Summer Fellowship Report

On

Python code for connection design,Development of GUI,Converting python2 code to python3 and Creating Windows Installer

Submitted by

Aryamaan Pandey

Under the guidance of

Prof.Siddharta Ghosh

Civil Engineering Department

IIT Bombay

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Acknowledgment

I would like to express my special thanks of gratitude to FOSSEE, IIT Bombay who gave me the golden opportunity to do this summer fellowship with Osdag. This fellowship helped me in doing a lot of research and I came to know about so many new things I am really thankful to them. It helped me to enhance my knowledge in software development and I also learnt about steel structures and designs. I feel grateful to have met so many wonderful people and professionals who guided me through this fellowship period.

Moreover, I must show my gratitude to Prof. Siddhartha Ghosh who in spite of being busy with his duties, took time out to hear, guide and keep me on the correct path and allowing me to carry out my project at their esteemed research lab (SSRR lab).

I would also like to acknowledge the members of the Osdag team; Danish Ansari (Project Research Assistant), Ajmal Babu MS (Project Research Engineer) and Sourabh Das (Project Research Associate) for their careful and precious guidance which was extremely valuable during the course of this fellowship.

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Chapter 1

Introduction

Osdag internship is provided under the FOSSEE project. FOSSEE project promotes the use of FOSS (Free and Open Source Software) tools to improve quality of education in our country. FOSSEE encourages the use of FOSS tools through various activities to ensure commercial (paid) softwares are replaced by equivalent FOSS tools.

The FOSSEE project is a part of the National Mission on Education through Infrastructure and Communication Technology (ICT), Ministry of Human Resources and Development, Government of India.

Osdag is one such open source software which comes under the FOSSEE project. Osdag internship is provided through FOSSEE project. Any UG/PG/PhD holder can apply for this internship. And the selection will be based on a screening task.


1.1 What is Osdag ?

Osdag is a cross-platform free and open-source software for the design of steel structures, following the Indian standard IS 800:2007. It allows the users to design steel connections, members and systems using a graphical user interface. The interactive GUI provides a 3D visualisation of the designed component and creates images for construction/fabrication drawings.

It is used for solving steel structures problems and to see how the connection will look after practical implementation. There are different modules available in Osdag with various connectivities.

Osdag provides various features such as:

1) An interactive window displaying a 3D CAD model, which provides a clear visualisation of the designed component.

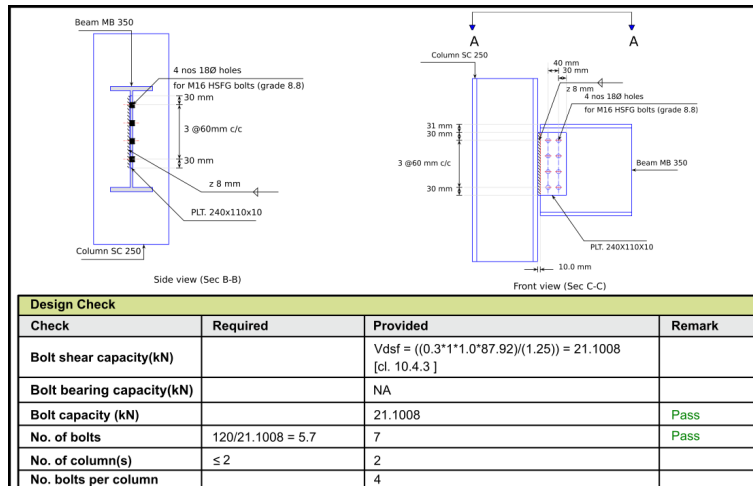2)Creation of 3D CAD models that can be imported to generic CAD softwares.
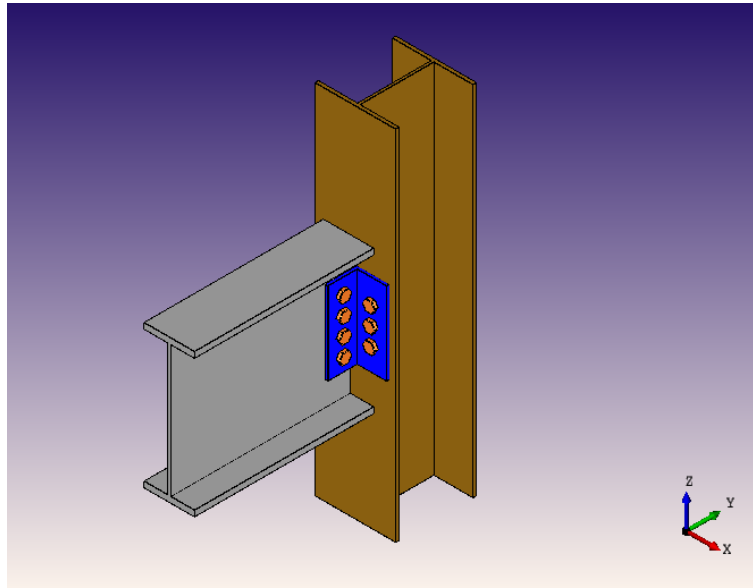
3)User-friendly input and output docs, with text-validated welds grouped according to the design window.
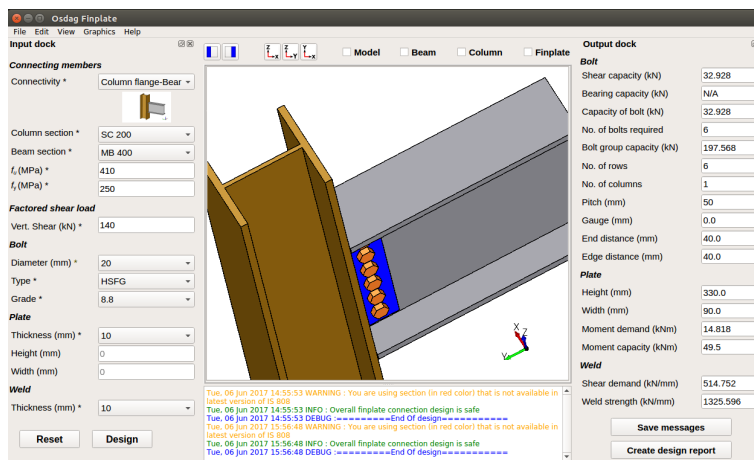
4)Creation of a professional design report showing all necessary checks, design calculations as per IS 800:2007, and standard views of the designed component.

5)A text window for message display, that also suggests necessary changes if a trial design is found unsafe.

Design Check			
Check	Required	Provided	Remark
Bolt shear capacity(kN)		Vdsf = ((0.3*1*1.0*87.92)/(1.25)) = 21.1008 [cl. 10.4.3]	
Bolt bearing capacity(kN)		NA	
Bolt capacity (kN)		21.1008	Pass
No. of bolts	120/21.1008 = 5.7	7	Pass
No. of column(s)	≤ 2	2	
No. bolts per column		4	

Mon, 05 Jun 2017 17:35:30 DEBUG :=========End Of design===========
Mon, 05 Jun 2017 17:36:53 WARNING : You are using section (in red color) that is not available in latest version of IS 808
Mon, 05 Jun 2017 17:36:53 ERROR : Chosen web plate thickness is not sufficient
Mon, 05 Jun 2017 17:36:53 WARNING : Minimum required thickness 8.90 mm
Mon, 05 Jun 2017 17:36:53 ERROR : Weld thickness is not sufficient [cl. 10.5.7; Insdag Detailing Manual, 2002]
Mon, 05 Jun 2017 17:36:53 WARNING : Minimum weld thickness required is 8.00 mm
Mon, 05 Jun 2017 17:36:53 INFO : Increase the weld thickness or length of weld/ finplate
Mon, 05 Jun 2017 17:36:53 WARNING : Minimum recommended weld thickness for shop weld is 6 mm
Mon, 05 Jun 2017 17:36:53 ERROR : Design is not safe
Mon, 05 Jun 2017 17:36:53 DEBUG :=========End Of design===========

1.2 Who can use ?

Osdag is generally created for industry professionals but it also keeps students in mind. As Osdag is funded by MHRD, Osdag team tries to manipulate software in such a way that it can be used by the students during their academics and to give them a better insight look in the subject.

Basically, Osdag can be used by anyone starting from novice to professionals. Its simple and sober user interface makes it flexible and attractive than the other softwares. Also, there are video tutorials to get started.

Chapter 2

Osdag Development

2.1 Module for Bolt Pitch Details

Created module for displaying pitch details according to the number of bolts chosen. This module is dynamic in nature since the number of fields varies. The code according to which this module works is in the main file under class Pitch.
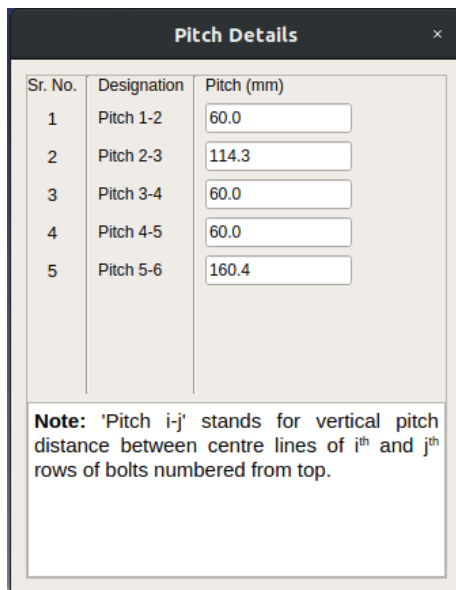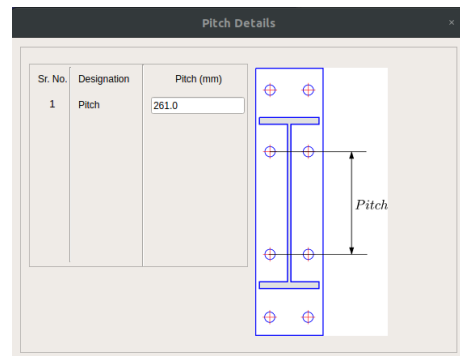

Figure 2.1: Beam-Beam End Plate

Figure 2.2: Beam-Column End Plate

GitHub Links-:

https://github.com/osdag-admin/Osdag/blob/test/Connections/Moment/BCEndPlate/ui_pitch.py
https://github.com/osdag-admin/Osdag/blob/test/Connections/Moment/BCEndPlate/ui_pitch.ui
https://github.com/osdag-admin/Osdag/blob/connections/Connections/Moment/

2.2 Module for Weld Details

Created a module for displaying the weld details. There are two different modules under weld details. When the user chooses the type of the weld as the groove weld then picture displaying weld details are displayed whereas when the user chooses fillet weld type it shows the values for critical stress and strength for flange and web weld.
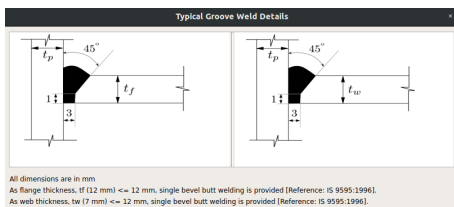
Figure 2.3: When Groove Weld is selected
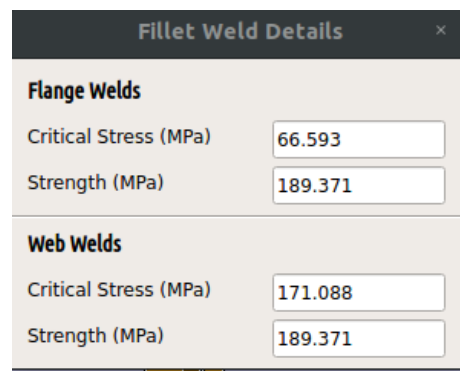
Figure 2.4: When fillet weld is selected
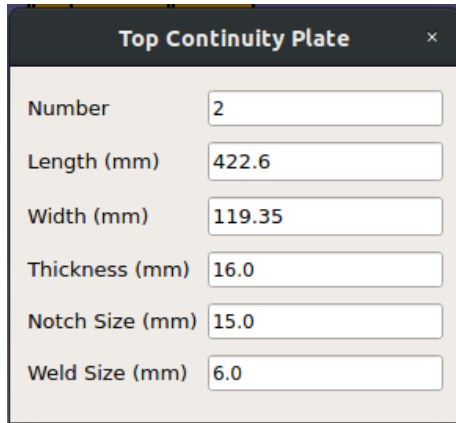
GitHub Links-:

https://github.com/osdag-admin/Osdag/blob/test/Connections/Moment/BCEndPlate/ui_weld_details_1.py
https://github.com/osdag-admin/Osdag/blob/test/Connections/Moment/BCEndPlate/ui_weld_details_1.ui
https://github.com/osdag-admin/Osdag/blob/test/Connections/Moment/BCEndPlate/ui_weld_details_2.py
https://github.com/osdag-admin/Osdag/blob/test/Connections/Moment/BCEndPlate/ui_weld_details_2.ui
https://github.com/osdag-admin/Osdag/blob/connections/Connections/Moment/ExtendedEndPlate/ui_weld_details.py
https://github.com/osdag-admin/Osdag/blob/connections/Connections/Moment/ExtendedEndPlate/ui_weld_details.ui
https://github.com/osdag-admin/Osdag/blob/connections/Connections/Moment/ExtendedEndPlate/extended_main.py
https://github.com/osdag-admin/Osdag/blob/connections/Connections/Moment/BCEndPlate/bc_endplate_main.py

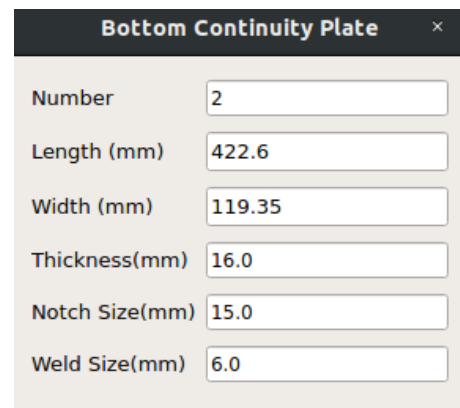## 2.3 Module for Top and Bottom Continuity Plate

Created module for top and bottom continuity plate which displays number, length, width, thickness, notch size, and weld size for the respective plate.

Figure 2.5: Top Continuity plate details
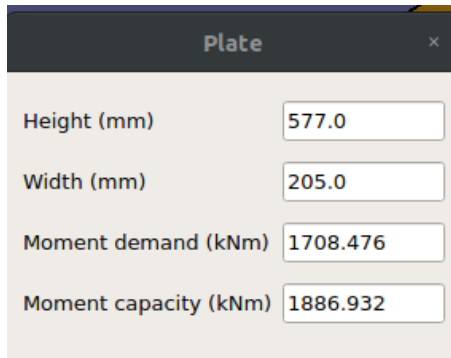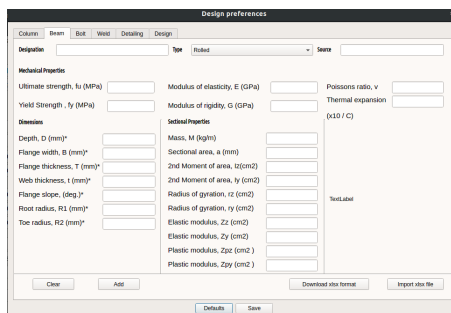

Figure 2.6: Bottom Continuity plate details

GitHub Links-:

https://github.com/osdag-admin/Osdag/blob/test/Connections/Moment/BCEndPlate/
ui_plate.py
https://github.com/osdag-admin/Osdag/blob/test/Connections/Moment/BCEndPlate/
ui_plate.ui
https://github.com/osdag-admin/Osdag/blob/test/Connections/Moment/BCEndPlate/
ui_plate_bottom.py
https://github.com/osdag-admin/Osdag/blob/test/Connections/Moment/BCEndPlate/
ui_plate_bottom.ui
https://github.com/osdag-admin/Osdag/blob/connections/Connections/Moment/
BCEndPlate/bc_endplate_main.py

2.4 Module for End Plate details

Created module for plate details for a beam to beam connection and is similar to top and bottom continuity plate details but displays values of different parameters.

Figure 2.7: Plate details

GitHub Links-:

2.5 Module for Section properties of Beam and Column in Design Preferences

Created the GUI form for beam and column in design preferences which will be included in later osdag release.

Figure 2.8: Beam and Column form in design preferences

2.6 UI changes in Beam-Column End-plate and Extended End-plate Design

Modified the BC end-plate and the extended-end-plate design and linked modules to the output dock since many new modules (ex-stiffener details,weld details,etc..) have been created.

Figure 2.9: Output Dock of BC End-plate

Figure 2.10: Output dock of Extended end-plate

GitHub Links-:

https://github.com/osdag-admin/Osdag/blob/test/Connections/Moment/BCEndPlate/ui_bc_endplate.py
https://github.com/osdag-admin/Osdag/blob/test/Connections/Moment/BCEndPlate/ui_bc_endplate.ui
https://github.com/osdag-admin/Osdag/blob/test/Connections/Moment/ExtendedEndPlate/ui_extendedendplate.py
https://github.com/osdag-admin/Osdag/blob/test/Connections/Moment/ExtendedEndPlate/ui_extendedendplate.ui

2.7 UI changes in Main Window

Some minor changes in the Main Window UI.
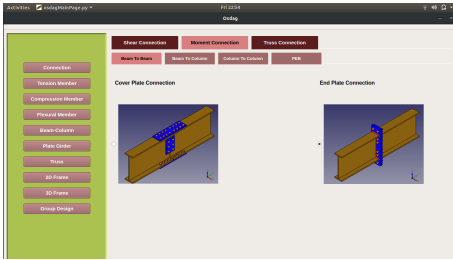
Figure 2.11: Main Window
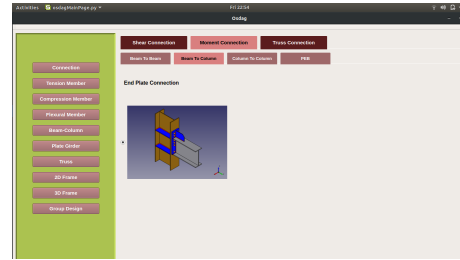
Figure 2.12: Main Window

GitHub Links-:

https://github.com/osdag-admin/Osdag/blob/test/OsdagMainPage.ui
https://github.com/osdag-admin/Osdag/blob/test/osdagMainPage.py

2.8 Windows Installer

Created an installer for the Osdag which is windows compatible. The installer installs Miniconda2 package manager and all the other dependencies used by the software. It also creates a shortcut on the desktop after the installation is complete.

GitHub Links-:

https://github.com/aryamaan98/Windows-Installer

2.9 Code conversion from Python2 to Python3

Since the current version of Osdag supports Python2 and its dependencies. Hence it was a crucial task to convert the code to Python3 since Python2 updates will not be coming after next year.

GitHub Links-:

https://github.com/aryamaan98/Osdag_3

Chapter 3

Software Testing

Software testing is a process, to evaluate the functionality of a software application with an intent to find whether the developed software met the specified requirements or not and to identify the defects to ensure that the product is defect free in order to produce the quality product.

3.1   Module Testing

Module testing is defined as a software testing type, which checks individual subprograms, subroutines, classes, or procedures in a program. Instead of testing whole software program at once, module testing recommends testing the smaller building blocks of the program.

3.2   UI Testing

Every time after designing the UI for a module I had to test it so that later on due to different screen resolution it changes dynamically and looks fine.

3.3   Fixing Crashes/Bug Fixing

There remained a need to test the software for edge and corner cases and make sure that the software gave appropriate results/suggestions. The found bugs were documented and reported to us where we worked on fixing the bugs/issues simultaneously. A bug in software is an error, flaw, or fault in a computer program or system that causes it to produce an incorrect or unexpected result or to behave in unintended ways. Every software or application either old or new might be having some bugs, sometimes noticeable while sometimes non-noticeable. And Osdag being in its initial stages, it is natural that it might have bugs.

Chapter 4

Conclusions

On the whole, this fellowship was a useful experience. It helped me enhance and develop new skills, abilities, and knowledge. I achieved several of my learning goals, however, for some the conditions did not permit. I got insight into professional practice. I learned the different facets of working within an open-source organization. Since the Osdag project is in its initial stages so I learned about new development techniques and programming methodologies. The fellowship was also good to find out what my strengths and weaknesses are. This helped me to define what skills and knowledge I have to improve in the coming time. At last this fellowship has given me new insights and motivation to pursue a career in software development.