



Undergraduates Modeling Small Satellites with Thermal Desktop

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Overview

At the University of Georgia, students are encouraged to explore extra-curricular activities ranging from intramural sports, interesting clubs, on campus jobs, and since the foundation of the Small Satellite Research Laboratory (SSRL), modeling small satellites. All of these extra-curriculars present initial obstacles for every student. With the last listing in mind, how does a student approach the overwhelming task of using satellite modeling software like Thermal Desktop? Most importantly, where do they find the time and resources?

The purpose of this research is to collect data in order to create a guide catered to engineering undergraduates in the SSRL. This guide walks students through a simple analysis of a mock 1U satellite with Thermal Desktop, and afterward, they are asked to submit answers to a brief survey allowing them to grade the guide based on readability and usefulness.

The primary benefits of this research are that it saves time and allows students to attain a basic understanding of Thermal Desktop without painstakingly flipping through a lengthy software manual. With these benefits, students are prevented from sinking time into searching for resources regarding basic tasks and are allowed the opportunity to go further with the software to uncover new methods of analysis.

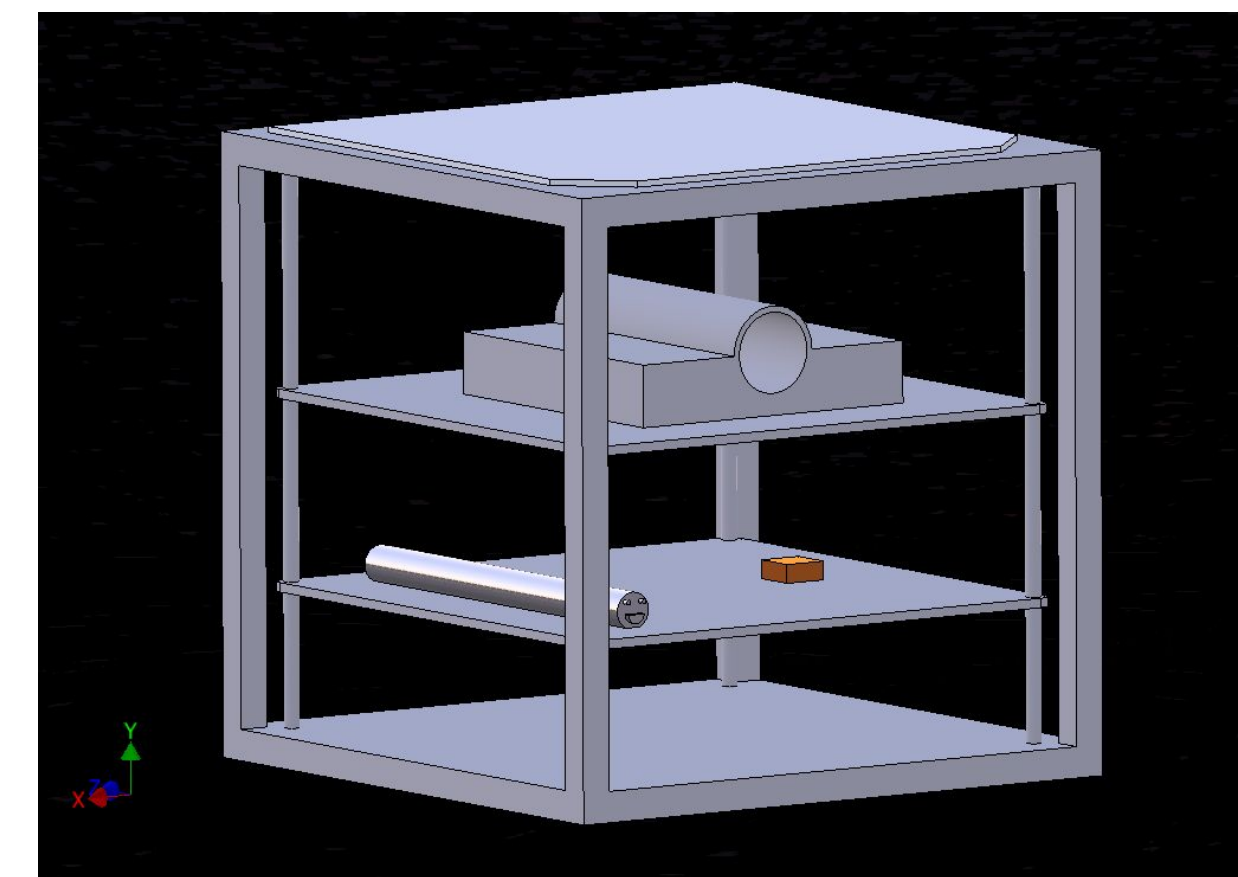


Figure 1: Model of the simplified 1U Satellite used for the Thermal Desktop Resource Guide. *Any resemblance of this model to another existing small satellite is completely coincidental.*

Results

Below is a figure that highlights four of the more determining questions for the guide. A total of ten questions were asked in a survey regarding the quality of the guide ranging from whether students felt this guide was catered to them to whether it helped them actually understand the process. Overall the general consensus was that the resource is easy to follow and understand; however, the reasoning behind the steps could be explained in more detail. It is clear a higher degree of explanation behind the process is needed in order for students to fully understand the decisions they are making regarding their model..

Q01

Did this guide feel catered to you as an undergraduate?

Yes

Q02

Is the exercise helpful in understanding how to model a real satellite in orbit?

Somewhat

Q03

Would you use this as a reference for Thermal Desktop in the future?

Yes

Q04

Would you use this to teach others Thermal Desktop?

Yes

Components and Process

The essential format consists of a step by step process for the set-up of the model. Any keystrokes that need to be made within the software are bolded, and important software windows are included to serve as a check for students. Additionally, each section of the guide has helpful notes and tips relevant to their respective sections, and at the conclusion of the 1U satellite example, an appendix of resources is available for students for troubleshooting their analyses.

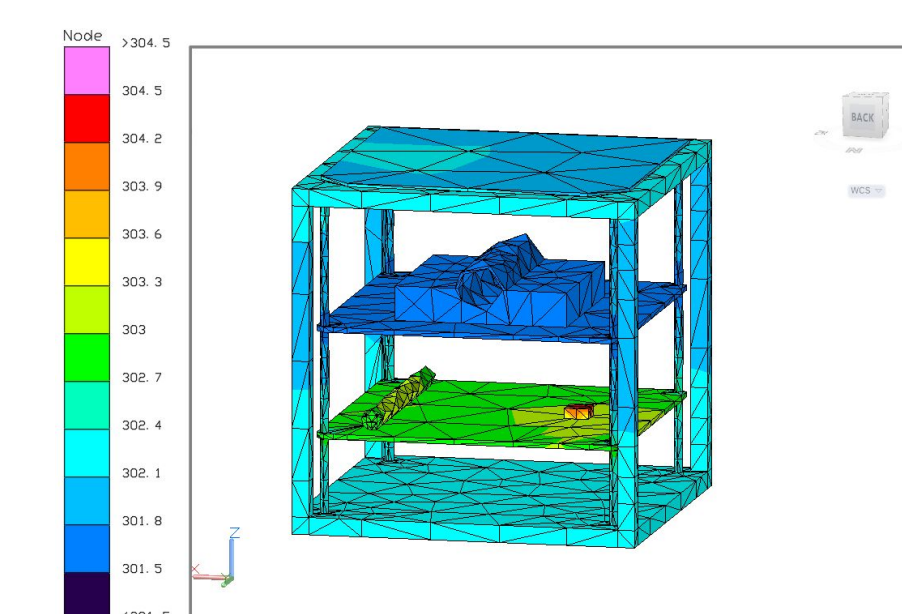
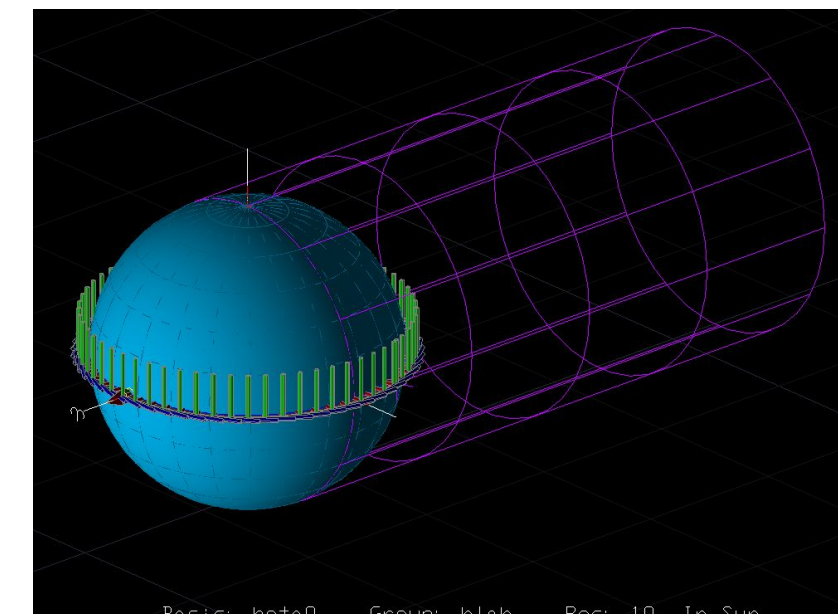
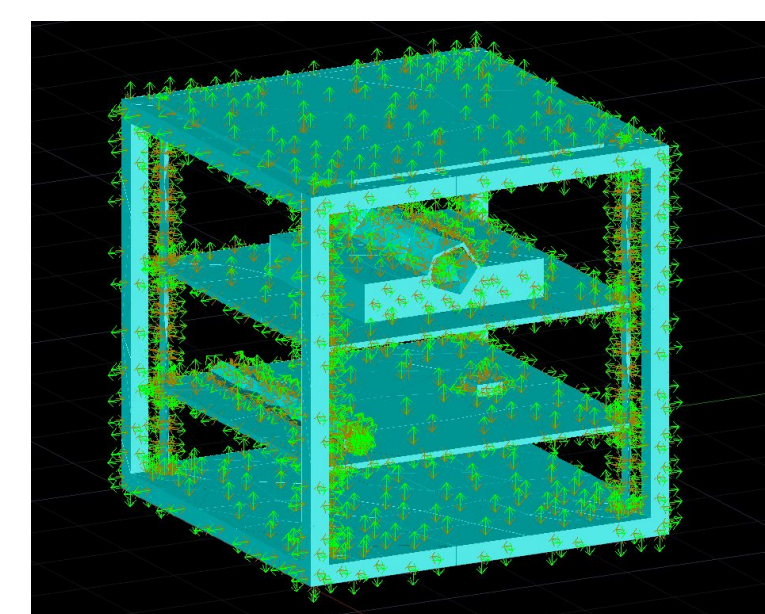
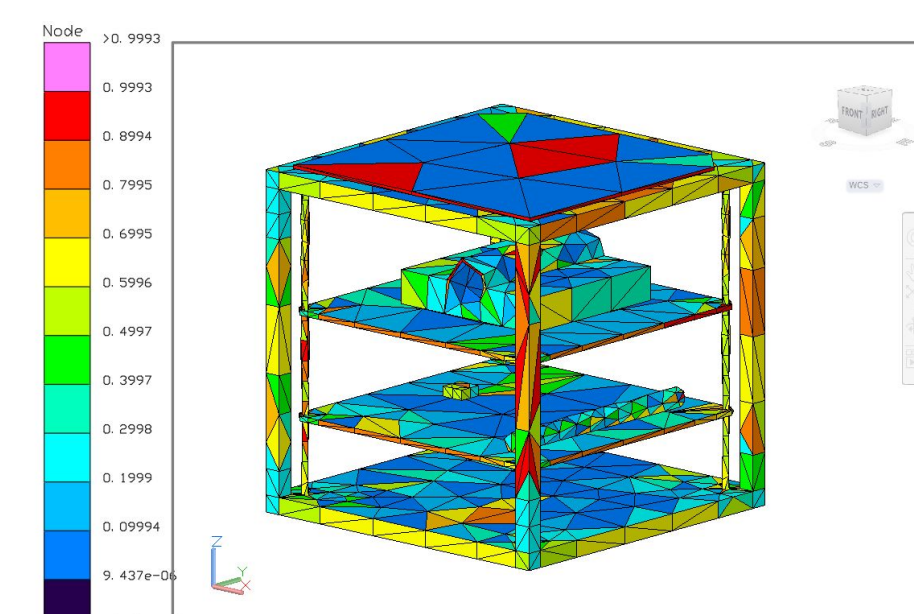
The introduction consists of a start-up section to get the model successfully represented in AutoCAD. The conclusion consists of methods for gathering data from the analysis after a successful run and an appendix of resources. The break-down of the body in the document can be seen below.

Meshing

Contactors

Orbit & Case Set Manager

Post Processing



Conclusions and Future Work

This document's home will be within the Small Satellite Research Laboratory (SSRL) at the University of Georgia. Moving forward, more students are expected to utilize and review the guide. Based on the current results, the concept of a running and editable document is the best way to move forward in order for the resource to be holistic and adaptable to both the SSRL's missions and students alike..

While the exercise itself is specifically catered to the 1U satellite example and is expected to remain relatively the same, the appendix of resources will be the continuously edited section of the document. Specifically, students can revise and add their own findings to the document. The researcher intends to continue bettering the resource for future generations of small satellite members over the summer of 2019 in order to quicken and streamline the process of becoming familiar with Thermal Desktop.

Acknowledgments

Thank you to the participants of this research. The authors would also like to thank their friends and family for their continued support.

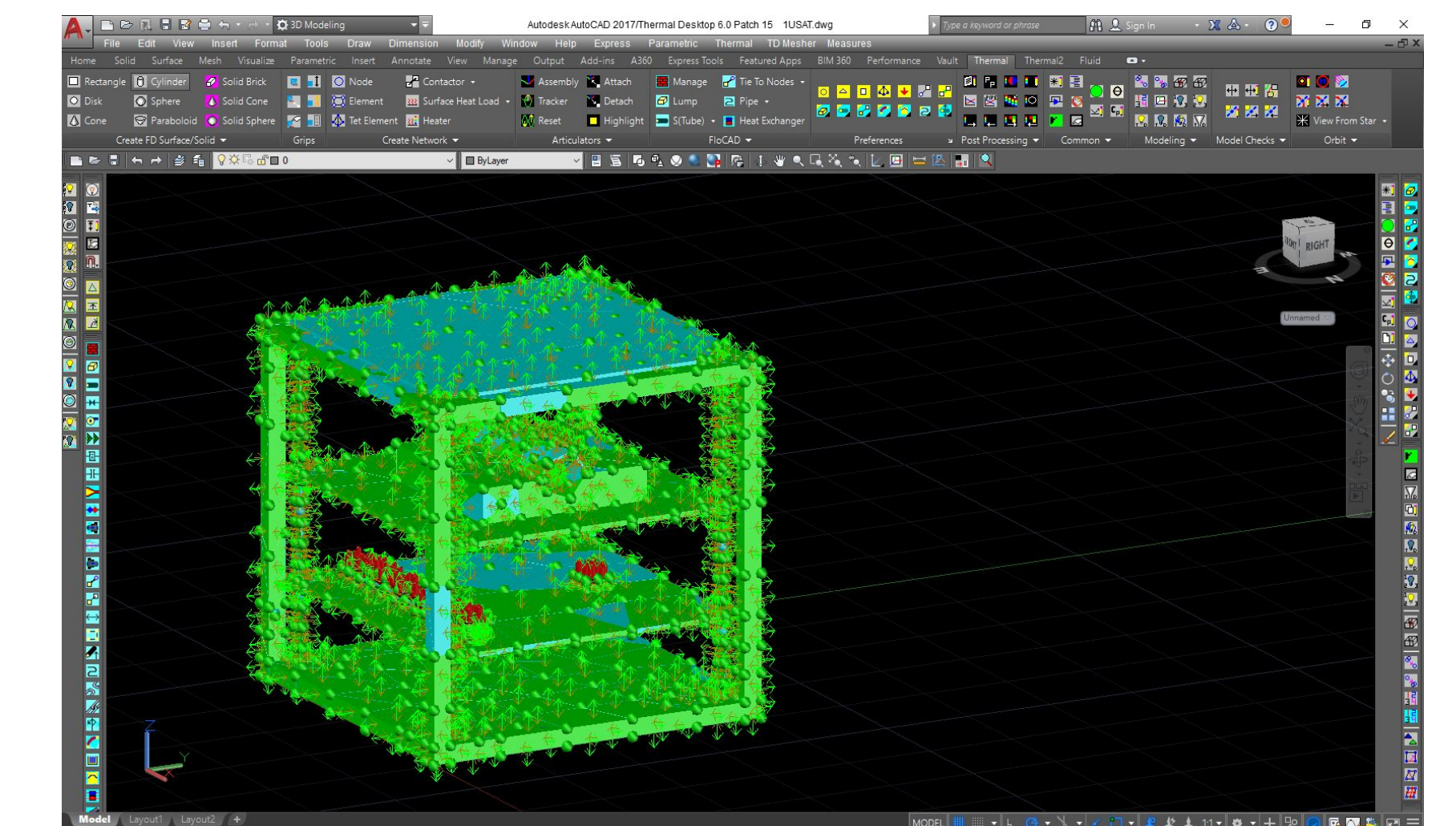


Figure 2: Workspace in AutoCAD, Thermal Desktop with a fully modeled system.

