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SciParam 1.0.0

SciParam Manual

Scientific Parameter Dialogs in wxPython based user interfaces.

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(After my wedding on July 30th, 2003: Thomas Arendsen Hein)

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1 Introduction

SciParam is a Python package to easily add additional quality control for entering scientific parameters in wxPython-based user interfaces. SciParam is the basis for the parameter dialogs of GREAT-ER II (Geo-referenced Regional Exposure Assessment Tool for European Rivers).

1.1 Links

Homepage	http://great-er.intevation.org/sciparam/
Bug Tracker	http://intevation.de/rt/webrt?q_queue=great-er
CVS	http://intevation.de/cgi-bin/viewcvs-greater.cgi/sciparam/
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2 Installing SciParam

2.1 Requirements

Python from <http://python.org/>

Tested with version 2.1 and 2.2, but should work with newer versions.

wxPython from <http://wxPython.org/>

Tested with version 2.2.9 and current 2.4.0 branch.

Later versions of SciParam may require at least wxPython 2.4 branch.

2.2 Installation

To install SciParam, just make sure the SciParam-1.0.0 directory is in the PYTHONPATH environment variable. For example, if you extracted SciParam-1.0.0.tar.bz2 or SciParam-1.0.0.zip to /home/fred/, then you would have something like:

```
export PYTHONPATH=$PYTHONPATH:/home/fred/SciParam-1.0.0/
```

in your ~/.bash_profile, etc.

If you use Windows NT, 2000, or XP, then set your environment variables by right-clicking on My Computer and selecting Properties. If you use some other version of windows, you'll need to set the variable at a command prompt, or in autoexec.bat, with the 'set' command.

If you'd like to install SciParam system-wide on your machine and into the default PYTHONPATH, you can use setup.py to do so:

```
# python ./setup.py install
```

Be sure to run setup.py with appropriate privileges (root under Unix).

For Windows there is a self-installing package: "SciParam-1.0.0.win32.exe"

3 SciParam GUI

3.1 Feature List

Parameter entry fields:

for different types of values

float values

are numbers, which can be limited to ranges which specify a usual range (see 3.2.5) and/or a valid range (see 3.2.6). Ranges can be specified in scientific notation, e.g. `]-oo;1.2E5]` for a range from minus infinity upto and including 120000.

distributed values

are like float numbers, but you can optionally have distribution type (see 3.2.7) like normal, log-normal or uniform.

integer values

can have ranges like float number, too.

strings

can contain any characters.

choices

allow to select a value with radiobuttons or from a drop down list (see 3.2.8).

Details on values:

A special details box (see 3.2.3) provides helpful information on a currently focused entry.

Default values:

For each entry a default can be specified, which is visible in the details box (see 3.2.3). A button allows to apply the default to the current entry.

Comment:

It is possible to enter a comment for the current entry in the details box (see 3.2.3).

Status “unknown”:

For any value it is possible to enter the status “unknown” by deleting the current value. This avoids concepts where a special and potentially misinterpreted number represents an unknown value.

Status “required”:

A small cross (“sign here”; see 3.2.4) informs about whether a parameter is necessary in a certain context (e.g. to complete a parameter set for a simulation equation). Giving a value here is not forced by the GUI, since this is only an indicator.

3.2 Screenshots

3.2.1 Dialog

This dialog is created by running `python dialog.py` from inside the SciParam/UI directory:

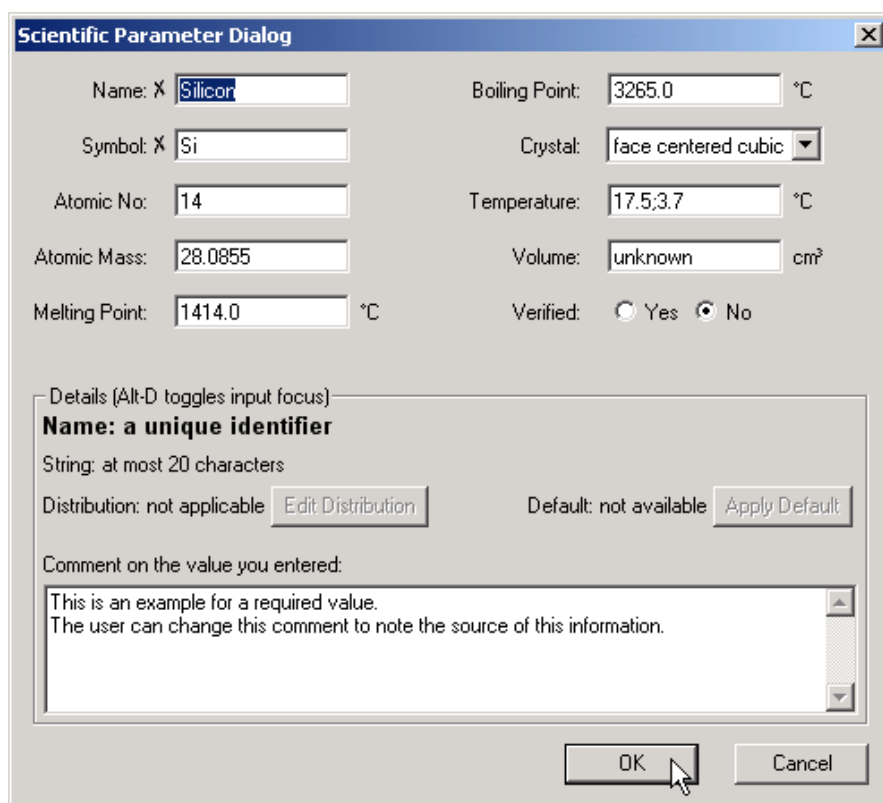


Fig. 3.1: SciParam Dialog

3.2.2 Notebook

This dialog is created by running `python notebook.py` from inside the SciParam/UI directory:

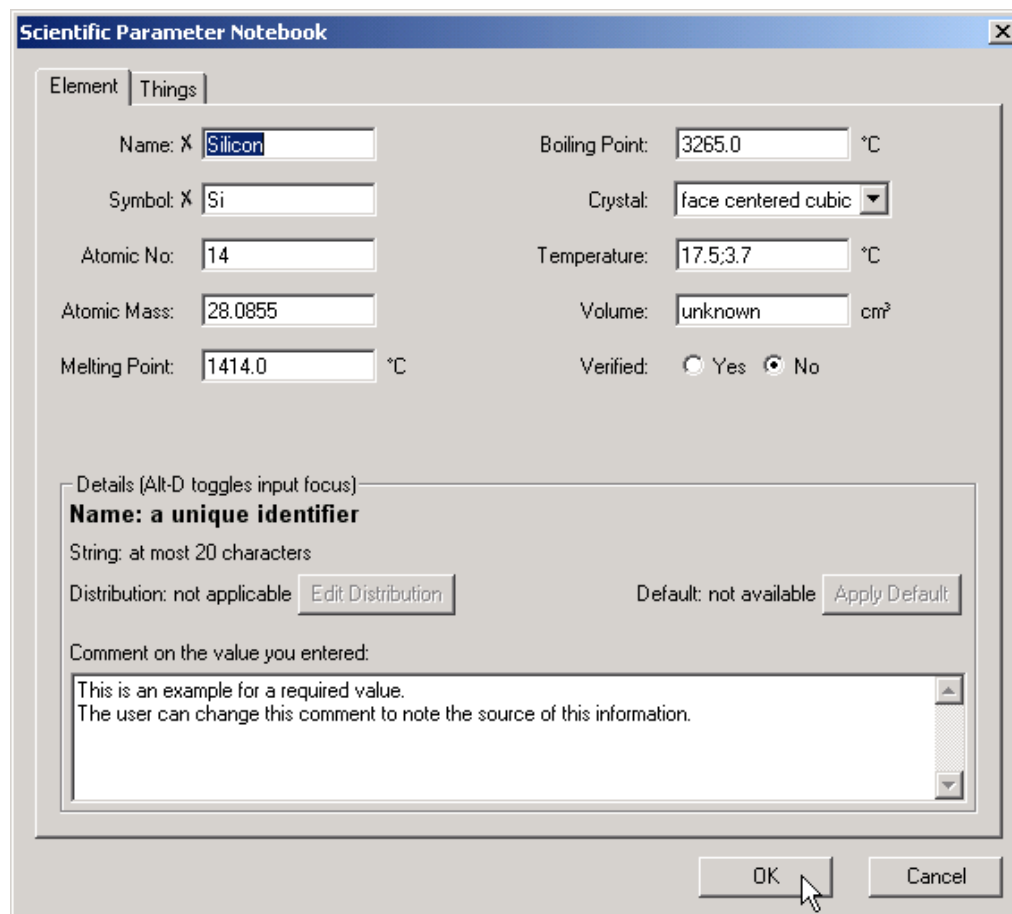


Fig. 3.2: SciParam Notebook

3.2.3 Detailed Information

A box will show additional details for the currently selected parameter. Here you see the parameter “Volume” with a long description “Volume of used samples”. It only allows float values greater or equal zero up to infinity.

There was no distribution active, but now the user selected “uniform”, therefore a new dialog shows up which asks for the maximum value.

The user already noted a comment to the value he’s typing now, so nobody should wonder where it came from.

Using the “Apply Default” button, you can also set this value to a default value, which would be 2;20/uniform in this case. This long format of “value;distribution parameter/distribution type” can be used in the input field, too, to save the user from putting his hands away from the keyboard to the mouse.

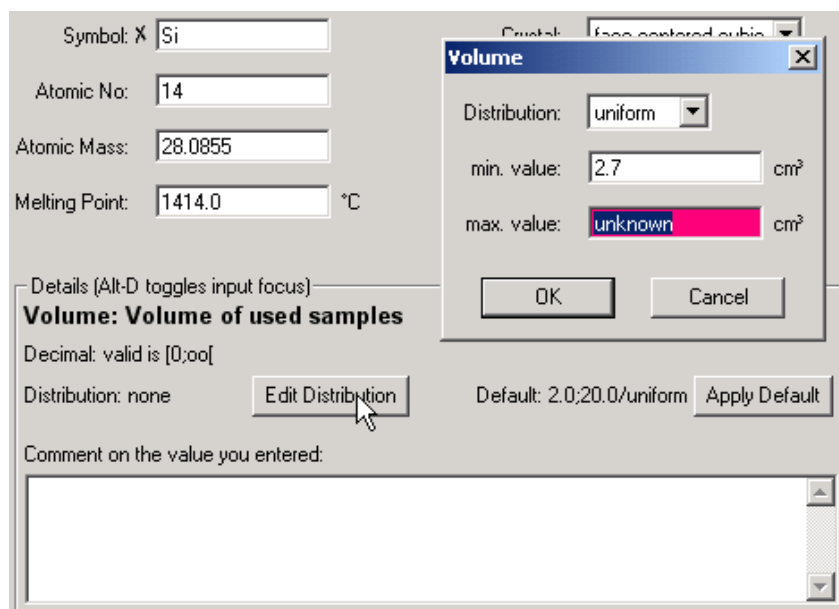


Fig. 3.3: Details Box

3.2.4 Required Parameters

The small cross indicates that this is a required parameter:

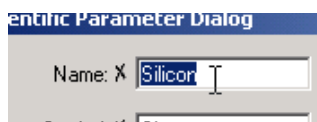


Fig. 3.4: Required Parameter

3.2.5 Usual Ranges

If you enter a value which is theoretically possible, but usually wrong (like an atomic number far higher than any known chemical element's number), the input field changes its color to yellow as soon as you leave the input field.

If you try to save this value using the “OK” button or switch to another notebook page, a warning dialog asks if you really want to use this value. The input field will stay yellow to warn you, even if you confirm this value, but the warning dialog will only appear again if you change the value.

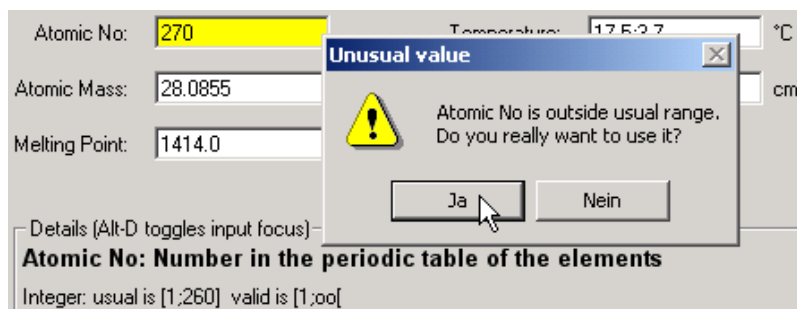


Fig. 3.5: Outside Usual Range

3.2.6 Valid Ranges

If you enter a value which is outside the valid range (like less than -273.15°C for a temperature), the input field changes its color to red as soon as you leave the input field.

If you try to save this value using the “OK” button or switch to another notebook page, an error dialog forces you to either enter a correct value or discard changes using the “Cancel” button.

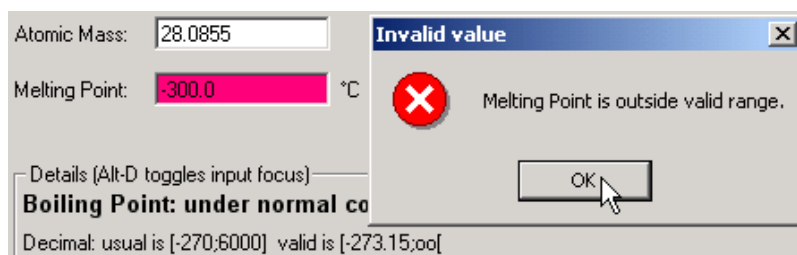


Fig. 3.6: Outside Valid Range

3.2.7 Distributed Parameters

When choosing a distribution type, a small dialog asks for additional parameters like standard deviation or maximum value. Illegal values for these parameters will be rejected:

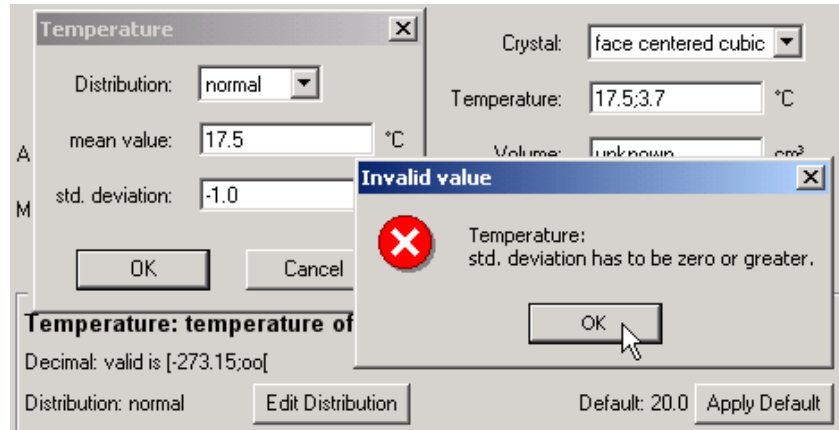


Fig. 3.7: Distributed Parameter

3.2.8 Choice Parameters

If you have a short list of choices, you can select one of them using radiobuttons. Choices include questions like Yes/No, or selecting one of few values like 3/5/7 meters.



Fig. 3.8: Short Choice

If you have a long list of choices, selecting one of them is done in a different way. Otherwise they might not fit inside the input field.

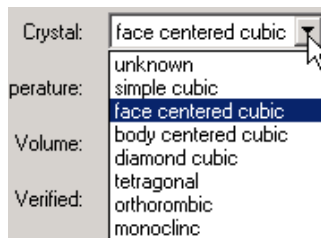


Fig. 3.9: Long Choice

3.2.9 Grouped Parameters

Parameters that belong together can be grouped.

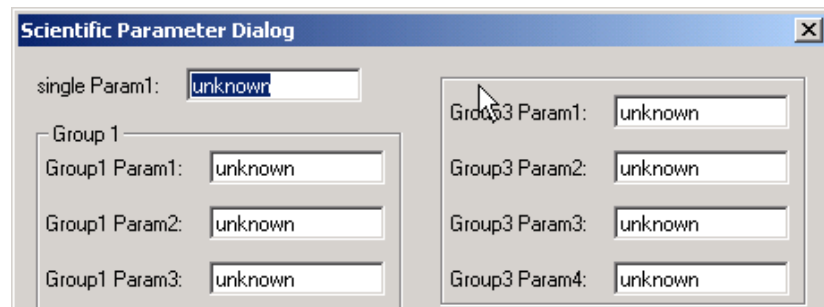


Fig. 3.10: Grouped Parameters

4 Developer Documentation

4.1 Creating Parameters

4.1.1 Import of Parameter Classes

The package SciParam contains the following parameter classes:

- FloatParam
- DistParam
- IntParam
- StringParam
- ChoiceParam

SciParam supports accessing them in several ways, as shown here with StringParam:

- ```
import SciParam
param = SciParam.StringParam('Name')
```
- ```
import SciParam.parameter
param = SciParam.parameter.StringParam('Name')
```
- ```
from SciParam import StringParam
param = StringParam('Name')
```

This one is deprecated, except for saving keystrokes in interactive sessions:

- ```
from SciParam import *
param = StringParam('Name')
```

Every parameter instance must have a name and can have a description, a unit, a default value, a current value and a comment. Additionally there are some boolean flags (required, notunknown, disabled) and method hooks (hook_isvalid, hook_isusual, hook_updated).

4.1.2 Import of Classes Range and Distribution

The parameter classes can build ranges and distributions from a string, therefore you don't need to import these classes very often. If you want to import them, use one of these methods:

- ```
import SciParam
rangel = SciParam.Range()
dist1 = SciParam.Distribution()
```
- ```
import SciParam.range
import SciParam.distribution
rangel = SciParam.range.Range()
dist1 = SciParam.distribution.Distribution()
```
- ```
from SciParam import Range, Distribution
rangel = Range()
dist1 = Distribution()
```

This one is deprecated, except for saving keystrokes in interactive sessions:

- ```
from SciParam import *
rangel = Range()
dist1 = Distribution()
```

4.1.3 Using Parameters with Ranges and Distributions

```
parameters = [
    StringParam('Name', 'a unique identifier', value='Silicon',
                required=1, maxlength=20, comment='A comment.'),
    IntParam('Atomic No', value=14, wrange='[1;260]', erange='[1;oo[',
            description='Number in the periodic table of elements'),
    FloatParam('Atomic Mass', None, value=28.0855, erange='[0;oo['),
    ChoiceParam('Crystal', 'crystal structure',
                choices=[None, 'simple cubic', 'face centered cubic',
                           'body centered cubic', 'diamond cubic',
                           'tetragonal', 'orthorombic', 'monoclinic'],
                value='face centered cubic',
                default='face centered cubic', long=1),
    DistParam('Temperature', 'temperature of samples', '°C',
              value='17.5;3.7/normal', erange='[-273.15;oo['),
    ChoiceParam('Verified', 'Have these values been checked?',
                choices=ChoiceParam.yes_no, value=0, default=1),
]
```

4.2 Creating Dialogs and Notebooks

4.2.1 Import of Dialog Classes

The package SciParam.UI contains the following dialog classes:

- ParameterDialog
- ParameterNotebookDialog

SciParam supports accessing them in several ways:

- ```
import SciParam.UI
dialog = SciParam.UI.ParameterDialog(...)
notebook = SciParam.UI.ParameterNotebookDialog(...)
```
- ```
from SciParam.UI.dialog import ParameterDialog
from SciParam.UI.notebook import ParameterNotebookDialog
dialog = ParameterDialog(...)
notebook = ParameterNotebookDialog(...)
```
- ```
from SciParam.UI import ParameterDialog, ParameterNotebookDialog
dialog = ParameterDialog(...)
notebook = ParameterNotebookDialog(...)
```

This one is deprecated, except for saving keystrokes in interactive sessions:

- ```
from SciParam.UI import *
dialog = ParameterDialog(...)
notebook = ParameterNotebookDialog(...)
```

4.2.2 Using Dialogs

Using a `ParameterDialog` works much like using any other dialog in wxPython. Additionally you have to specify a list of parameters and optionally a number of columns (defaults to one) to use:

```
parameters = [parameter1, parameter2, parameter3]
dialog = ParameterDialog(parent, -1, 'Dialog Title',
                        parameters, columns=2)
if dialog.ShowModal() == wxID_OK:
    print "OK"
else:
    print "Cancel"
for par in dialog.get_parameters():
    print "%s = %s (%s)" % (par.name, par, par.value)
    print " comment = %s" % par.comment
dialog.Destroy()
```

`ParameterNotebookDialog` takes a list of pages instead of parameters as argument. Each page is a 2-tuple consisting of page name and parameter list for this page:

```
parameters1 = [parameter1, parameter2, parameter3]
parameters2 = [parameter4, parameter5, parameter6]
parameters3 = [parameter7, parameter8, parameter9]
parameters = [('Page 1', page1),
              ('Page 2', page2),
              ('Page 3', page3)]
dialog = ParameterNotebookDialog(parent, -1, 'Notebook Title',
                                parameters, columns=2)
if dialog.ShowModal() == wxID_OK:
    print "OK"
else:
    print "Cancel"
for par in dialog.get_parameters():
    print "%s = %s (%s)" % (par.name, par, par.value)
    print " comment = %s" % par.comment
dialog.Destroy()
```

A Keyboard Shortcuts

Keyboard shortcuts depend on your graphical environment, but here is a list shortcuts known to work in MS Windows and GTK+:

<Tab>	Move to the next control.
<Shift-Tab>	Move to the previous control.
<Ctrl-Tab>	Move to the next notebook page.
<Shift-Ctrl-Tab>	Move to the previous notebook page.
<Enter>	Equivalent to clicking the OK button.
<Escape>	Equivalent to clicking the Cancel button.
<Space>	Equivalent to clicking the current button or radio button.
<Alt-Down>	Drop down the list box of a selection list.
<Cursor>	Change the current item in a selection list.
<Alt-D>	Toggle the input focus between a parameter and its details box.

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