MaryMorse

Design and Mechanical Engineering Portfolio

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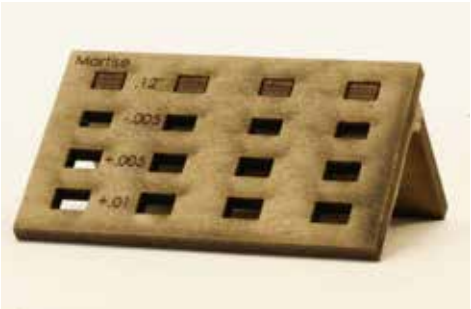
Identify Opportunity

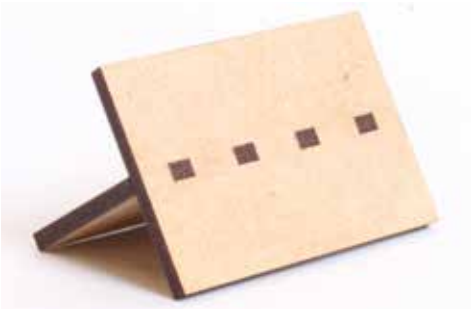
Laser cutters are becoming cheaper and more accessible as a prototyping tool. Resources that teach about laser cutters are either academic and intellectually out of reach or overly simplistic.

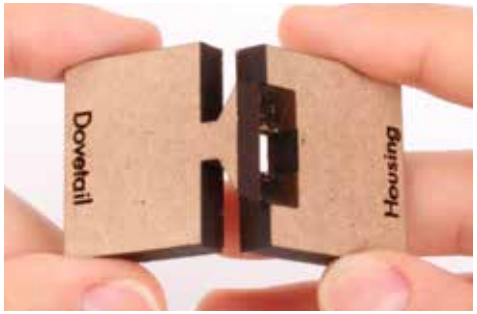
Goal

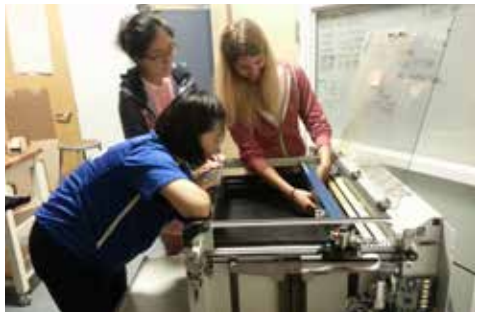
Create the ultimate guide to prototyping with the laser cutter filling in the gap identified in available resources

Process of Becoming a Boss









Experimentation played a large part in our development of techniques. At some point in the summer we had become experts and no one else had the answers to questions we asked.

The breadth of our experience forced us to overcome a variety of problems along the way. This gave us a holistic understanding of the machine allowing us to troubleshoot unexpexcted issues with the laser cutter.

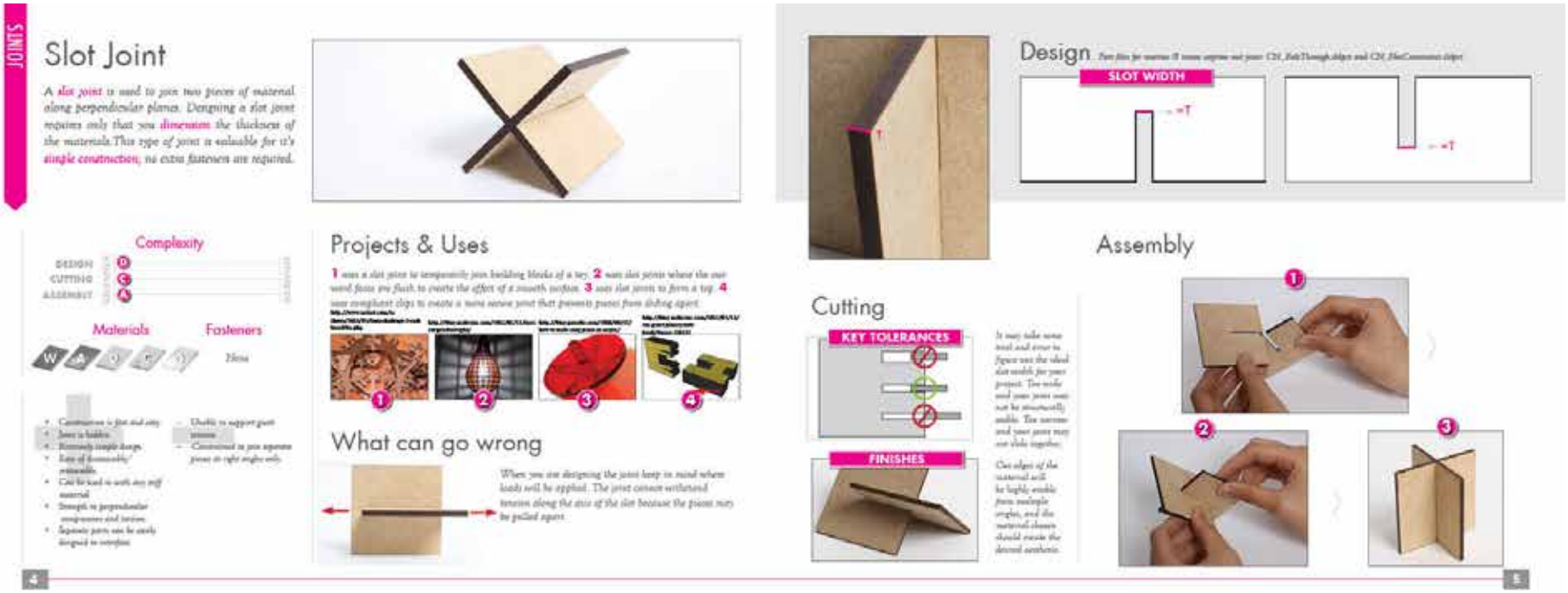
01 Laser Cutting “Like a Boss”

The Book - "Laser Cutting Like a Boss"

User Centered Design of Book Contents

Our team presented at World Maker Faire in September to share what we've learned so far.
We also used this opportunity to perform user research which has shaped the way we present information in our book.

Preliminary Page Layout



02 Cont'd

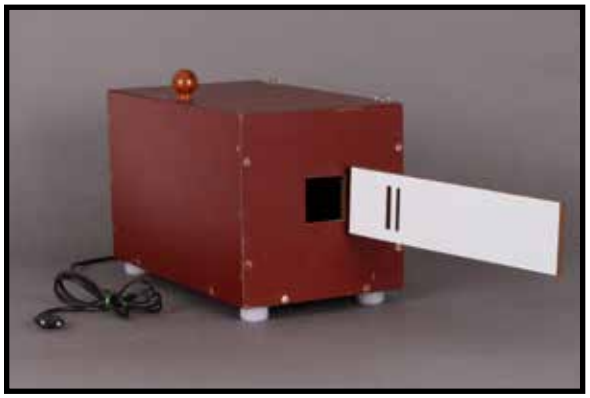
2D design
Ethnographic Research
Prototyping

Team of 4 + 2 advisors
June 2013 to Present

International Partnership

We are team of students at Olin College of engineering working with Agastya, the largest hands on science organization in India, to create educational toys and curriculum which will travel to rural schools all over India. We are currently developing a ray projector used to teach optics based on one of Agastya's designs.

Bright Box development

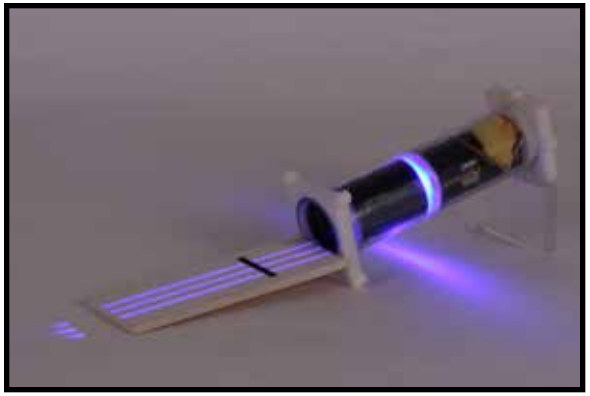


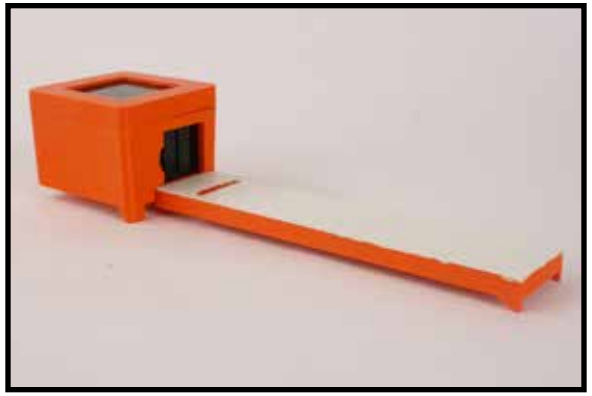
Interactive
Provides hands on learning experience

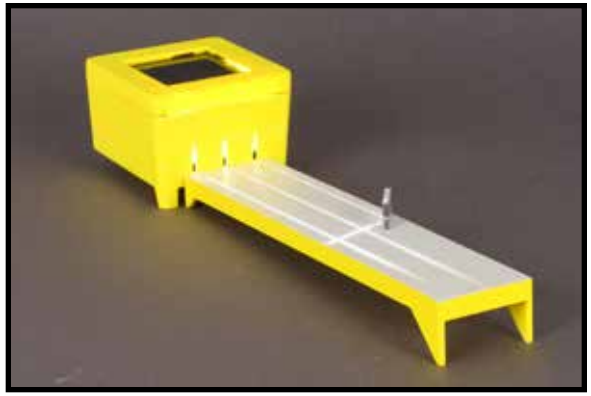
Kid-Sized
Less than 3 inches in each dimension

Solar Powered
Usuable in rural school houses without electricity

Durable
Withstands the most curious hands







Agastya's dream is to distribute 500 of these toys through their mobile lab program. To meet this aim we are designing the toy to be injection molded and launching a kickstarter to fund the manufacturing.

03 Optics Educational Toy

Project Management
Design for Manufacture

Team of 12 + Advisor
2 years

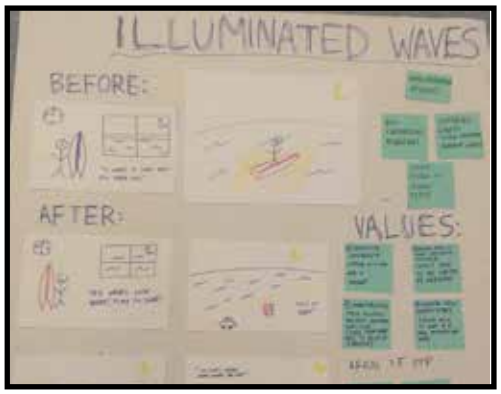
Goal

Second-year project to gain experience with user-centered design. Worked with winter surfers as our user group

Process

Meet surfers and perform ethnographic research.

Develop personas and other frameworks to aid design process



Generate large number of raw ideas and sketch out most promising

Create props to codevelop ideas with users

Final Solution

A projector sits on the bottom of the ocean and illuminates the surface of the water which creates a light show and gives users an entirely new surfing experience. The projector is controlled by a remote worn on the wrist.

Reflection

- People don't always know what they want/need
- Don't just improve an experience, create an entirely new one
- Dream big - it's easier to bring a lofty idea down to earth than to make a simple idea bolder

Individual Contribution

- Leading role in 'Understanding Surfers' phase
- Leading role in ideation and brianstorming
- Supporting role in final prototype development

04 Design for Winter Surfers

Ethnographic Research
Concept Generation

Team of 4
3 months

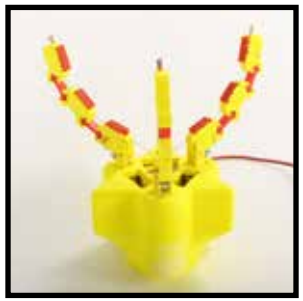
Challenge

The final project of the Introduction to Mechanical Prototyping course was a study of underactuation, when a device has more degrees of freedom than sources of actuation. Each team was given one motor and three chances to build an underactuated hand, which would adapt to the shape of the objects being picked up.

Individual Contribution: Finger Design

Prototype 1: RP and Molded polymers





- Design and model in Solidworks (including molds)
- Mix and pour polymer grips and joints
- Assemble cable drive

Prototype 2: Sheet Metal and Plywood


- Design linkage fingers based on existing theoretical model
- CAD linkage mechanism and animate as proof of concept
- Fold and assemble water jet cut aluminum parts of finger

Prototype 3: Combine and Refine Past Models


- Choose to keep linkage finger design for control of motion
- Add 3D printed finger tips so that polymer grips can be molded
- Eliminate half of sheet metal parts to lighten the load

Success!

Reflection

- Fail early and often for final success
- Design with construction in mind

Skills Learned

- Sheet Metalworking
- Polymer pouring and processing
- Design of underactuated system
- Group CAD integration
- Design for sheet metal
- Design for 3D printing

05 Robotic Hand

Prototyping
Mechanical Design

Team of 4
1.5 months