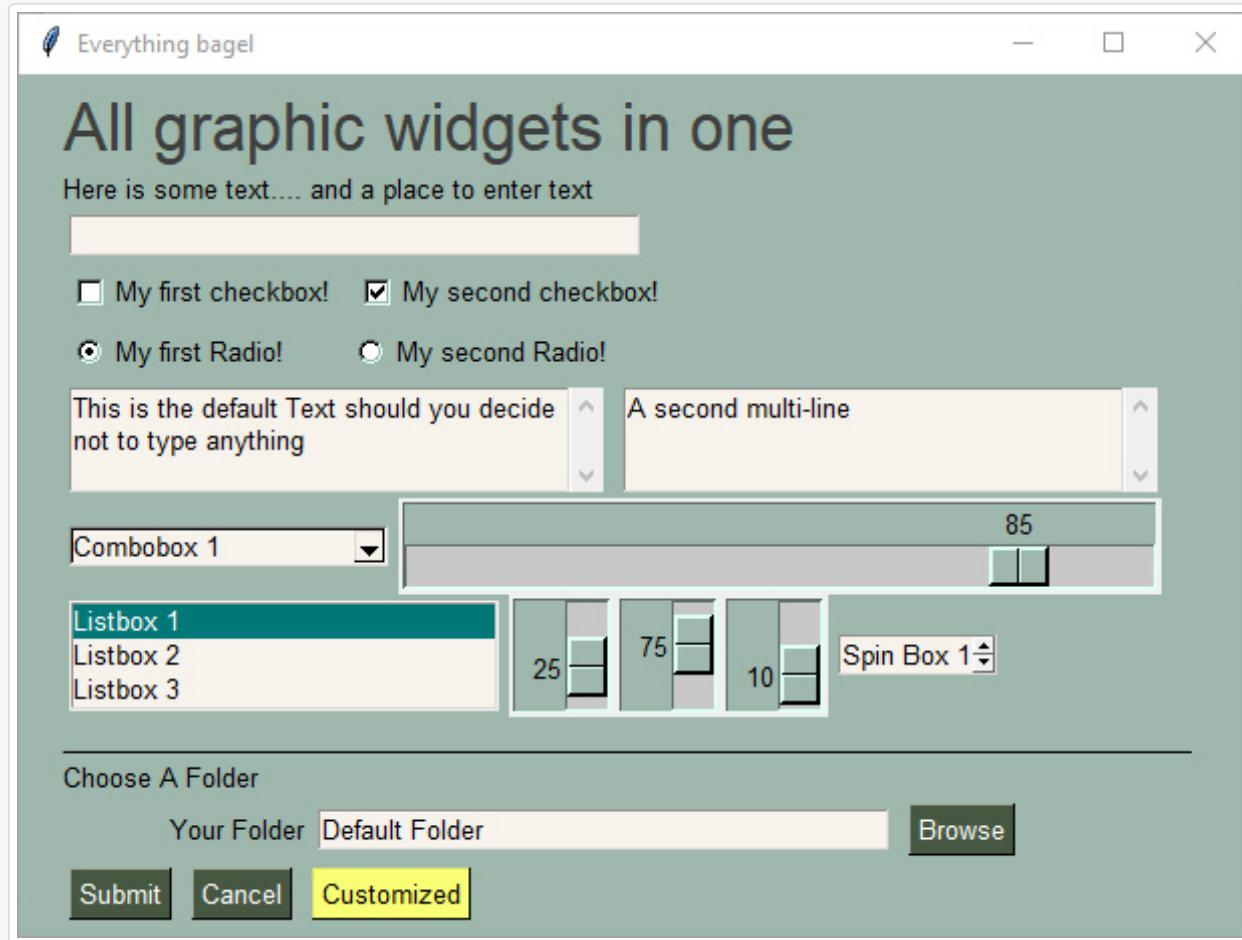
## Colors

Starting in version 2.5 you can change the background colors for the window and the Elements.

Your windows can go from this:



to this... with one function call...



While you can do it on an element by element or window level basis, the easiest way, by far, is a call to `SetOptions`.

Be aware that once you change these options they are changed for the rest of your program's execution. All of your windows will have that look and feel, until you change it to something else (which could be the system default colors).

This call sets all of the different color options.

```
SetOptions(background_color='#9FB8AD',
 text_element_background_color='#9FB8AD',
 element_background_color='#9FB8AD',
 scrollbar_color=None,
 input_elements_background_color='#F7F3EC',
 progress_meter_color = ('green', 'blue')
 button_color=('white', '#475841'))
```

# Global Settings

## Global Settings

Let's have some fun customizing! Make PySimpleGUI look the way you want it to look. You can set the global settings using the function `PySimpleGUI.SetOptions`. Each option has an optional parameter that's used to set it.

```
SetOptions(icon=None
 button_color=(None, None)
 element_size=(None, None),
 margins=(None, None),
 element_padding=(None, None)
 auto_size_text=None
 auto_size_buttons=None
 font=None
 border_width=None
 slider_border_width=None
 slider_relief=None
 slider_orientation=None
 autoclose_time=None
 message_box_line_width=None
 progress_meter_border_depth=None
 progress_meter_style=None
 progress_meter_relief=None
 progress_meter_color=None
 progress_meter_size=None
 text_justification=None
 text_color=None)
```

```
background_color=None
element_background_color=None
text_element_background_color=None
input_elements_background_color=None
element_text_color=None
input_text_color=None
scrollbar_color=None, text_color=None
debug_win_size=(None, None)
window_location=(None, None)
tooltip_time = None
```

#### Explanation of parameters

icon - filename **of** icon used **for** taskbar **and** title bar  
button\_color - button color (foreground, background)  
element\_size - element size (width, height) **in** characters  
margins - tkinter margins **around** outsize  
element\_padding - tkinter padding **around** each element  
auto\_size\_text - autosize **the** elements **to** fit their **text**  
auto\_size\_buttons - autosize **the** buttons **to** fit their **text**  
font - font used **for** elements  
border\_width - amount **of** bezel **or** border **around** sunken **or** raised elements  
slider\_border\_width - changes **the** way sliders look  
slider\_relief - changes **the** way sliders look  
slider\_orientation - changes orientation **of** slider  
autoclose\_time - time **in** seconds **for** autoclose boxes  
message\_box\_line\_width - **number** **of** characers **in** a line **of** **text** **in** message boxes  
progress\_meter\_border\_depth - amount **of** border **around** raised **or** lowered progress met  
progress\_meter\_style - style **of** progress meter **as** defined **by** tkinter  
progress\_meter\_relief - relief style  
progress\_meter\_color - color **of** **the** bar **and** background **of** progress meters  
progress\_meter\_size - size **in** (characters, pixels)  
background\_color - Color **of** **the** main window's background  
element\_background\_color - Background color **of** **the** elements  
text\_element\_background\_color - Text element background color  
input\_elements\_background\_color - Input fields background color  
element\_text\_color - Text color **of** elements **that** have **text**, like Radio Buttons  
input\_text\_color - Color **of** **the** **text** **that** you type **in**  
scrollbar\_color - Color **for** scrollbars (may **not** always work)

```
text_color - Text element default text color
text_justification - justification to use on Text Elements. Values are strings - 'le
debug_win_size - size of the Print output window
window_location - location on the screen (x,y) of window's top left corner
tooltip_time - time in milliseconds to wait before showing a tooltip. Default is 400
```

These settings apply to all windows `SetOptions`. The Row options and Element options will take precedence over these settings. Settings can be thought of as levels of settings with the window-level being the highest and the Element-level the lowest. Thus the levels are:

- window level
- Row level
- Element level

Each lower level overrides the settings of the higher level. Once settings have been changed, they remain changed for the duration of the program (unless changed again).

## Persistent windows (Window stays open after button click)

Apologies that the next few pages are perhaps confusing. There have been a number of changes recently in PySimpleGUI's Read calls that added some really cool stuff, but at the expense of being not so simple. Part of the issue is an attempt to make sure existing code doesn't break. These changes are all in the area of non-blocking reads and reads with timeouts.

There are 2 ways to keep a window open after the user has clicked a button. One way is to use non-blocking windows (see the next section). The other way is to use buttons that 'read' the window instead of 'close' the window when clicked. The typical buttons you find in windows, including the shortcut buttons, close the window. These include OK, Cancel, Submit, etc. The Button Element also closes the window.

The `RButton` Element creates a button that when clicked will return control to the user, but will leave the window open and visible. This button is also used in Non-Blocking windows. The difference is in which call is

made to read the window. The normal `Read` call with no parameters will block, a call with a `timeout` value of zero will not block.

Note that `InputText` and `MultiLine` Elements will be **cleared** when performing a `Read`. If you do not want your input field to be cleared after a `Read` then you can set the `do_not_clear` parameter to True when creating those elements. The clear is turned on and off on an element by element basis.

The reasoning behind this is that Persistent Windows are often "forms". When "submitting" a form you want to have all of the fields left blank so the next entry of data will start with a fresh window. Also, when implementing a "Chat Window" type of interface, after each read / send of the chat data, you want the input field cleared. Think of it as a Texting application. Would you want to have to clear your previous text if you want to send a second text?

The design pattern for Persistent Windows was already shown to you earlier in the document... here it is for your convenience.

```
import PySimpleGUI as sg

layout = [[sg.Text('Persistent window')],
 [sg.Input()],
 [sg.RButton('Read'), sg.Exit()]]

window = sg.Window('Window that stays open').Layout(layout)

while True:
 event, values = window.Read()
 if event is None or event == 'Exit':
 break
 print(event, values)

window.Close()
```

## Read(timeout = t, timeout\_key='timeout')

Read with a timeout is a very good thing for your GUIs to use in a read non-blocking situation, if you can use them. If your device can wait for a little while, then use this kind of read. The longer you're able to add to the

timeout value, the less CPU time you'll be taking.

One way of thinking of reads with timeouts:

During the timeout time, you are "yielding" the processor to do other tasks.

But it gets better than just being a good citizen....**your GUI will be more responsive than if you used a non-blocking read**

Let's say you had a device that you want to "poll" every 100ms. The "easy way out" and the only way out until recently was this:

```
YOU SHOULD NOT DO THIS....
while True: # Event Loop
 event, values = window.ReadNonBlocking() # DO NOT USE THIS CALL ANYMORE
 read_my_hardware() # process my device here
 time.sleep(.1) # sleep 1/10 second
```

This program will quickly test for user input, then deal with the hardware. Then it'll sleep for 100ms, while your gui is non-responsive, then it'll check in with your GUI again. I fully realize this is a crude way of doing things. We're talking dirt simple stuff without trying to use threads, etc to 'get it right'. It's for demonstration purposes.

The new and better way.... using the Read Timeout mechanism, the sleep goes away.

```
This is the right way to poll for hardware
while True: # Event Loop
 event, values = window.Read(timeout = 100)
 read_my_hardware() # process my device here
```

This event loop will run every 100 ms. You're making a Read call, so anything that the user does will return back to you immediately, and you're waiting up to 100ms for the user to do something. If the user doesn't do anything, then the read will timeout and execution will return to the program.

## Non-Blocking Windows (Asynchronous reads)

There are TWO ways to perform a non-blocking read.

The "old way" was:

```
event, values = sg.ReadNonBlocking()
```

The new way

```
event, values = sg.Read(timeout=0)
```

You should use the new way if you're reading this for the first time.

The difference in the 2 calls is in the value of event. For ReadNonBlocking, event will be `None` if there are no other events to report. There is a "problem" with this however. With normal Read calls, an event value of None signified the window was closed. For ReadNonBlocking, the way a closed window is returned is via the values variable being set to None.

## sg.TIMEOUT\_KEY

If you're using the new, `timeout=0` method, then an event value of `None` signifies that the window was closed, just like a normal Read. That leaves the question of what it is set to when not other events are happening. This value will be the value of `timeout_key`. If you did not specify a `timeout_key` value in your call to read, then it will be set to a default value of: `TIMEOUT_KEY = 'timeout'`

If you wanted to test for "no event" in your loop, it would be written like this:

```
while True:
 event, value = window.Read(timeout=0)
 if event is None:
 break # the user has closed the window
 if event == sg.TIMEOUT_KEY:
 print("Nothing happened")
```

Use async windows sparingly. It's possible to have a window that appears to be async, but it is not. **Please** try to find other methods before going to async windows. The reason for this plea is that async windows poll tkinter over and over. If you do not have a sleep in your loop, you will eat up 100% of the CPU time. It's important to be a good citizen. Don't chew up CPU cycles needlessly.

Non-blocking is generally reserved as a "last resort". Too many times people use non-blocking reads when a blocking read will do just fine.

There is a hybrid approach... a read with a timeout. You'll score much higher points on the impressive meter if you're able to use a lot less CPU time by using this type of read.

The most legit time to use a non-blocking window is when you're working directly with hardware. Maybe you're driving a serial bus. If you look at the Event Loop in the `Demo_OpenCV_Webcam.py` program, you'll see that the read is a non-blocking read. However, there is a place in the event loop where blocking occurs. The point in the loop where you will block is the call to read frames from the webcam. When a frame is available you want to quickly deliver it to the output device, so you don't want your GUI blocking. You want the read from the hardware to block.

Another example can be found in the demo for controlling a robot on a Raspberry Pi. In that application you want to read the direction buttons, forward, backward, etc, and immediately take action. If you are using `RealtimeButtons`, your only option at the moment is to use non-blocking windows. You have to set the timeout to zero if you want the buttons to be real-time responsive.

However, with these buttons, adding a sleep to your event loop will at least give other processes time to execute. It will, however, starve your GUI. The entire time you're sleeping, your GUI isn't executing.

## Periodically Calling `Read`

Let's say you do end up using non-blocking reads... then you've got some housekeeping to do. It's up to you to periodically "refresh" the visible GUI. The longer you wait between updates to your GUI the more sluggish your windows will feel. It is up to you to make these calls or your GUI will freeze.

There are 2 methods of interacting with non-blocking windows.

1. Read the window just as you would a normal window
2. "Refresh" the window's values without reading the window. It's a quick operation meant to show the user the latest values

With asynchronous windows the window is shown, user input is read, but your code keeps right on chugging. YOUR responsibility is to call `PySimpleGUI.Read` on a periodic basis. Several times a second or more will produce a reasonably snappy GUI.

```
Exiting (Closing) a Persistent Window
```

If your window has a button that closes the window, then PySimpleGUI will automatically close the window for you. If all of your buttons are ReadButtons, then it'll be up to you to close the window when done.  
To close a window, call the `Close` method.

```
window.Close()
```

## Persistent Window Example - Running timer that updates

See the sample code on the GitHub named Demo Media Player for another example of Async windows. We're going to make a window and update one of the elements of that window every .01 seconds. Here's the entire code to do that.

```
import PySimpleGUI as sg
import time

----- Create Form -----
sg.ChangeLookAndFeel('Black')
sg.SetOptions(element_padding=(0, 0))

layout = [[sg.Text('')],
 [sg.Text('', size=(8, 2), font=('Helvetica', 20), justification='center', key='t'),
 sg.ReadButton('Pause', key='button', button_color=('white', '#001480')),
 sg.ReadButton('Reset', button_color=('white', '#007339'), key='Reset'),
 sg.Exit(button_color=('white', 'firebrick4'), key='Exit')]]

window = sg.Window('Running Timer', no_titlebar=True, auto_size_buttons=False, keep_on_top=True)

----- main loop -----
current_time = 0
paused = False
start_time = int(round(time.time() * 100))
while (True):
 # ----- Read and update window -----
 event, values = window.Read(timeout=10)
 current_time = int(round(time.time() * 100)) - start_time
```

```
----- Display timer in window -----
window.FindElement('text').Update('{:02d}:{:02d}.{:02d}'.format((current_time // 100)
 (current_time // 100) %
 current_time % 100))
```

Previously this program was implemented using a sleep in the loop to control the clock tick. This version uses the new timeout parameter. The result is a window that reacts quicker than the one with the sleep and the accuracy is just as good.

## Instead of a Non-blocking Read --- Use

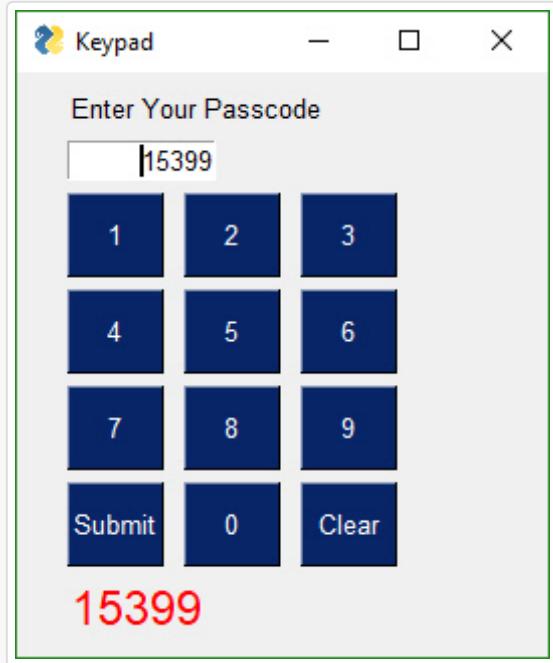
`change_submits = True` or  
`return_keyboard_events = True`

Any time you are thinking "I want an X Element to cause a Y Element to do something", then you want to use the `change_submits` option.

***Instead of polling, try options that cause the window to return to you.*** By using non-blocking windows, you are *polling*. You can indeed create your application by polling. It will work. But you're going to be maxing out your processor and may even take longer to react to an event than if you used another technique.

### Examples

One example is you have an input field that changes as you press buttons on an on-screen keypad.



## Updating Elements (changing elements in active window)

Persistent windows remain open and thus continue to interact with the user after the Read has returned. Often the program wishes to communicate results (output information) or change an Element's values (such as populating a List Element).

You can use Update to do things like:

*Have one Element (appear to) make a change to another Element*

Disable a button, slider, input field, etc

*Change a button's text*

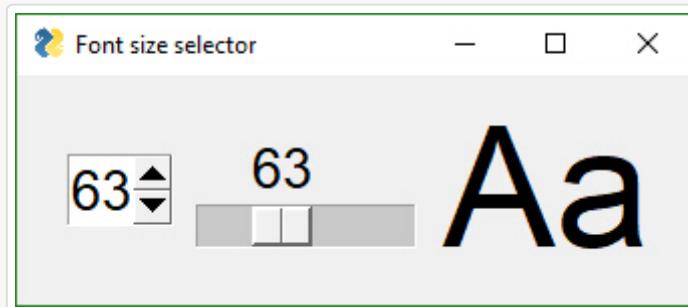
Change an Element's text or background color

Add text to a scrolling output window

Change the choices in a list

\* etc

The way this is done is via an Update method that is available for nearly all of the Elements. Here is an example of a program that uses a persistent window that is updated.



In some programs these updates happen in response to another Element. This program takes a Spinner and a Slider's input values and uses them to resize a Text Element. The Spinner and Slider are on the left, the Text element being changed is on the right.

```
Testing async window, see if can have a slider
that adjusts the size of text displayed

import PySimpleGUI as sg
fontSize = 12
layout = [[sg.Spin([sz for sz in range(6, 172)], font='Helvetica 20', initial_value=fontSize),
 sg.Slider(range=(6,172), orientation='h', size=(10,20),
 change_submits=True, key='slider', font='Helvetica 20'),
 sg.Text("Aa", size=(2, 1), font="Helvetica " + str(fontSize), key='text')]]

sz = fontSize
window = sg.Window("Font size selector", grab_anywhere=False).Layout(layout)
Event Loop
while True:
 event, values= window.Read()
```

```
if event is None:
 break
sz_spin = int(values['spin'])
sz_slider = int(values['slider'])
sz = sz_spin if sz_spin != fontSize else sz_slider
if sz != fontSize:
 fontSize = sz
 font = "Helvetica " + str(fontSize)
 window.FindElement('text').Update(font=font)
 window.FindElement('slider').Update(sz)
 window.FindElement('spin').Update(sz)

print("Done.")
```

Inside the event loop we read the value of the Spinner and the Slider using those Elements' keys.

For example, `values['slider']` is the value of the Slider Element.

This program changes all 3 elements if either the Slider or the Spinner changes. This is done with these statements:

```
window.FindElement('text').Update(font=font)
window.FindElement('slider').Update(sz)
window.FindElement('spin').Update(sz)
```

Remember this design pattern because you will use it OFTEN if you use persistent windows.

It works as follows. The call to `window.FindElement` returns the Element object represented by they provided `key`. This element is then updated by calling it's `Update` method. This is another example of Python's "chaining" feature. We could write this code using the long-form:

```
text_element = window.FindElement('text')
text_element.Update(font=font)
```

The takeaway from this exercise is that keys are key in PySimpleGUI's design. They are used to both read the values of the window and also to identify elements. As already mentioned, they are used as targets in Button calls.

### ### Updating Multiple Elements

If you have a large number of Elements to update, you can call `Window.UpdateElements()`.

```
UpdateElements(key_list,
 value_list)
```

`key_list` - list of keys for elements you wish to update

`value_list` - list of values, one for each key

```
window.UpdateElements(('name', 'address', 'phone'), ('Fred Flintstone', '123 Rock Quarry Road'))
```

## Keyboard & Mouse Capture

Beginning in version 2.10 you can capture keyboard key presses and mouse scroll-wheel events. Keyboard keys can be used, for example, to detect the page-up and page-down keys for a PDF viewer. To use this feature, there's a boolean setting in the Window call `return_keyboard_events` that is set to True in order to get keys returned along with buttons.

Keys and scroll-wheel events are returned in exactly the same way as buttons.

For scroll-wheel events, if the mouse is scrolled up, then the `button` text will be `MouseWheel:Up`. For downward scrolling, the text returned is `MouseWheel:Down`

Keyboard keys return 2 types of key events. For "normal" keys (a,b,c, etc), a single character is returned that represents that key. Modifier and special keys are returned as a string with 2 parts:

<code>Key Sym:Key Code</code>
-------------------------------

Key Sym is a string such as 'Control\_L'. The Key Code is a numeric representation of that key. The left control key, when pressed will return the value 'Control\_L:17'

```
import PySimpleGUI as sg

Recipe for getting keys, one at a time as they are released
```

```
If want to use the space bar, then be sure and disable the "default focus"

with sg.Window("Keyboard Test", return_keyboard_events=True, use_default_focus=False) as window:
 text_elem = sg.Text("", size=(18, 1))
 layout = [[sg.Text("Press a key or scroll mouse")],
 [text_elem],
 [sg.Button("OK")]]

 window.Layout(layout)
 # ----- Loop taking in user input --- #
 while True:
 event, value = window.Read()

 if event == "OK" or event is None:
 print(event, "exiting")
 break
 text_elem.Update(event)
```

You want to turn off the default focus so that there no buttons that will be selected should you press the spacebar.

## Realtime Keyboard Capture

Use realtime keyboard capture by calling

```
import PySimpleGUI as sg

with sg.Window("Realtime Keyboard Test", return_keyboard_events=True, use_default_focus=False):
 layout = [[sg.Text("Hold down a key")],
 [sg.Button("OK")]]

 window.Layout(layout)

 while True:
 event, value = window.Read(timeout=0)
 if event == "OK" or event is None:
 print(event, value, "exiting")
```

```
 break
if event != sg.TIMEOUT_KEY:
 print(event)
```

# Menus

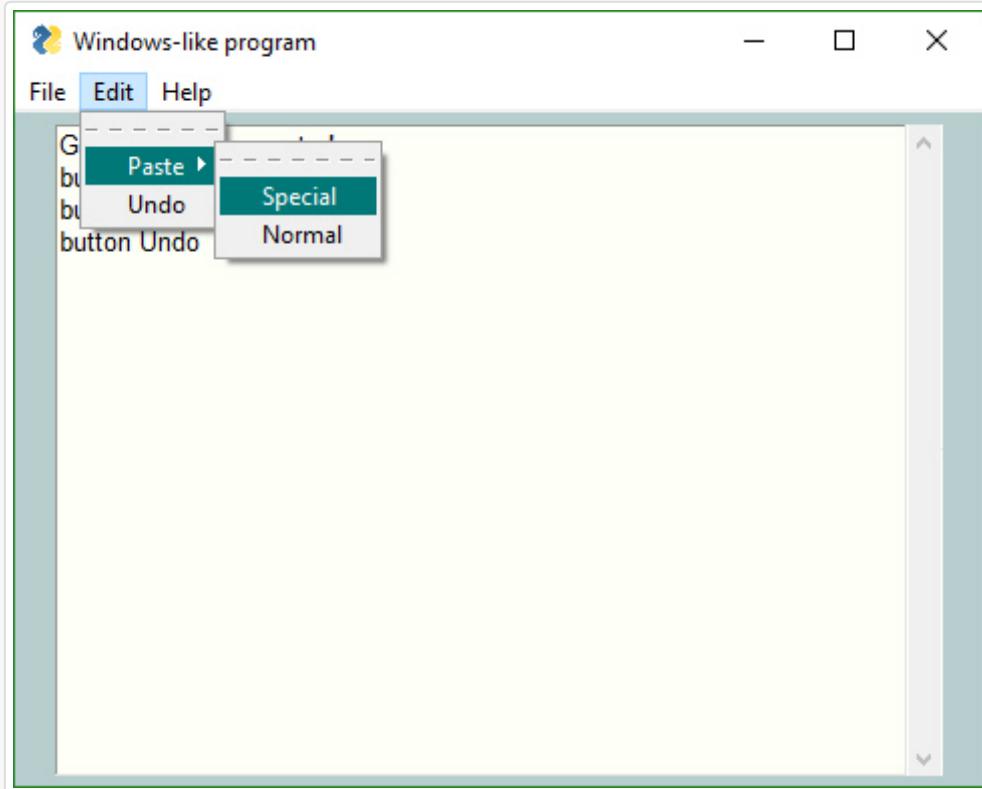
Beginning in version 3.01 you can add a menubar to your window. You specify the menus in much the same way as you do window layouts, with lists. Menu selections are returned as button clicks, so be aware of your overall naming conventions. If you have an Exit button and also an Exit menu option, then you won't be able to tell the difference when your window.Read returns. Hopefully will not be a problem.

This definition:

```
menu_def = [['File', ['Open', 'Save', 'Exit'],],
 ['Edit', ['Paste', ['Special', 'Normal'], 'Undo'],],
 ['Help', 'About...'],]
```

Note the placement of ',' and of []. It's tricky to get the nested menus correct that implement cascading menus. See how paste has Special and Normal as a list after it. This means that Paste has a cascading menu with items Special and Normal.

The menu\_def layout produced this window:



You have used ALT-key in other Windows programs to navigate menus. For example Alt-F+X exits the program. The Alt-F pulls down the File menu. The X selects the entry marked Exit.

The good news is that PySimpleGUI allows you to create the same kind of menus! Your program can play with the big-boys. And, it's trivial to do.

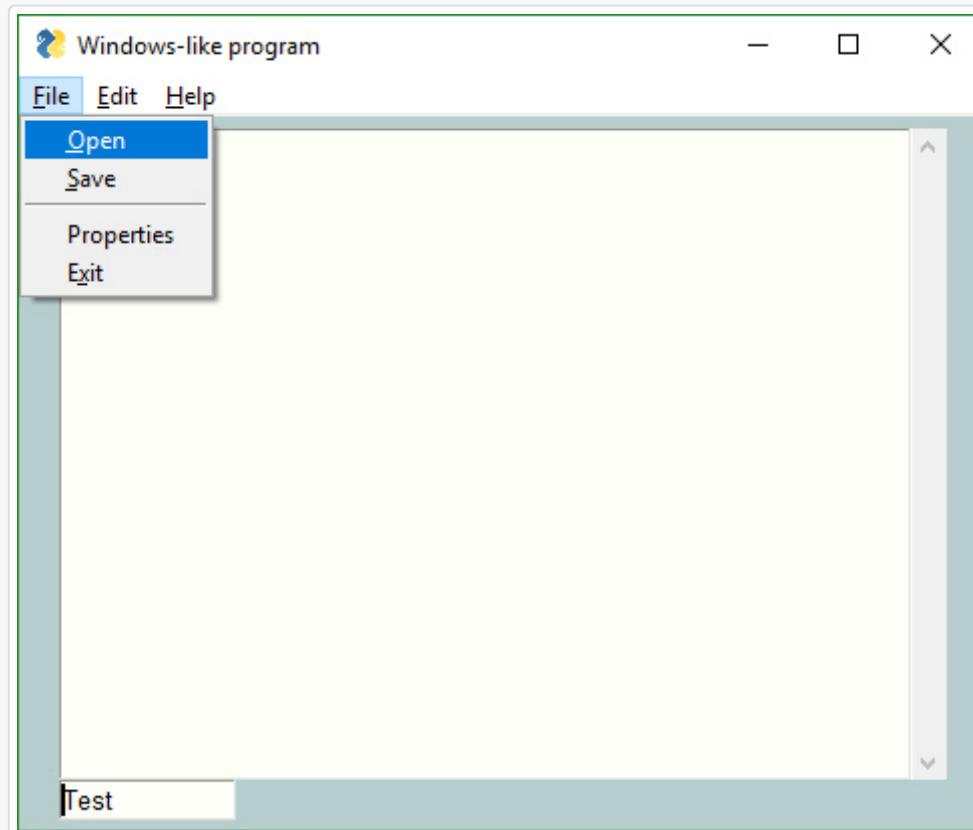
All that's required is for your to add an "&" in front of the letter you want to appear with an underscore. When you hold the Alt key down you will see the menu with underlines that you marked.

One other little bit of polish you can add are separators in your list. To add a line in your list of menu choices, create a menu entry that looks like this: '---'

This is an example Menu with underlines and a separator.

```
----- Menu Definition -----
menu_def = [[['&File', ['&Open', '&Save', '---', 'Properties', 'E&xit']],
 ['&Edit', ['Paste', ['Special', 'Normal'], 'Undo'],],
 ['&Help', '&About...'],]]
```

And this is the spiffy menu it produced:



# Sample Applications

Use the example programs as a starting basis for your GUI. Copy, paste, modify and run! The demo files are:

Source File	Description
<a href="#">Demo_All_Widgets.py</a>	Nearly all of the Elements shown in a single window
<a href="#">Demo_Borderless_Window.py</a>	Create clean looking windows with no border
<a href="#">Demo_Button_States.py</a>	One way of implementing disabling of buttons
<a href="#">Demo_Calendar.py</a>	Demo of the Calendar Chooser button
<a href="#">Demo_Canvas.py</a>	window with a Canvas Element that is updated outside of the window
<a href="#">Demo_Chat.py</a>	A chat window with scrollable history
<a href="#">Demo_Chatterbot.py</a>	Front-end to Chatterbot Machine Learning project
<a href="#">Demo_Color.py</a>	How to interact with color using RGB hex values and named colors
<a href="#">Demo_Columns.py</a>	Using the Column Element to create more complex windows
<a href="#">Demo_Compare_Files.py</a>	Using a simple GUI front-end to create a compare 2-files utility
<a href="#">Demo_Cookbook_Browser.py</a>	Source code browser for all Recipes in Cookbook
<a href="#">Demo_Dictionary.py</a>	Specifying and using return values in dictionary format
<a href="#">Demo_DOC_Viewer_PIL.py</a>	Display a PDF, HTML, ebook file, etc in your window
<a href="#">Demo_DisplayHash1and256.py</a>	Using high level API and custom window to implement a simple display hash code utility

Source File	Description
<b>Demo_DuplicateFileFinder.py</b>	High level API used to get a folder that is used by utility that finds duplicate files. Uses progress meter to show progress. 2 lines of code required to add GUI and meter
<b>Demo_Fill_Form.py</b>	How to perform a bulk-fill for a window. Saving and loading a window from disk
<b>Demo_FontSizer.py</b>	Demonstrates Elements updating other Elements
<b>Demo_Func_Callback_Simulator.py</b>	For the Raspberry Pi crowd. Event loop that simulates traditional GUI callback functions should you already have an architecture that uses them
<b>Demo_GoodColors.py</b>	Using some of the pre-defined PySimpleGUI individual colors
<b>Demo_HowDoI.py</b>	This is a utility to be experienced! It will change how you code
<b>Demo_Img_Viewer.py</b>	Display jpg, png,tiff, bmp files
<b>Demo_Keyboard.py</b>	Using blocking keyboard events
<b>Demo_Keyboard_Realtime.py</b>	Using non-blocking / realtime keyboard events
<b>Demo_Machine_Learning.py</b>	A sample Machine Learning front end
<b>Demo_Matplotlib.py</b>	Integrating with Matplotlib to create a single graph
<b>Demo_Matplotlib_Animated.py</b>	Animated Matplotlib line graph
<b>Demo_Matplotlib_Animated_Scatter.py</b>	Animated Matplotlib scatter graph
<b>Demo_Matplotlib_Browser.py</b>	Browse Matplotlib gallery

Source File	Description
Demo_Media_Player.py	Non-blocking window with a media player layout. Demonstrates button graphics, Update method
Demo_MIDI_Player.py	GUI wrapper for Mido MIDI package. Functional MIDI player that controls attached MIDI devices
Demo_NonBlocking_Form.py	a basic async window
Demo_OpenCV.py	Integrated with OpenCV
Demo_Password_Login	Password protection using SHA1
Demo_PDF_Viewer.py	Submitted by a user! Previews PDF documents. Uses keyboard input & mouse scrollwheel to navigate
Demo_Pi_LEDs.py	Control GPIO using buttons
Demo_Pi_Robotics.py	Simulated robot control using realtime buttons
Demo_PNG_Vierwer.py	Uses Image Element to display PNG files
Demo_Progress_Meters.py	Demonstrates using 2 progress meters simultaneously
Demo_Recipes.py	A collection of various Recipes. Note these are not the same as the Recipes in the Recipe Cookbook
Demo_Script_Launcher.py	Demonstrates one way of adding a front-end onto several command line scripts
Demo_Script_Parameters.py	Add a 1-line GUI to the front of your previously command-line only scripts
Demo_Tabbed_Form.py	Using the Tab feature

Source File	Description
Demo_Table_Simulation.py	Use input fields to display and edit tables
Demo_Timer.py	Simple non-blocking window

## Packages Used In Demos

While the core PySimpleGUI code does not utilize any 3rd party packages, some of the demos do. They add a GUI to a few popular packages. These packages include:

- \* [Chatterbot](#)
- \* [Mido](#)
- \* [Matplotlib](#)
- \* [PyMuPDF](#)

## Creating a Windows .EXE File

It's possible to create a single .EXE file that can be distributed to Windows users. There is no requirement to install the Python interpreter on the PC you wish to run it on. Everything it needs is in the one EXE file, assuming you're running a somewhat up to date version of Windows.

Installation of the packages, you'll need to install PySimpleGUI and PyInstaller (you need to install only once)

```
pip install PySimpleGUI
pip install PyInstaller
```

To create your EXE file from your program that uses PySimpleGUI, `my_program.py`, enter this command in your Windows command prompt:

```
pyinstaller -wF my_program.py
```

You will be left with a single file, `my_program.exe`, located in a folder named `dist` under the folder where you executed the `pyinstaller` command.

That's all... Run your `my_program.exe` file on the Windows machine of your choosing.

"It's just that easy."

(famous last words that screw up just about anything being referenced)

Your EXE file should run without creating a "shell window". Only the GUI window should show up on your taskbar.

If you get a crash with something like:

```
ValueError: script '.....\src\tkinter' not found
```

Then try adding `--hidden-import tkinter` to your command

## Fun Stuff

Here are some things to try if you're bored or want to further customize

### Debug Output

Be sure and check out the EasyPrint (Print) function described in the high-level API section. Leave your code the way it is, route your stdout and stderr to a scrolling window.

For a fun time, add these lines to the top of your script

```
import PySimpleGUI as sg
print = sg.Print
```

This will turn all of your print statements into prints that display in a window on your screen rather than to the terminal.

### Look and Feel

Dial in the look and feel that you like with the `SetOptions` function. You can change all of the defaults in one

function call. One line of code to customize the entire GUI.

Or beginning in version 2.9 you can choose from a look and feel using pre-defined color schemes. Call ChangeLookAndFeel with a description string.

```
sg.ChangeLookAndFeel('GreenTan')
```

Valid values for the description string are:

```
GreenTan
LightGreen
BluePurple
Purple
BlueMono
GreenMono
BrownBlue
BrightColors
NeutralBlue
Kayak
SandyBeach
TealMono
```

To see the latest list of color choices, take a look at the bottom of the `PySimpleGUI.py` file where you'll find the `ChangeLookAndFeel` function.

You can also combine the `ChangeLookAndFeel` function with the `SetOptions` function to quickly modify one of the canned color schemes. Maybe you like the colors but was more depth to your bezels. You can dial in exactly what you want.

### ObjToString

Ever wanted to easily display an objects contents easily? Use ObjToString to get a nicely formatted recursive walk of your objects.

This statement:

```
print(sg.ObjToString(x))
```

And this was the output

```
<class '__main__.X'>
 abc = abc
 attr12 = 12
 c = <class '__main__.C'>
 b = <class '__main__.B'>
 a = <class '__main__.A'>
 attr1 = 1
 attr2 = 2
 attr3 = three
 attr10 = 10
 attrx = x
```

You'll quickly wonder how you ever coded without it.

---

## Known Issues

While not an "issue" this is a *stern warning*

**Do not attempt to call PySimpleGUI from multiple threads! It's tkinter based and tkinter has issues with multiple threads**

**Progress Meters** - the visual graphic portion of the meter may be off. May return to the native tkinter progress meter solution in the future. Right now a "custom" progress meter is used. On the bright side, the statistics shown are extremely accurate and can tell you something about the performance of your code. If you are running 2 or more progress meters at the same time using `OneLineProgressMeter`, you need to close the meter by using the "Cancel" button rather than the X

**Async windows** - these include the 'easy' windows (`OneLineProgressMeter` and EasyPrint/Print). If you start overlapping having Async windows open with normal windows then things get a littler squirrelly. Still tracking down the issues and am making it more solid every day possible. You'll know there's an issue when you see blank window.

**EasyPrint** - EasyPrint is a new feature that's pretty awesome. You print and the output goes to a window, with a scroll bar, that you can copy and paste from. Being a new feature, it's got some potential problems. There are known interaction problems with other GUI windows. For example, closing a Print window can also close other windows you have open. For now, don't close your debug print window until other windows are closed too.

## Contributing

A MikeTheWatchGuy production... entirely responsible for this code.... unless it causes you trouble in which case I'm not at all responsible.

## Versions

Version	Description
1.0.9	July 10, 2018 - Initial Release
1.0.21	July 13, 2018 - Readme updates
2.0.0	July 16, 2018 - ALL optional parameters renamed from CamelCase to all_lower_case
2.1.1	July 18, 2018 - Global settings exposed, fixes
2.2.0	July 20, 2018 - Image Elements, Print output
2.3.0	July 23, 2018 - Changed form.Read return codes, Slider Elements, Listbox element. Renamed some methods but left legacy calls in place for now.
2.4.0	July 24, 2018 - Button images. Fixes so can run on Raspberry Pi
2.5.0	July 26, 2018 - Colors. Listbox scrollbar. tkinter Progress Bar instead of homegrown.
2.6.0	July 27, 2018 - auto_size_button setting. License changed to LGPL 3+
2.7.0	July 30, 2018 - realtime buttons, window_location default setting

Version	Description
2.8.0	Aug 9, 2018 - New None default option for Checkbox element, text color option for all elements, return values as a dictionary, setting focus, binding return key
2.9.0	Aug 16, 2018 - Screen flash fix, <code>do_not_clear</code> input field option, <code>autosize_text</code> defaults to <code>True</code> now, return values as ordered dict, removed text target from progress bar, rework of return values and initial return values, removed legacy Form.Refresh() method (replaced by Form.ReadNonBlockingForm()), COLUMN elements!!, colored text defaults
2.10.0	Aug 25, 2018 - Keyboard & Mouse features (Return individual keys as if buttons, return mouse scroll-wheel as button, bind return-key to button, control over keyboard focus), SaveAs Button, Update & Get methods for InputText, Update for Listbox, Update & Get for Checkbox, Get for Multiline, Color options for Text Element Update, Progress bar Update can change max value, Update for Button to change text & colors, Update for Image Element, Update for Slider, Form level text justification, Turn off default focus, scroll bar for Listboxes, Images can be from filename or from in-RAM, Update for Image). Fixes - text wrapping in buttons, msg box, removed slider borders entirely and others
2.11.0	Aug 29, 2018 - Lots of little changes that are needed for the demo programs to work. Buttons have their own default element size, fix for Mac default button color, padding support for all elements, option to immediately return if list box gets selected, FilesBrowse button, Canvas Element, Frame Element, Slider resolution option, Form.Refresh method, better text wrapping, 'SystemDefault' look and feel setting

Version	Description
2.20.0	Sept 4, 2018 - Some sizable features this time around of interest to advanced users. Renaming of the MsgBox functions to Popup. Renaming GetFile, etc, to PopupGetFile. High-level windowing capabilities start with Popup, PopupNoWait/PopupNonblocking, PopupNoButtons, default icon, change_submits option for Listbox/Combobox/Slider/Spin/, New OptionMenu element, updating elements after shown, system default color option for progress bars, new button type (Dummy Button) that only closes a window, SCROLLABLE Columns!! (yea, playing in the Big League now), LayoutAndShow function removed, form.Fill - bulk updates to forms, FindElement - find element based on key value (ALL elements have keys now), no longer use grid packing for row elements (a potentially huge change), scrolled text box sizing changed, new look and feel themes (Dark, Dark2, Black, Tan, TanBlue, DarkTanBlue, DarkAmber, DarkBlue, Reds, Green)
2.30.0	Sept 6, 2018 - Calendar Chooser (button), borderless windows, load/save form to disk
3.0.0	Sept 7, 2018 - The "fix for poor choice of 2.x numbers" release. Color Chooser (button), "grab anywhere" windows are on by default, disable combo boxes, Input Element text justification (last part needed for 'tables'), Image Element changes to support OpenCV?, PopupGetFile and PopupGetFolder have better no_window option
3.01.01	Sept 10, 2018 - Menus! (sort of a big deal)
3.01.02	Step 11, 2018 - All Element.Update functions have a <code>disabled</code> parameter so they can be disabled. Renamed some parameters in Update function (sorry if I broke your code), fix for bug in Image.Update. Wasn't setting size correctly, changed grab_anywhere logic again, added grab anywhere option to PopupGetText (assumes disabled)
3.02.00	Sept 14, 2018 - New Table Element (Beta release), MsgBox removed entirely, font setting for InputText Element, <b>packing change</b> risky change that allows some Elements to be resized, removed command parameter from Menu Element, new function names for ReadNonBlocking (Finalize, PreRead), change to text element autosizing and wrapping (yet again), lots of parameter additions to Popup functions (colors, etc).

Version	Description
3.03.00	New feature - One Line Progress Meters, new display_row_numbers for Table Element, fixed bug in EasyProgressMeters (function will soon go away), OneLine and Easy progress meters set to grab anywhere but can be turned off.
03.04.00	Sept 18, 2018 - New features - Graph Element, Frame Element, more settings exposed to Popup calls. See notes below for more.
03.04.01	Sept 18, 2018 - See release notes
03.05.00	Sept 20, 2018 - See release notes
03.05.01	Sept 22, 2018 - See release notes
03.05.02	Sept 23, 2018 - See release notes
03.06.00	Sept 23, 2018 - Goodbye FlexForm, hello Window
03.08.00	Sept 25, 2018 - Tab and TabGroup Elements\
01.00.00	Sept 25, 2018 - First release for 2.7 for 2.7
03.08.04	Sept 30, 2018 - See release notes
03.09.00	Oct 1, 2018
2.7 01.01.00	Oct 1, 2018
2.7 01.01.02	Oct 8, 2018
03.09.01	Oct 8, 2018

Version	Description
3.9.3 & 1.1.3	Oct 11, 2018
3.9.4 & 1.1.4	Oct 16, 2018
3.10.1 & 1.2.1	Oct 20, 2018
3.10.3 & 1.2.3	Oct 23, 2018
3.11.0 & 1.11.0	Oct 28, 2018
3.12.0 & 1.12.0	Oct 28, 2018
3.13.0 & 1.13.0	Oct 29, 2018
3.14.0 & 1.14.0	Nov 2, 2018
3.15.0 & 1.15.0	Nov 20, 2018
3.16.0 & 1.16.0	Nov 26, 2018

## Release Notes

## 2.3 - Sliders, Listbox's and Image elements (oh my!)

If using Progress Meters, avoid cancelling them when you have another window open. It could lead to future windows being blank. It's being worked on.

New debug printing capability. `sg.Print`

2.5 Discovered issue with scroll bar on `Output` elements. The bar will match size of ROW not the size of the element. Normally you never notice this due to where on a form the `Output` element goes.

Listboxes are still without scrollwheels. The mouse can drag to see more items. The mouse scrollwheel will also scroll the list and will `page up` and `page down` keys.

2.7 Is the "feature complete" release. Pretty much all features are done and in the code

2.8 More text color controls. The caller has more control over things like the focus and what buttons should be clicked when enter key is pressed. Return values as a dictionary! (NICE addition)

2.9 COLUMNS! This is the biggest feature and had the biggest impact on the code base. It was a difficult feature to add, but it was worth it. Can now make even more layouts. Almost any layout is possible with this addition.

..... insert releases 2.9 to 2.30 .....

3.0 We've come a long way baby! Time for a major revision bump. One reason is that the numbers started to confuse people the latest release was 2.30, but some people read it as 2.3 and thought it went backwards. I kinda messed up the 2.x series of numbers, so why not start with a clean slate. A lot has happened anyway so it's well earned.

One change that will set PySimpleGUI apart is the parlor trick of being able to move the window by clicking on it anywhere. This is turned on by default. It's not a common way to interact with windows. Normally you have to move using the titlebar. Not so with PySimpleGUI. Now you can drag using any part of the window. You will want to turn this off for windows with sliders. This feature is enabled in the Window call.

Related to the Grab Anywhere feature is the `no_titlebar` option, again found in the call to Window. Your window will be a spiffy, borderless window. It's a really interesting effect. Slight problem is that you do not have an icon on the taskbar with these types of windows, so if you don't supply a button to close the window, there's no way to close it other than task manager.

3.0.2 Still making changes to Update methods with many more ahead in the future. Continue to mess with grab anywhere option. Needed to disable in more places such as the PopupGetText function. Any time there is text input on a form, you generally want to turn off the grab anywhere feature.

### 3.2.0

Biggest change was the addition of the Table Element. Trying to make changes so that form resizing is a possibility but unknown if will work in the long run. Removed all MsgBox, Get\* functions and replaced with Popup functions. Popups had multiple new parameters added to change the look and feel of a popup.

### 3.3.0

OneLineProgressMeter function added which gives you not only a one-line solution to progress meters, but it also gives you the ability to have more than 1 running at the same time, something not possible with the EasyProgressMeterCall

### 3.4.0

- Frame - New Element - a labelled frame for grouping elements. Similar to Column
- Graph (like a Canvas element except uses the caller's coordinate system rather than tkinter's).
- initial\_folder - sets starting folder for browsing type buttons (browse for file/folder).
- Buttons return key value rather than button text **If** a `key` is specified,
- OneLineProgressMeter! Replaced EasyProgressMeter (sorry folks that's the way progress works sometimes)
- Popup - changed ALL of the Popup calls to provide many more customization settings
  - Popup
  - PopupGetFolder
  - PopupGetFile
  - PopupGetText
  - Popup
  - PopupNoButtons
  - PopupNonBlocking
  - PopupNoTitlebar
  - PopupAutoClose
  - PopupCancel

- PopupOK
- PopupOKCancel
- PopupYesNo

### 3.4.1

- Button.GetText - Button class method. Returns the current text being shown on a button.
- Menu - Tearoff option. Determines if menus should allow them to be torn off
- Help - Shortcut button. Like Submit, cancel, etc
- ReadButton - shortcut for ReadFormButton

### 3.5.0

- Tool Tips for all elements
- Clickable text
- Text Element relief setting
- Keys as targets for buttons
- New names for buttons:
- Button = SimpleButton
- RButton = ReadButton = ReadFormButton
- Double clickable list entries
- Auto sizing table widths works now
- Feature DELETED - Scaling. Removed from all elements

### 3.5.1

- Bug fix for broken PySimpleGUI if Python version < 3.6 (sorry!)
- LOTS of Readme changes

### 3.5.2

- Made `Finalize()` in a way that it can be chained
- Fixed bug in return values from Frame Element contents

### 3.6.0

- Renamed FlexForm to Window
- Removed LookAndFeel capability from Mac platform.

## 3.8.0

- Tab and TabGroup Elements - awesome new capabilities

## 1.0.0 Python 2.7

It's official. There is a 2.7 version of PySimpleGUI!

## 3.8.2

- Exposed `TKOut` in Output Element
- `DrawText` added to Graph Elements
- Removed `Window.UpdateElements`
- `Window.grab_anywhere` defaults to False

## 3.8.3

- Listbox, Slider, Combobox, Checkbox, Spin, Tab Group - if `change_submits` is set, will return the Element's key rather than "
- Added `change_submits` capability to Checkbox, Tab Group
- Combobox - Can set value to an Index into the Values table rather than the Value itself
- Warnings added to Drawing routines for Graph element (rather than crashing)
- Window - can "force top level" window to be used rather than a normal window. Means that instead of calling Tk to get a window, will call TopLevel to get the window
- Window Disable / Enable - Disables events (button clicks, etc) for a Window. Use this when you open a second window and want to disable the first window from doing anything. This will simulate a 'dialog box'
- Tab Group returns a value with Window is Read. Return value is the string of the selected tab
- Turned off `grab_anywhere` for Popups
- New parameter, `default_extension`, for `PopupGetFile`
- Keyboard shortcuts for menu items. Can hold ALT key to select items in men
- Removed old-style Tabs - Risky change because it hit fundamental window packing and creation. Will also break any old code using this style tab (sorry folks this is how progress happens)

## 3.8.6

- Fix for Menus.
- Fixed table colors. Now they work
- Fixed returning keys for tabs

- Window Hide / UnHide methods
- Changed all Popups to remove context manager
- Error checking for Graphing objects and for Element Updates

## 3.9.0 & 1.1.0

- The FIRST UNIFIED version of the code!
- Python 2.7 got a TON of features . Look back to 1.0 release for the list
- Tab locations - Can place Tabs on top, bottom, left, right now instead of only the top

## 3.9.1 & 1.1.2

- Tab features
- Themes
- Enable / Disable
- Tab text colors
- Selected tab color
- New GetListValues method for Listbox
- Can now have multiple progress bars in 1 window
- Fix for closing debug-output window with other windows open
- Topanga Look and Feel setting
- User can create new look and feel settings / can access the look and feel table
- New PopupQuick call. Shows a non-blocking popup window with auto-close
- Tree Element partially done (don't use despite it showing up)

## 3.9.3 & 1.1.3

- Disabled setting when creating element for:
- Input
- Combo
- Option Menu
- Listbox
- Radio
- Checkbox

- Spinner
- Multiline
- Buttons
- Slider
- Doc strings on all Elements updated
- Buttons can take image data as well as image files
- Button Update can change images
- Images can have background color
- Table element new num\_rows parameter
- Table Element new alternating\_row\_color parameter
- Tree Element
- Window Disappear / Reappear methods
- Popup buttons resized to same size
- Exposed look and feel table

### 3.9.4 & 1.1.4

- Parameter order change for Button.Update so that new button ext is at front
- New Graph.DrawArc method
- Slider tick interval parameter for labeling sliders
- Menu tearoff now disabled by default
- Tree Data printing simplified and made prettier
- Window resizable parameter. Defaults to not resizable
- Button images can have text over them now
- BUG fix in listbox double-click. First bug fix in months
- New Look And Feel capability. List predefined settings using ListOfLookAndFeelValues

### 3.10.1 & 1.2.1

- Combobox new readonly parameter in init and Update
- Better default sizes for Slider
- Read of Tables now returns which rows are selected (big damned deal feature)
- PARTIAL support of Table.Update with new values (use at your own peril)
- Alpha channel setting for Windows

- Timeout setting for Window.Read (big damned deal feature)
- Icon can be base64 image now in SetIcon call
- Window.FindElementWithFocus call
- Window.Move allows moving window anywhere on screen
- Window.Minimize will minimize to taskbar
- Button background color can be set to system default (i.e. not changed)

## 3.10.2 & 1.2.2

Emergency patch release... going out same day as previous release *The timeout timer for the new Read with timer wasn't being properly shut down* The Image.Update method appears to not have been written correctly. It didn't handle base64 images like the other elements that deal with images (buttons)

## 3.10.3 & 1.2.3

- New element - Vertical Separator
- New parameter for InputText - change\_submits. If True will cause Read to return when a button fills in the InputText element
- Read with timeout = 0 is same as read non blocking and is the new preferred method
- Will return event == None if window closed
- New Close method will close all window types
- Scrollbars for Tables automatically added (no need for a Column Element)
- Table Update method complete
- Turned off expand when packing row frame... was accidentally turned on (primary reason for this release)
- Try added to Image Update so won't crash if bad image passed in

## 3.11.0 & 1.11.0

- Syncing up the second digit of the releases so that they stay in sync better. the 2.7 release is built literally from the 3.x code so they really are the same
- Reworked Read call... significantly.
- Realtime buttons work with timeouts or blocking read
- Removed default value parm on Buttons and Button Updates

- New Tree Element parm show\_expanded. Causes Tree to be shown as fully expanded
- Tree Element now returns which rows are selected when Read
- New Window method BringToFront
- Shortcut buttons no longer close windows!
- Added CloseButton, CButton that closes the windows

## 3.12.0 & 1.12.0

- Changed Button to be the same as ReadButton which means it will no longer close the window
- All shortcut buttons no longer close the window
- Updating a table clears selected rows information in return values
- Progress meter uses new CloseButton
- Popups use new CloseButton

## 3.13.0 & 1.13.0

- Improved multiple window handling of Popups when the X is used to close
- Change submits added for:
- Multiline
- Input Text
- Table
- Tree
- Option to close calendar chooser when date selected
- Update for Tree Element
- Scroll bars for Trees

## 3.14.0 & 1.14.0

- More windowing changes... using a hidden root windowing (Tk()) all children are Toplevel() windows  
Read only setting for: Input Text Multiline Font setting for InputCombo, Multiline change\_submits setting for Radio Element SetFocus for multiline, input elements Default mon, day, year for calendar chooser  
button Tree element update, added ability to change a single key Message parm removed from  
ReadNonBlocking Fix for closing windows using X CurrentLocation method for Windows Debug Window  
options location font no\_button no\_titlebar grab\_anywhere keep\_on\_top New Print / EasyPrint options

```
location font no_button no_titlebar grab_anywhere keep_on_top New popup, PopupQuickMessage
PopupGetFolder, PopupGetFile new initial_folder parm
```

## 3.15.0 & 1.15.0

Error checking for InputText.Get method Text color, background color added to multiline element.Update  
Update method for Output Element - gives ability to clear the output Graph Element - Read returns values if  
new flags set *Change submits, drag submits* Returns x,y coordinates

Column element new parm vertical\_scroll\_only Table element new parm - bind return key - returns if return or  
double click New Window parms - size, disable\_close "Better" multiwindow capabilities Window.Size property  
Popups - new title parm, custom\_text *title sets the window title* custom\_text - single string or tuple string sets  
text on button(s)

## 3.16.0 & 1.16.0

Bug fix in PopupScrolled New Element shortcut function for FindElement Dummy Stretch Element made for  
backwards compatibility with Qt Timer function prints in milliseconds now, was seconds

## Upcoming

Make suggestions people! Future release features

Port to other graphic engines. Hook up the front-end interface to a backend other than tkinter. Qt, WxPython,  
etc. At the moment, Qt and Kivy are being considered for the next GUI framework. Work has already begun on  
them.

## Code Condition

```
Make it run
Make it right
Make it fast
```

It's a recipe for success if done right. PySimpleGUI has completed the "Make it run" phase. It's far from "right"  
in many ways. These are being worked on. The module is particularly poor for PEP 8 compliance. It was a

learning exercise that turned into a somewhat complete GUI solution for lightweight problems.

While the internals to PySimpleGUI are a tad sketchy, the public interfaces into the SDK are more strictly defined and comply with PEP 8 for the most part.

Please log bugs and suggestions in the GitHub! It will only make the code stronger and better in the end, a good thing for us all, right?

## Design

A moment about the design-spirit of `PySimpleGUI`. From the beginning, this package was meant to take advantage of Python's capabilities with the goal of programming ease.

### Single File

While not the best programming practice, the implementation resulted in a single file solution. Only one file is needed, `PySimpleGUI.py`. You can post this file, email it, and easily import it using one statement.

### Functions as objects

In Python, functions behave just like object. When you're placing a Text Element into your form, you may be sometimes calling a function and other times declaring an object. If you use the word `Text`, then you're getting an object. If you're using `Text`, then you're calling a function that returns a `Text` object.

### Lists

It seemed quite natural to use Python's powerful list constructs when possible. The form is specified as a series of lists. Each "row" of the GUI is represented as a list of Elements. When the form read returns the results to the user, all of the results are presented as a single list. This makes reading a form's values super-simple to do in a single line of Python code.

### Dictionaries

Want to view your form's results as a dictionary instead of a list... no problem, just use the `key` keyword on your elements. For complex forms with a lot of values that need to be changed frequently, this is by far the best way of consuming the results.

You can also look up elements using their keys. This is an excellent way to update elements in reaction to another element. Call `form.FindElement(key)` to get the Element.

## Named / Optional Parameters

This is a language feature that is featured **heavily** in all of the API calls, both functions and classes. Elements are configured, in-place, by setting one or more optional parameters. For example, a Text element's color is chosen by setting the optional `text_color` parameter.

**tkinter** tkinter is the "official" GUI that Python supports. It runs on Windows, Linux, and Mac. It was chosen as the first target GUI framework due to its **ubiquity**. Nearly all Python installations, with the exception of Ubuntu Linux, come pre-loaded with tkinter. It is the "simplest" of the GUI frameworks to get up and running (among Qt, WxPython, Kivy, etc).

From the start of the PSG project, tkinter was not meant to be the only underlying GUI framework for PySimpleGUI. It is merely a starting point. All journeys begin with one step forward and choosing tkinter was the first of many steps for PySimpleGUI.

## Author

MikeTheWatchGuy

## Demo Code Contributors

[JorjMcKie](#) - PDF and image viewers (plus a number of code suggestions)

[Otherion](#) - Table Demos Panda & CSV. Loads of suggestions to the core APIs

## License

GNU Lesser General Public License (LGPL 3) +

## Acknowledgments

- [JorjMcKie](#) was the motivator behind the entire project. His wxsimpleGUI concepts sparked PySimpleGUI into existence
- [Fredrik Lundh](#) for his work on `tkinter`
- [Ruud van der Ham](#) for all the help he's provided as a Python-mentor. Quite a few tricky bits of logic was supplied by Ruud. The dual-purpose return values scheme is Ruud's for example

- **Numerous** users who provided feature suggestions! Many of the cool features were suggested by others. If you were one of them and are willing to take more credit, I'll list you here if you give me permission. Most are too modest
- [moshekapan/tkinter\\_components](#) wrote the code for the Calendar Chooser Element. It was lifted straight from GitHub
- [Bryan Oakley](#) for the code that enables the `grab_anywhere` feature.
- [Otherion](#) for help with Tables, being a sounding board for new features, naming functions, ..., all around great help
- [agjunyent](#) figured out how to properly make tabs and wrote prototype code that demonstrated how to do it
- [jfongattw](#) huge suggestion... dictionaries. turned out to be
- one of the most critical constructs in PySimpleGUI
- [venim](#) code to doing Alt-Selections in menus, updating Combobox using index, request to disable windows (a really good idea), checkbox and tab submits on change, returning keys for elements that have `change_submits` set, ...
- [rtrrtr](#) Helped get the 2.7 and 3.x code unified (big damned deal)
- Tony Crewe ([anthony.crewe@gmail.com](mailto:anthony.crewe@gmail.com)) Generously provided his classroom materials that he has written to teach a GUI course. If you're an educator and want to trade materials with Tony, he would like to hear from you.
- [spectre6000](#) - Readme updates
- [jacky007](#) - Demo programs. OpenCV with realtime image processing, popup keyboard, input Combo read only option.
- [AltoRetrato](#) - Fonts for multiline and combo
- [frakman1](#) - Sample code error
- [deajan](#) - Custom button text for Popups

## How Do I

Finally, I must thank the fine folks at How Do I.

<https://github.com/gleitz/howdoi>

Their utility has forever changed the way and pace in which I can program. I urge you to try the `HowDoI.py` application here on GitHub. Trust me, **it's going to be worth the effort!**

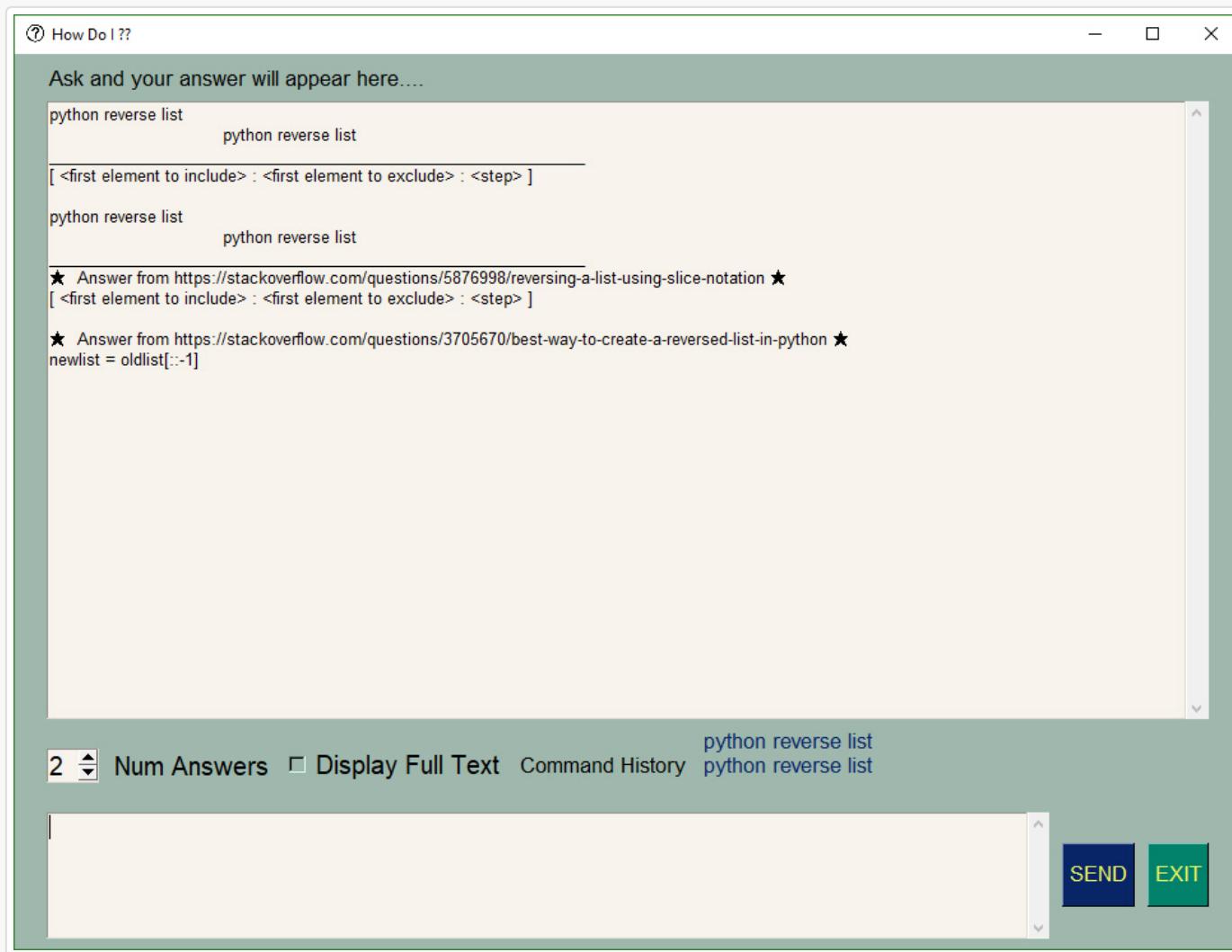
Here are the steps to run that application

```
Install howdoi:
 pip install howdoi
Test your install:
 python -m howdoi howdoi.py
To run it:
 Python HowDoI.py
```

The pip command is all there is to the setup.

The way HowDol works is that it uses your search term to look through stack overflow posts. It finds the best answer, gets the code from the answer, and presents it as a response. It gives you the correct answer OFTEN. It's a miracle that it work SO well.

For Python questions, I simply start my query with 'Python'. Let's say you forgot how to reverse a list in Python. When you run HowDol and ask this question, this is what you'll see.



In the hands of a competent programmer, this tool is **amazing**. It's a must-try kind of program that has completely changed my programming process. I'm not afraid of asking for help! You just have to be smart about using what you find.

The PySimpleGUI window that the results are shown in is an 'input' field which means you can copy and paste the results right into your code.

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Documentation built with [MkDocs](#).