



Summer Fellowship Report

On

Creating Spoken Tutorials for Scilab

Submitted by

Mankrit Singh

Under the guidance of

Prof.Kannan M. Moudgalya
Chemical Engineering Department
IIT Bombay

Mentors

Mr. Rupak Rokade
Ms. Vineeta Ghavri
Ms. Rashmi Patankar

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Being a part of the FOSSEE internship has taught me a lot. Working in the open-source community was a great experience. I will try my best to enhance my skills and bring them to good use.

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Chapter 1

Overview

During the time of this Internship we were tasked to Create Spoken tutorial for Scilab and related toolboxes. I was able to contribute mainly to 3 series.

- GUI series
- Xcos series
- FOT series

In these I created performed various roles like doing the novice check, preparing script and slides, recording,etc for various Spoken tutorials.

Chapter 2

Introduction

2.1 About FOSSEE

FOSSEE (Free and Open Source Software in Education) project promotes the use of free and open-source tools to improve the quality of education in our country. They aim to reduce dependency on proprietary software in educational institutions. They encourage the use of FOSS tools through various activities to ensure that commercial software is replaced by equivalent FOSS tools. They also develop new FOSS tools and upgrade existing tools to meet requirements in academia and research. Incorporated to FOSSEE program, this fellowship's main aim is to introduce students to the FOSS in various engineering fields and to become a part of this big community.

2.2 About Scilab

Scilab is a free and open-source, cross-platform numerical computational package and a high-level, numerically oriented programming language. It can be used for signal processing, statistical analysis, image enhancement, fluid dynamics simulations, numerical optimization, and modelling, simulation of explicit and implicit dynamical systems and (if the corresponding toolbox is installed) symbolic manipulations.

2.3 About FOSSEE Optimization Toolbox(FOT)

FOSSEE Optimization Toolbox (FOT) for Scilab offers several optimization routines including, but not limited to, linear optimization, integer linear optimization, unconstrained optimization, bounded optimization and constrained optimization. The function calls and outputs are similar to those available in Matlab. These routines call optimization libraries in the backend, most of which are COIN-OR(link is external) libraries. It use CLP for linear programming, CBC and SYMPHONY for integer linear programming, IPOPT (with MUMPS) for nonlinear optimization and Bonmin for integer nonlinear optimization. There are also routines for specific

optimization problems like linear and nonlinear least squares, minimax, and goal programming using these solvers.

2.4 Spoken Tutorial

Spoken Tutorial is a multi-award winning educational content portal. One can learn various Free and Open Source Software all by themselves. The self-paced, multi-lingual courses ensure that anybody with a computer and a desire for learning, can learn from any place, at any time and in a language of their choice. All the content published on Spoken Tutorial website is shared under the CC BY SA license. The Spoken Tutorial project is funded by the National Mission on Education through Information and Communication Technology (ICT), launched by the erstwhile Ministry of Human Resources and Development, Government of India.

Chapter 3

FOSSEE Optimization Toolbox

3.1 Optimization functions

The FOSSEE Optimization Toolbox offers several optimization functions. The functions have several input parameter based on the user requirement.

3.2 `fot_linprog`

Solves a linear optimization problem

3.3 `fot_intlinprog`

Solves a mixed-integer linear optimization problem.

3.4 `fot_fminunc`

Solves an unconstrained optimization problem.

3.5 `fot_intfminunc`

Solves an unconstrained mixed-integer nonlinear optimization problem

3.6 `fot_fminbnd`

Solves a nonlinear optimization problem on bounded variables.

3.7 `fot_intfminbnd`

Solves a mixed-integer nonlinear optimization problem on bounded variables.

3.8 fot_fmincon

Solves a general nonlinear optimization problem.

3.9 fot_intfmincon

Solves a constrained mixed-integer nonlinear optimization problem.

3.10 fot_quadprog

Solves a quadratic optimization problem.

3.11 fot_intquadprog

Solves a mixed integer quadratic optimization problem.

3.12 Help

The FOSSEE Optimization Toolbox has an extensive help section that covers all of the functions that the toolbox currently consists of. The help section covers all important aspects like the input, output, how to call the function etc.

Chapter 4

Contribution

4.1 Process of creating a Spoken tutorial

The aim of my internship was to create spoken tutorial for the Scilab software. Scilab is a free and open-source, cross-platform numerical computational software

The process of creating the tutorials involved many steps. The creation cycle in brief is as follows

- **Research:** The first step of the process was to gather knowledge and revise concepts related to the the tutorials. The concepts of Optimization like linear programming, non linear programming, integer constraint and quadratic optimization are some of the important concepts present in the tutorial series.
- **Script:** Creation of script and edition of previously available script. The script are precise, simple and self explanatory in nature. The script consist of all important parts present in a tutorial like prerequisites, system requirements, assignments etc.
- **Slides:** The slides accompany the script and provide a visual aspect to the tutorial. The slides contain precise points, carrying just enough data for the learner to understand the explanation and not be overloaded with information.
- **Quality Checks:** After self verifying the script and slides, they are them checked thoroughly by peers and various teams to ensure the quality and correctness of the entire tutorials.
- **Recording:** The video are recorded after all verification are done. The tutorials are recorded keeping in mind all screen sizes. The concepts are then explained in step wise format for complete understanding of the tutorial.

I was responsible for creating tutorials for the FOT series where i had the opportunity to work on four different tutorials. I had other interns working along with me in the FOT series. The Tutorials I worked on where:

- Linear Programming using linprog function

- Integer Linear Programming using `intlinprog` function
- Constrained Optimisation using `fmincon` and `intfmincon` functions
- Quadratic Optimisation using `quadprog` and `intquadprog` functions

4.2 Novice Check

Novice Check is the process of thoroughly checking the tutorial from a perspective of a novice learner. Each term used is explained if needed.

I have performed the novice check for the following tutorials

- Creating a GUI based Interest calculator
- Building a GUI for plotting 2D parametric curves
- Building a GUI for plotting 3D parametric curves
- Loading and saving data in Xcos
- Conditional operations in Xcos
- Super Blocks in Xcos

4.3 Cross OS compatibility verification

Each tutorial is checked to ensure that it runs the same way on each OS. If any discrepancy is found then the learner is informed about it. I have performed the Cross OS compatibility verification for the following tutorials.

- Installation of GUI Builder Toolbox
- Creating a GUI to print the user input
- Object properties and alignment in GUI
- Creating a GUI based exponent calculator
- Building a GUI for graphing linear equations
- Bounded Optimisation using `fminbnd` and `intfminbnd` functions
- Unconstrained Optimisation using `fminunc` and `intfminunc` functions
- Bounded Optimisation using `fminbnd` and `intfminbnd` functions

Chapter 5

Learning Outcome

5.1 Technical Outcome:

- Scilab
- Optimization Theory
- Latex
- Installation and testing of toolbox
- FOT
- GUI
- Xcos

5.2 Professional Outcome:

- Working in a team
- Professional communication ethics
- Time management
- Professional Communication

Chapter 6

Conclusion

The internship was a great learning experience. During the internship I learnt the various steps involved in creation of educational content and in creation of playlist of video tutorials. Throughout the internship, I learnt many new software and programming languages. I got the opportunity to be involved with the open-source community and be a part of it. I would like to thank everyone that was a part of my internship and would like to express my gratitude for all the help and support offered throughout the internship.

Chapter 7

Useful Links

7.1 FOT Series

- Linear Programming using linprog
- Integer linear programming using intlinprog function
- Constrained optimisation using fmincon and intfmincon functions
- Quadratic Optimisation using quadprog and intquadprog functions

7.2 GUI Series

- Building a GUI for plotting 2D parametric curves
- Building a GUI for plotting 3D parametric curves

7.3 Xcos Series

- Loading and saving data in Xcos
- Conditional operations in Xcos
- Super Blocks in Xcos

Chapter 8

Reference

- <https://scilab.in/fossee-scilab-toolbox/optimization-toolbox>
- <https://spoken-tutorial.org/>
- <https://github.com/FOSSEE/FOSSEE-Optimization-toolbox>
- <http://atoms.scilab.org/toolboxes/guibuilder/4.2.1>