# Modern Catapult


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## Art/Egt 396: 3D Modeling and Design Processes

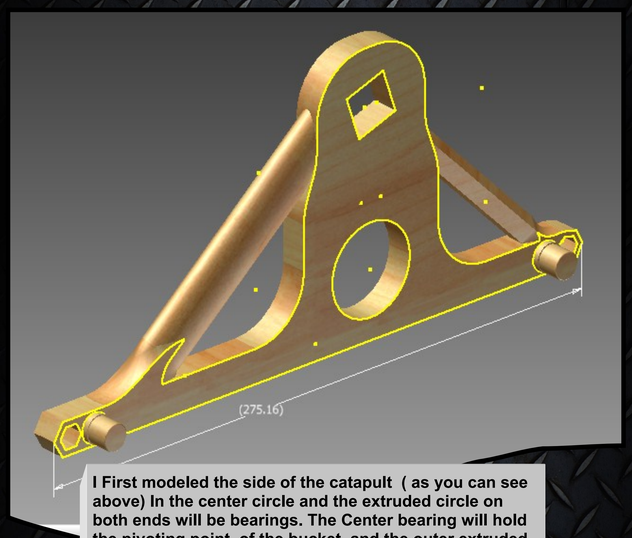

## Abstract

A catapult is an ancient engineering engine for hurling an object. I plan to build all the pieces in an Inventor (3d modeling software) and then print them to make a catapult. The connections will have to be tight so that when it launches an object it will not fall apart. There will be a big focus on tectonics (which is the art of connections) and on the strength of the design. I will learn more about the 3d printers, perfect tectonics, and find the strengths of the plastic in extreme conditions. I most likely will have a lot of problems with the 3d printer being able to print the parts and connections I want. I expect to have a fully functioning catapult by the end of the project.


## *Outline*

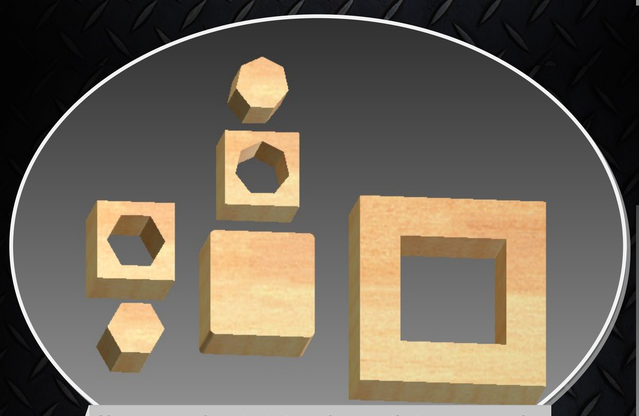
**March 22:** Finish abstract and start designing
**March 27:** Work on 1st design
**March 29:** Print something
**April 3:** Test and edit design
**April 5:** Make design better and more elaborate
**April 10:** Figure out how to make range adjustable
**April 12:** Make range adjustable by changing the launch trajectory
**April 17:** Print
**April 19:** Edit and test and reprint if necessary, Get supplies for poster over the weekend
**April 24:** Finish Poster
**April 26:** Turn In

## #1 First Side

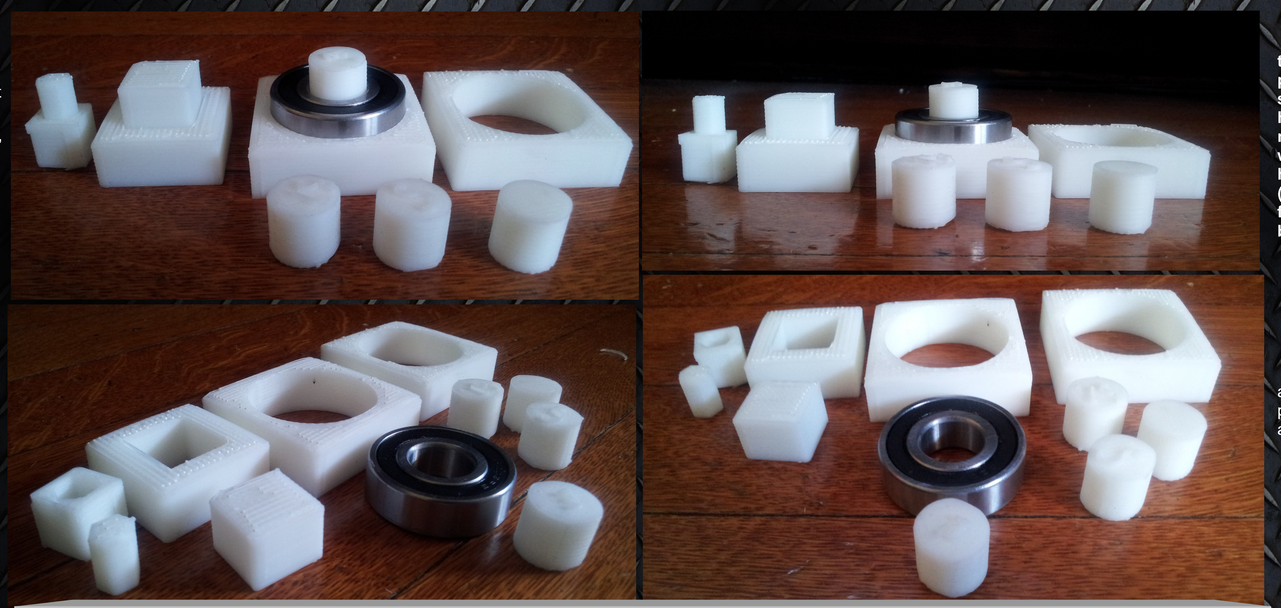



I First modeled the side of the catapult ( as you can see above) In the center circle and the extruded circle on both ends will be bearings. The Center bearing will hold the pivoting point of the bucket and the outer extruded circles will be for the wheels. The square directly above the center circle will be the beam that will stop the bucket. The two holes on the end will be for beams that will connect the two sides together.

## #2Tests



Above are various tests to make sure that every tectonic (connection) will fit perfectly together. On the far left is the connection on the far left (please refer to the first picture) . In the top middles is the connection on the opposite side of the of the first picture. The connection in the middle is the stopping beam.

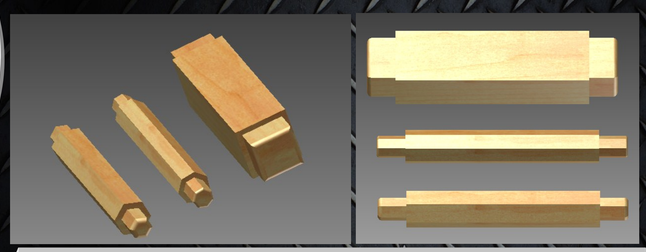


Above are several test prints to make sure the connection are perfect. The bearing was a little more difficult because the connection had to be very tight so that the bearing would actually move and not the plastic. You can barely tell but on top of 3 of the 4 extruded circle is a letter so that I could tell the different sized cylinders apart, which shows the precision of the printers.

## #3 The Bucket

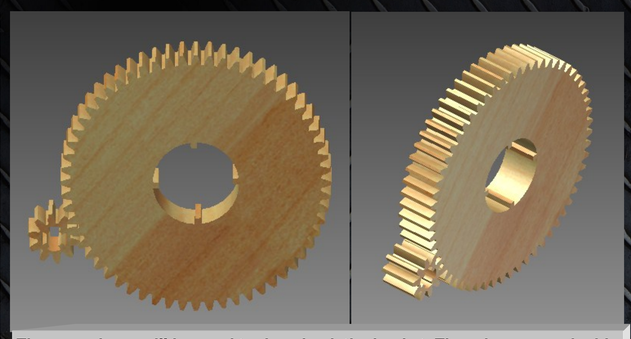
The bucket above was probably required the most thought to model. I started with just a triangle in the middle then extruded everything from it. In the middle of the shaft is a little divot for the rubber band to ride. And at the bottom are little grooves for the gears to set. At each end of the pivoting beam will be the

## #4 Beams

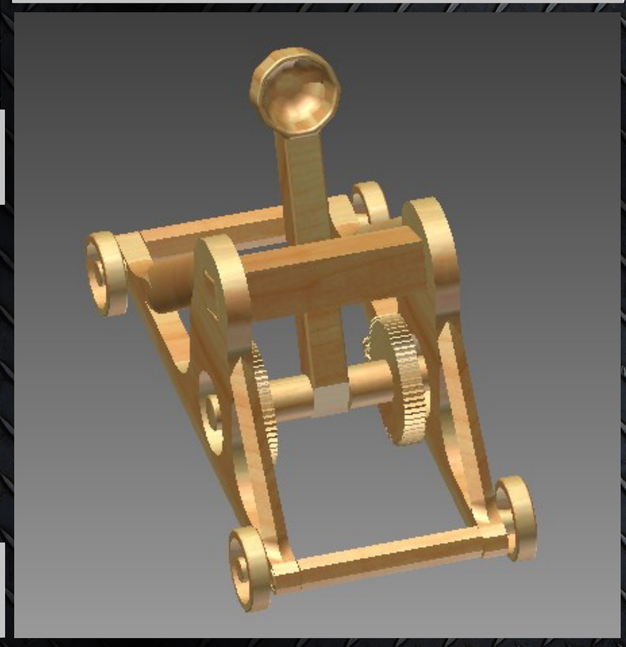


The beams above will connect the two sides together. I chose three different shapes the far left one is a hexagon the middle one is a heptagon and the end on is of coarse a square.

## #5 Gears



The gear above will be used to draw back the bucket. There is grooves inside the bigger gear that will slide on the pivot beam of the bucket. And the grooves inside the smaller gears will slide on the crank handle.



## Method

**Please Refer to captions. The captions are ordered in a step by step patterned starting at the top left going strait down. I used Inventor to model all the parts. I started by modeling one side (as seen in picture #1) I then mirrored the side to make the other side. After I decides all the different connections I would have I modeled the connections in Inventor then printed them to test the connections ( as you can see in the picture to the left). I next made the bucket ( #3) which will hold the object being lunched. The beams were next ( #4) they would hold the two sides together and the bigger one would stop the bucket. The gear ( #5) was actually one of the easier parts to make because in Inventor the have a function just for making gears. I then assembled them all in inventor which can be seen in image #6.**

## Conclusion

There is a lot of fine tuning to be done with the 3D printers to be able to print an accurate model. But we are the first class to use the 3D printers so that is to be expected. 3D printing is becoming the way of the future and here at Missouri western we are getting a head start.

## References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http://www.scottishmist.com/index.php?option=com_content&view=article&id=111:jewellery-with-a-history&catid=51:latest&Itemid=66
http://library.thinkquest.org/05aug/00627/phy.html
http://transformerstrebuchet.pbworks.com/w/page/24114717/Welcome


## #6 Finished Work