



Senior Design Project in Electrical & Computer Engineering



Graphical Truss Design Software

Cadet: 1/c Roger Nurse

Advisor: Prof. Holland

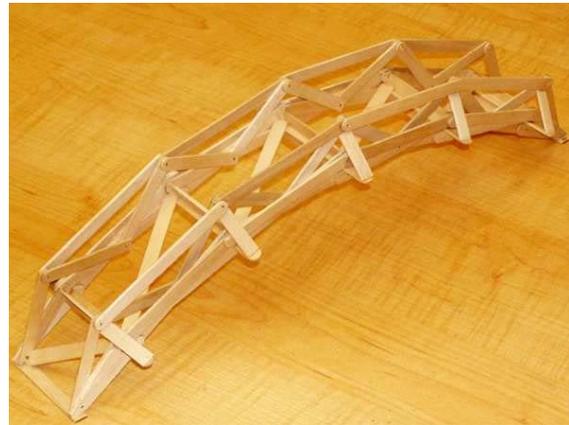
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Project Background

As a part of Statics and Engineering Design (SED), a required course for 4th class cadets, students must first design then construct a model bridge made of popsicle sticks. They then test the strength and efficiency of that model in a class-wide competition. The aim of this project is to develop a software program to facilitate the design and calculations for the truss. Using the software will drastically reduce the time that the student spends designing the truss on paper and doing calculations by hand.

Project Work

- Complete the integration of the Graphical User Interface and the calculation algorithm of the Bridge Design Software.
- Design and implement algorithms to perform statistical analysis on the truss design in an effort to predict the behavior of the truss in reality. These algorithms will take variances in the glue joint strength and the truss elements into consideration.
- Address the issue of cross bracing since the 2-D model designed in the program is only half of the truss and it must be connected to the second half.
- Include the effects of the cross bracing to produce a more realistic prediction of truss behavior.



Project Goals

- Allow cadet to create a truss design with required class specifications, simulating the properties of the material that they will use for building.
- Allow the user to apply various loads to the design to test joints and members strength using Method of Joints algorithm.
- Output a list of the joints and members strength and the weakest member so the cadet can reinforce the member with more popsicle sticks.
- Finally the program will be able to perform statistical analysis on the design to estimate its performs in reality.

Project Plan

Currently, the program GUI has been built and the base algorithms for performing the method of nodes analysis have been written. The next step is to finish the integration of the method of nodes algorithm and the GUI.

Then the statistical analysis algorithms need to be designed and integrated with the GUI. The program will simulate a load being placed at one or more locations as determined by the instructor.

The instructor will supply information about the strength of the material being used to build the bridge. This information will be uploaded into software, which will use the method of joints to analyze the cadets' truss designs.

Since cadets learn to perform these calculations by hand in SED, they will be able to understand the basic method the program is using. The software will contain a user friendly interface along with adequate analysis features. The advanced analysis done by the program will provide an estimate for how well the truss will perform in reality.

Project Breakdown



Graphic User Interface:

- Creates Joints and Members
- Moves Joints and Members
- Deletes Joints and Members



Program Calculations:

- Calculates all forces
- Simulates
- Determines weakest member

