Faculty of Information Technology
Brno University of Technology

Practical Aspects of Software Design

calculator – USER MANUAL

Introduction

The application "calculator" is a school project developed by the team "oznuk_1" on the Faculty of Information Technology (BUT) and it presents a simple calculator app. Members of the development team are:

- Adam Dzurilla (xdzuri00)
- Adam Ližičiar (xlizic00)
- Tomáš Hak (xhakto01)
- Jakub Vilček (xvilce00)

The application is primarily developed for Linux operating system (Ubuntu 64bit), although it is possible to make it available for other operating systems as well in the future, due to the fact that it is written in python and can therefore run wherever python is supported. The project is distributed under the GPLv3 license.

Features

For user convenience the application features a GUI, which was created using `pygame`. User is able to enter keyboard input and there is also a brief help in the top right corner of the application window if there happen to be any problems. The calculator features following functions:

- processing basic numerical operations (addition, subtraction, multiplication, division), powers, square roots, sine, cosine and factorial[1],
- working with expressions in parentheses,
- working with decimal numbers,
- history of previous calculations,
- ability to make use of the result of last computation by clicking on the 'Ans' button

[1] Implementation of these can be found in "src/operations.py" file.

Syntax

The application can in some cases process nested calculations, which is shown by the `<expression>` tag. Format of entering each of the operations is shown here:

- ADD: "`<expression> + <expression>`"
- SUB: "`<expression> - <expression>`"
- MUL: "`<expression> * <expression>`"
- DIV: "`<expression> / <expression>`"
- POW: "`<expression> ^ <expression>`"
- SIN: "`sin(<expression>)`"
- COS: "`cos(<expression>)`"
- SQRT: "$\sqrt{}$`NUM`"[2] or "$\sqrt{}$`(<expression>,<expression>)`"[3]
- FACT: "`<expression>!`"

Abilities and Restrictions

The application is restricted in some way. Following are some important notes about the capabilities of the calculator:

- It is able to process integer and float numbers and operations between them infinitely and catches `OverflowError`[4] and `ZeroDivisionError`[5].
- It computes factorial, even if the number of wich the factorial is to be calculated is in brackets.
- It rounds results of every operation except SQRT and FACT to 9 decimal places.
- SIN and COS functions work with degrees.

Development

This section is only for more advanced users who would like to take a closer look at the project development, otherwise it can be ignored.
The application was tested on the following platforms:

- Ubuntu 20.04
- ivs server

[2] square root with base 2
[3] square root with base returned by the second expression
[4] `https://docs.python.org/3/library/exceptions.html#OverflowError`
[5] `https://docs.python.org/3/library/exceptions.html#ZeroDivisionError`

The application has its public repository at `https://github.com/dzuris/IVS-Project2` and it was developed using test-driven development approach.

Repository structure

`IVS-Project2/`	
`mockup/`	drafts of future versions of the app
`plan/`	initial plans for the application development
`profiling/`	output of profiling
`src/`	folder with source codes
`*.py`	source codes
`test_*.py`	tests
`Doxyfile`	file for generating program documentation
`Makefile`	file for building the project
`dokumentace.pdf`	this document
`README.md`	brief introduction to the application

Install and uninstall via a debian package

The application is distributed as a debian package "calculator_1.0_amd64.deb". Following is the procedure to securely install it on (and later uninstall it from) your Ubuntu 64bit system:

- download the package `"calculator_1.0_amd64.deb"`
- run the following command to unpack it

```
$ sudo dpkg -i calculator_1.0_amd64.deb
```

- if there happen to be any dependencies needed to be installed, run the following command to install them directly

```
$ sudo apt-get -f install
```

- the application should now be installed under `/opt/calculator` folder on your system and there should be a script `calculator` in `/usr/bin` for your convenience, so you should be able to start the application by simply typing `calculator` from anywhere in the system[6]
- uninstalling the application is done by running

```
$ sudo apt-get remove calculator
```

[6] `/usr/bin` is by default in the PATH environment variable (if not you can add it there by typing "`PATH=$PATH:/usr/bin`" to the command line to be able to directly start programmes which reside there)

Building the application manualy

For more advanced users there is also a way to build the application directly from the source code. Because it is a python application, it should run wherever python interpreter is present.

- start with downloading the source code located in `IVS-Project2/src/`
- you will need some python packages installed too, get these by typing

```
$ sudo apt-get install python3.8-full python3.8-dev
python3-pip python3-pygame
```

- in the next step you will need to upgrade `pygame` to the latest version using `pip`, you can do this by typing

```
$ sudo pip install pygame --upgrade
```

- now you can run the application directly from the source folder by typing

```
$ python3 main.py
```

  or

```
$ make run
```