INTRODUCTION

The U.S. is the largest producer and importer of lumber in the world [1]. However, there is a market for homeowners and individual loggers who want to mill their own lumber for personal projects or to harvest and clear fallen trees. Small-scale logging operations often occur in remote locations, making transportation of logs to saw mills difficult and expensive. Also, homeowners may not have the necessary equipment to transport logs. In these cases, it is more practical to mill the logs on site. Figure 1(a) shows a Granberg Small Log Mill and a milled log. Figure 1(b) shows an operator milling a log [2]. An example of the Granberg Small Log Mill being used to cut a fallen tree into lumber is shown in the referenced video [3].

The design objectives for this project are to conceptualize, analyze, and propose a design for a portable lumber mill system. The proposed system should allow small-scale loggers or homeowners to safely and easily mill fallen trees into lumber. A photograph of a typical large section of a felled tree is presented in Figure 2. The system should be portable, easy to set up, position the logs at a comfortable working height, and minimize the likelihood and severity of accidents. Some additional key design parameters are that the system should be affordable for homeowners and must be storable in a small toolshed.

Figure 1 – Lumber milling with Granberg G777 Small Log Mill: (a) chain saw mill and milled log, and (b) operator making a cut [2].
INSTRUCTIONS

Each design team must propose a portable lumber mill system. During the early part of your process, you should thoroughly investigate the existing techniques or products that may be currently used by small-scale loggers or homeowners to mill fallen trees into lumber. You can incorporate the best features from these concepts into your design, or you may choose to engineer an entirely new solution. In the final report, you will need to present a review of current techniques and products and discuss their strengths and weaknesses, and list applicable patents that may limit or influence production and sale of the proposed design.

Deliverables due at the beginning of studio in Week 5 (week of September 15th, 2014)

• 5-minute PowerPoint Presentation outlining Problem Understanding and Specifications.

The progress made on the design effort will be presented to the studio section. Clearly describe the Problem Understanding analysis that the team has generated. Present a House of Quality, Function Tree and Design Specification in support of your understanding of the design problem.

A single member of the team will give the presentation. Review your lecture notes and the chapter of the textbook on technical presentations. This presentation has a large amount of content but only limited presentation time. Each slide should be thoroughly planned out to maximize presentation efficiency.

Deliverables due at the beginning of studio in Week 6 (week of September 22nd, 2014)

• 8-minute PowerPoint Presentation discussing the chosen design. The presentation should include Problem Understanding, Specifications, Final Design Overview, Concept Generation, Alternative Concepts (4), and Concept Evaluation.

A member of the team needs to present on the final design. Briefly review the understood problem and specifications, and update the audience on any significant modifications that have
been made as the problem understanding has evolved. Discuss the functions that the design must execute.

Present the final design using a functionality-based overview. Discuss the concept generation process, and show a morphological chart and discuss how the chart led to the best alternative designs. Present the four best alternative design concepts generated (not including the final design, so you will show five designs total). Justify the selected design.

This presentation is worth 5% of the overall course grade.

Deliverables due at the beginning of studio in Week 7 (week of September 29th, 2014)

Two copies of a final report containing the following:

1) Title Page
2) Abstract
   • Standalone summary of this report’s contents
3) Introduction
   • Define the customer’s needs\wants\desires, the overall product function, and design challenges.
   • Present a concise review of current techniques and products and discuss their strengths and weaknesses. Also address any applicable patents. (Any documentation/pictures/videos obtained from the Internet must properly cited using IEEE reference style.)
4) Design Objectives
   • Include succinct presentation of the problem understanding process followed and results from the analysis:
     • House of Quality
     • Function Tree
     • Specification List
5) Design Overview
   • Give a detailed description of the final design including quality CAD-generated figures that show its components and how it operates.
6) Alternative Designs
   • Present and discuss four alternative design solution ideas. (That means five total designs.)
   • Written explanation of why you chose your design from among the five considered designs. Use a structured evaluation process.
   • Explanation of the advantages and disadvantages of your chosen design.
7) Discussion
8) Conclusion
The report should include a maximum of five (5) pages of text, plus as many figures and tables as necessary. The report should adhere to the format requirements detailed below:

- Times New Roman typeface
- 12pt font
- 1.5 line spacing
- 1.0” page margins
- Figures, tables, citations after the complete body of text including appendices
- IEEE reference style

This report is worth 10% of the overall course grade.

REFERENCES

