FOSSEE Semester Long Internship

On

Creating Spoken tutorial for Scilab

Submitted by

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August 30, 2021

Acknowledgment

First of all, I would like to express immense happiness and gratitude for being part of this internship presented by the FOSSEE Team, IIT BOMBAY. It was a great journey exploring new possibilities, knowledge and its practical uses. Being guided by some of the experts of the country, I was given a great chance at acquiring new skills and further improvement.

I would like to thank Ms.Vineeta Ghavri, Mr.Rupak Rokade and Ms.Rashmi Patankar for their support and guidance given throughout this internship. They helped me learn a lot of new concepts and improve professionally. The patience they showed while guiding me through this whole endeavor is truly exemplary.

I am forever grateful for this opportunity that has marked a milestone in my skill and career development and going forward will strive to learn more to make the best use of these skills throughout my life. I sincerely hope to work with FOSSEE and Spoken tutorial team again in the future.

Contents

Chapter 1

Overview

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

- GUI series

- Xcos series

- FOT series

In these, I performed various roles like doing the novice check, preparing script and slides, recording, etc for various spoken tutorials.
Apart from this, I have performed cross-platform verification and tested out various toolboxes for multiple operating systems.

Chapter 2

Technical Specification

2.1 Scilab

Scilab is an open-source software for numerical computation, providing a powerful computing environment for engineering and scientific applications made available by the French Government's "Institut Nationale de Recherche en Informatique et en Automatique - INRIA (National Insti- tute for Informatics and Automation Research)". First released in 1994, Scilab includes hundreds of mathematical functions and high level programming language allowing access to advanced data structures, 2D and 3D graphical functions. Scilab has a large number of functionalities including:

- **Maths & Simulation:** For usual engineering and science applications including mathematical operations and data analysis.

- **2-D & 3-D Visualization:** Graphics functions to visualize, annotate, and export data and many ways to create and customize various types of plots and charts.

- **Optimization:** Algorithms to solve constrained and unconstrained continuous and discrete optimization problems.

- **Statistics:** Tools to perform data analysis and modeling.

- **Control Systems:** Standard algorithms and tools for control system study.

- **Signal Processing:** Visualize, analyze and filter signals in time and frequency domains.

- **Application Development:** Increase Scilab native functionality and manage data exchange with external tools.

- **Xcos - Dynamic systems modeling:** Modeling mechanical systems, hydraulic circuits, control systems.

2.2 GUI

GUI (Graphical User Interface) is an interface in which the user can interact with graphical objects like buttons,windows and icons.There are several ways to create GUI in Scilab. In this series we have demonstrated two of them. GUI Builder toolbox is one of these ways to build a GUI in Scilab. The program allows us to build your GUI quickly, and the code for the GUI would be generated automatically. The current version of this toolbox is 4.2.1 and the authors are Tan Chin Luh and David Violeau.

2.3 Xcos

Xcos is a graphical editor freely available used to design hybrid dynamical systems models. Models can be designed, loaded, saved, compiled, and simulated using Xcos.It can be used for various industrial and academic needs. Xcos includes functionalities for modeling mechanical systems, hydraulic circuits, control systems, etc.

2.4 FOT

FOT-FOSSEE Optimisation Toolbox is a toolbox available for free in Scilab. Using this toolbox we can solve a variety of optimisation problems in Scilab.
It can solve problems of :

- Linear programming
- Mixed-Integer Linear programming
- Quadratic programming
- Least squares

- Non-linear programming
- Minimax
- Goal attain
- Minimization/maximization with or without constraints

Functions in the FOT toolbox are:

- fot_linprog
- fot_intlinprog
- fot_quadprog
- fot_intquadprog
- fot_fmincon

- fot_intfmincon
- fot_fminunc
- fot_intfminunc
- fot_fminbnd
- fot_intfminbnd

2.5   Spoken Tutorial Project

Spoken Tutorial is a multi-award winning educational content portal. It provides various resources on free and open source software so that anyone can learn them irrespective of place or time in a language of the learner's choosing. These courses range from Beginner to Advanced from which a learner can choose according to their knowledge or expertise. The content includes side by side practice which ensures the active participation of the learner.The Spoken Tutorial project is funded by the National Mission on Education through Information and Communication Technology (ICT), launched by the Ministry of Human Resources and Development, Government of India. In this day and age of digital learning, initiatives like the Spoken Tutorial Project are of vital importance.

2.5.1   Process of creating a Spoken tutorial

- Outline:
  An outline for the topic is created to help us get a basic understanding of the subject and to give some idea about the structure and sequence of the overall tutorial.

- Script:
  A script is the written form of the spoken tutorial. Each sentence said during the recording is according to the script. This is made according to the guidelines by the ST team. For a good spoken tutorial, the script needs to be clear and simple.

- Slides:
  Slides are made to help explain certain topics in the script. They are made corresponding to the script. LaTeX beamer environment is used to create the slides. For a specific FOSS, templates are used to make the slides. These slides should follow the guidelines given by the ST steam.

- Novice check:
  Novice check is done by a person who has very little knowledge about the ST to make sure that the script and slides are easy to understand. The novice also points out mistakes made in the script and slides.

- Recording:
  The narrated video is made according to the guidelines. Extra care is taken to minimize mistakes and ensure the proper quality of recording.

- Review:
  After the above steps, the all related files are sent to the reviewer who verifies that the recording and files are done according to the spoken tutorial guidelines and checklist. This is to ensure a good quality of the content being uploaded. Once all issues are addressed, the reviewer publishes the tutorial on the spoken-tutorial website.

Chapter 3

Contributions

3.1 Creating Spoken tutorial for GUI series

In the GUI series, I have worked on 2 tutorials:

- Creating a basic GUI using Scilab

- Creating a GUI to print user input

3.1.1 Creating basic GUI using Scilab

In this tutorial steps to create a simple GUI is mentioned For this spoken tutorial, I have performed the Novice check to find errors in the script and slides and to ensure that it is easy enough for a beginner to follow.
I have also done the recording for this tutorial which was then edited by the editing team which is now ready for publishing in the Spoken Tutorial website.

3.1.2 Creating a GUI to print user input

For this spoken tutorial, I have performed the Novice check to find errors in the script and slides and to ensure that it is easy enough for a beginner to follow.

3.2 Creating Spoken Tutorial for Xcos series

In the Xcos series, I have worked on various 2 tutorials:

- User defined variables in Xcos

- Super blocks in Xcos

3.2.1 User defined variables in Xcos

Variables can be defined by the user in Xcos. These variables can then be further used in multiple blocks in an Xcos simulation. This tutorial explains how to create user-defined variables using the Scilab console and the context menu.

For this spoken tutorial, I have created the script and slides required for recording. These were made following the Spoken tutorial guidelines.

3.2.2 Super blocks in Xcos

Super block is a block available in the user defined blocks section of Xcos. Using this block we can build an Xcos inside an Xcos.This block can be used to further segregate a complicated Xcos thereby keeping it neat and clean by design.
For this tutorial, I have prepared the script and slides according to the Spoken tutorial guidelines.
I also recorded the video for this tutorial, which was later edited by the editing team and is now ready to be uploaded to the ST website.

3.3 Creating Spoken Tutorials for FOT series

In the FOT series, I have worked on 3 tutorials:

- Installation of FOT

- Unconstrained Optimisation using FOT

- Bounded Optimisation using FOT

3.3.1 Installation of FOT

In this tutorial, the process for downloading the latest version of FOT are mentioned in detail. The main problems that can be solved using this toolbox and some functions in the toolbox are mentioned in this tutorial.
I have performed the recording for this spoken tutorial. This recording was done according to the script and slides provided by the FOSSEE team.

3.3.2 Unconstrained Optimisation using FOT

In this tutorial, the process of solving an Unconstrained Optimisation using the functions fot_fminunc and fot_intfminunc are discussed with example codes. It also provides an assignment for the learners to try out and learn for themselves.
For this tutorial, I corrected and updated the pre-existing script and made the corresponding slides according to the Spoken Tutorials guidelines.
I also performed the recording after verification and confirmation from the ST admin.

3.3.3   Bounded Optimisation using FOT

In this tutorial, the process of solving a Bounded Optimisation using the functions fot_fminbnd and fot_intfminbnd are discussed with example codes. It also provides an assignment for the learners to try out and learn for themselves.

For this tutorial, I corrected and updated the per existing script and made the corresponding slides according to the Spoken Tutorial guidelines.

Recording of this tutorial could not be completed due error in the code file.

3.4   Testing and OS verification of toolboxes

For this internship, I have mainly done cross-platform verification and testing for 2 toolboxes:

- FOSSEE Optimisation Toolbox (FOT)

- Scilab Octave toolbox

3.4.1   FOSSEE Optimisation Toolbox (FOT)

For FOT toolbox, latest versions of the toolbox were installed on Ubuntu 18.04 and Scilab 6.1.0. Various functions were then verified using the existing code files from the FOT series in the spoken tutorial creation process. Errors encountered were then reported to the FOT team who later corrected them.

3.4.2   Scilab Octave Toolbox

For the Scilab Octave toolbox, the installation was carried out according to the instructions provided by the Scilab Octave Team. Errors encountered during the process were then reported to Scilab Octave team for rectification.

Chapter 4

Learning Outcomes

During this Internship, I got the opportunity to learn about different open source software and software related resources which provided new knowledge and skills helpful to my career. Apart from technical outcomes I have also been able to gain knowledge and experience about working in a professional environment.

4.1 Technical outcomes

Technical aspects learned in the internship are:

- Scilab and its uses in different fields.

- Creating GUI in Scilab using the GUI builder toolbox.

- Creating and running Xcos simulations.

- Better understanding of LaTeX and LaTeX beamer environment.

- Various functions in the FOSSEE Optimisation Toolbox and their usage in solving optimisation problems.

- Creation and verification of Spoken tutorials by the Spoken Tutorial Project.

- Knowledge about testing and OS verification of Scilab toolboxes.

4.2 Professional outcomes

Professional skills developed during this internship are:

- Proper work etiquette.

- Workplace communication skills.

- Time management.

- Creating work reports and presentations.

Chapter 5

Conclusion

In conclusion, I got the opportunity to work on 7 tutorials in 3 series in the FOSSEE Semester Long internship 2021. Each of these tutorials imparted various new skills and concepts which I am sure would be of use in my professional career. I got a chance to learn about some new prospects of the open source software Scilab. I feel a sense of happiness knowing that the work I've put into this internship would be of use to thousands of people via the Spoken Tutorial Website. I would like to thank all mentors and my fellow interns who turned this Internship into such a wondrous experience.

Chapter 6

Useful Links

6.1　GUI series

Creating a basic GUI using Scilab :
`https://drive.google.com/drive/folders/1a63BufcNFR-r_0BAPiq4liB6DXAUknyY?`
`usp=sharing`
Creating a GUI to print user input :
`https://drive.google.com/drive/folders/1oqWKGaXAUaEQAKM1zP50HVHK5MVMgf8B?`
`usp=sharing`

6.2　Xcos Series

User defined variables in Xcos :
`https://drive.google.com/drive/folders/1LY9GjZUuAiylT6EBkpxnh-5Pv_IpbObk?`
`usp=sharing/`
Super blocks in Xcos :
`https://drive.google.com/drive/folders/1UXsqIhPWEZul1uaVPXn8O42LG3poNghT?`
`usp=sharing`

6.3　FOT series

Installation of FOT :
`https://drive.google.com/drive/folders/1wp4K_cZWF7y0LUYghyU43uqwHB_6Mzad?`
`usp=sharing`
Unconstrained Optimisation using FOT :
`https://drive.google.com/drive/folders/1SGG8OBYFWI9QP1NmOPPru03QKWfa3_`
`MO?usp=sharing` Bounded Optimisation using FOT :
`https://drive.google.com/drive/folders/1CWwhgAW9bfmjzR5O8XDHTuLrZti-I8yf?`
`usp=sharing`

6.4 Recordings

Creating a basic GUI using Scilab :
https://drive.google.com/file/d/1VETyXtph5Ebn-sLQ9JgjHPiE5NtHYajj/view
Super blocks in Xcos :
https://drive.google.com/file/d/1UU44OH7C4pWJoY21nP5Pq_phpZSDNe6n/view
Installation of FOT :
https://drive.google.com/file/d/1iMPlEjhYGbNUFxwVbAjl-iT5861JoZzx/view
Unconstrained Optimisation :
https://drive.google.com/file/d/1ZGl2myI_4gSxn5E_UYzJutcjy-aL1TqK/view?
usp=sharing

6.5 Reference

- https://spoken-tutorial.org/about-us/

- https://www.scilab.org/abouthttps://www.scilab.org/about

- https://atoms.scilab.org/toolboxes/FOT/0.2.3

- https://github.com/FOSSEE/FOSSEE-Optimization-toolbox