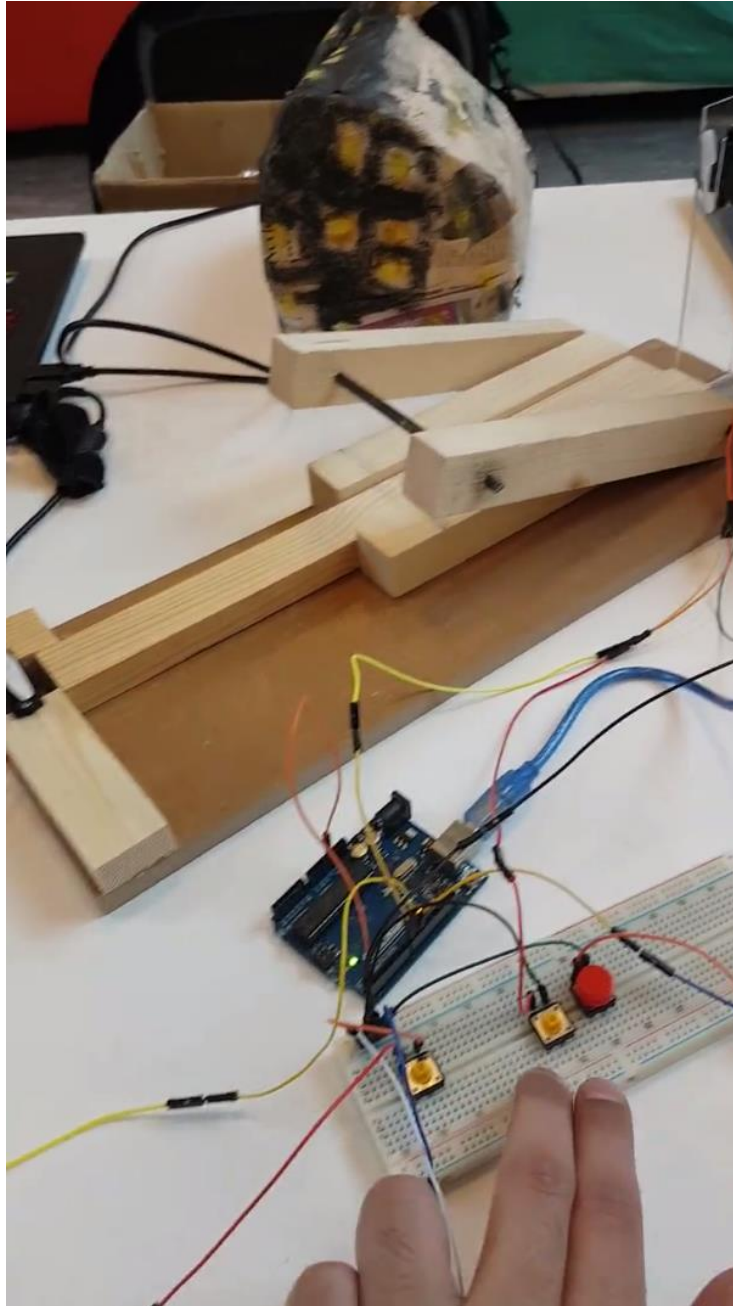# If This Then That

Catapult

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Versioning

Date	Version	Change	Who
23-1-2017	1	Start of the document	Muhammed

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Introduction

I wanted to recreate Arduino Controlled Catapult. But because I had no experience whit Arduino, it was harder than I taught. Also I burnt my 9 volt cable so I needed to improvise how to do the electronic parts.
In the end I could not finish it, but you can see that there is not much left and can see when I wanted to achieve.

Resources

Step 1

Before you start, you need the following items.

- 8 coloured cables(at least black, red and yellow)
- Arduino Uno
- USB cable
- 3 servos(2.5 kg is the one that I used), if you want to use stronger ones, you will need to use 9 volt, but my schematics is not set for that.
- 3 push buttons
- Wood for your catapult.
- Plastic to attach your servo
- Spring
- 2 iron pins to keep your catapult together.

Creating the Catapult

Draw how you will make your catapult, it does not to be a piece of art.
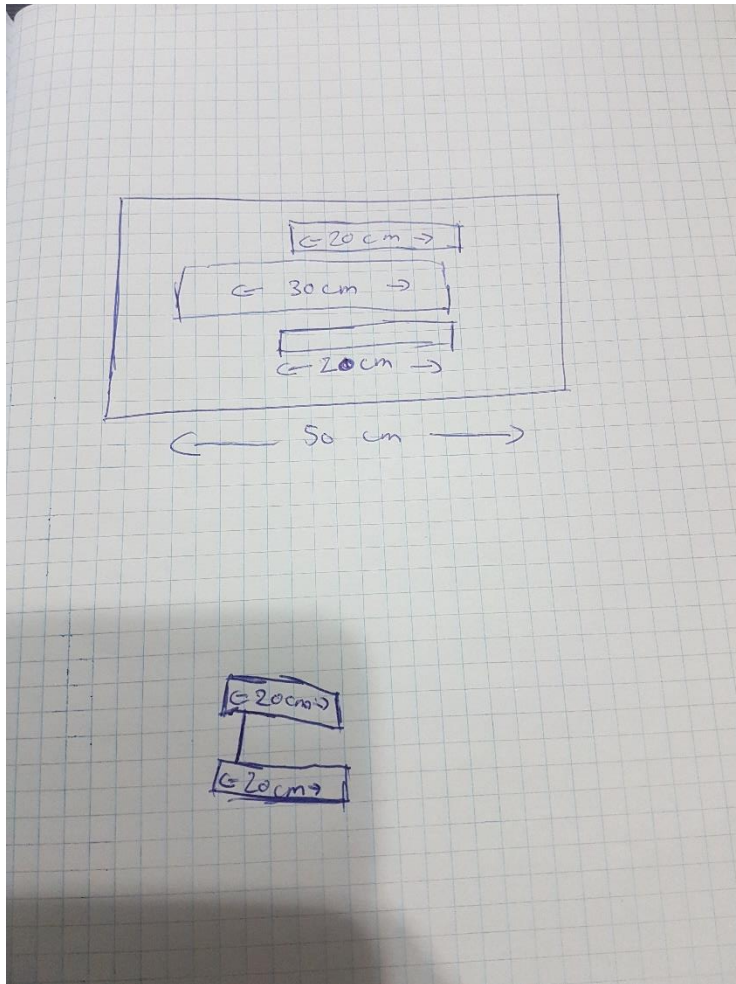
You need to have the base where you clue and hold your catapult, then you need your middle piece that fires. 2 pieces next to it is for its sturdiness. And last but not least, the drawing under is for your angle when you want to fire it.

Step 3
Get your wood ready.

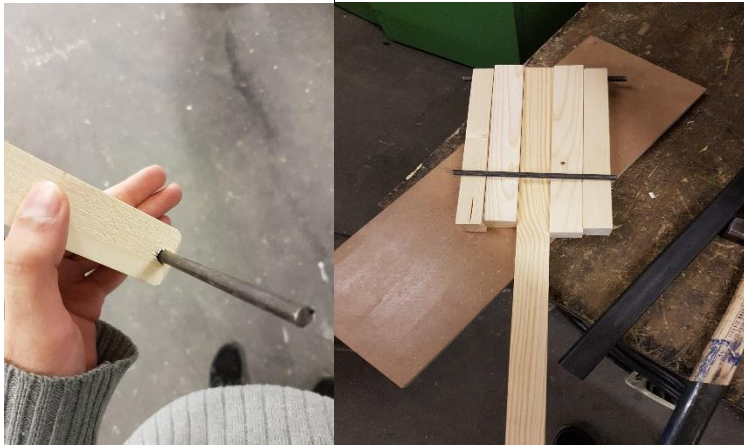After drawing you need to get your wood and get them ready for the next parts.

Step 4
Scour your wood.

You need to scour the wood, so that it can move finer on the board.

Let's drill some holes

For this you need to drill holes on all your wood pieces and you need to drill 1 extra hole in the ones you will use for the angel.
But the most important is that you need to get 1 pin a bit loose, that's the one that holds all the pieces together. if you don't do that you can't move your catapult properly. And the one that you will use for your angle needs to be stuck hard and should not move out.
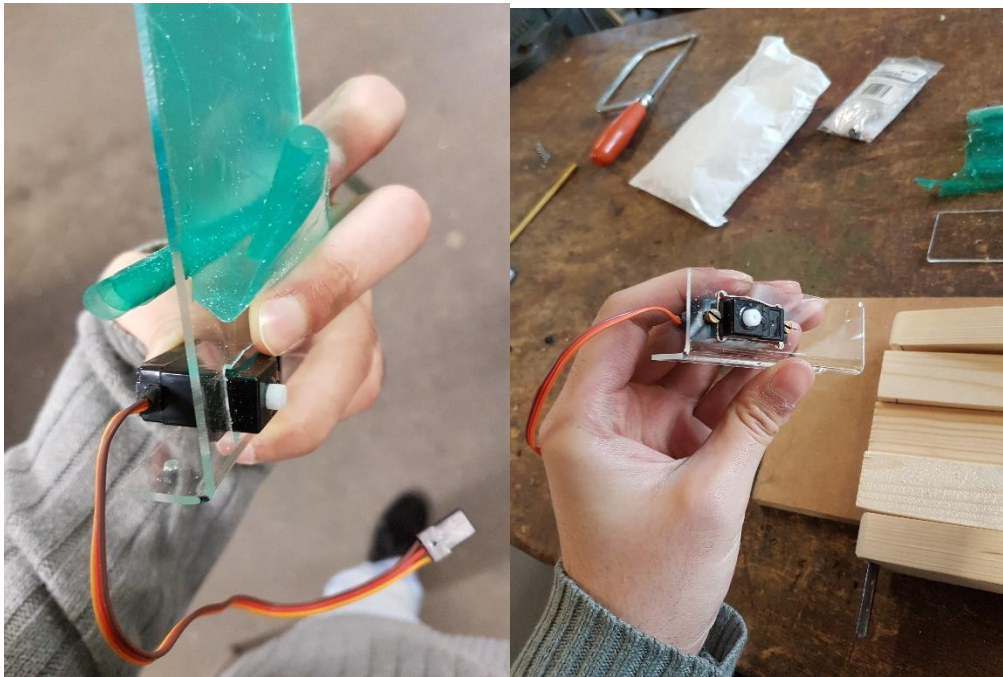
Step 6
Get the plastics

This part can also be done differently, but I used plastic. This is to hold 2 servos 1 for the angle and 1 the spring. What you see here is that I warmed the plastic up and bended it. The bended part is used to screw it on the board. As you can see I already made the holes.

We need to saw

After bending the plastic we need to saw some space for our servo's. I did it with a fretsaw. Drill a small hole and use a fretsaw to make some space. After I was done sawing I remembered I also could laser it, but what's done is done.
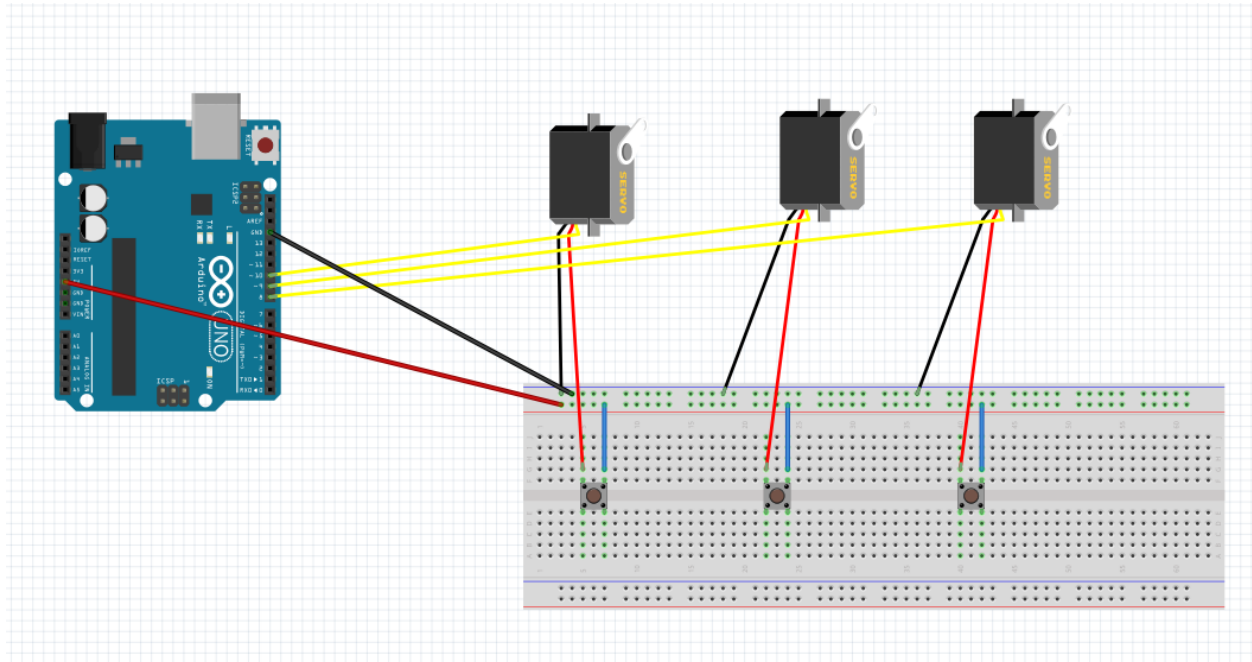
Step 8

Put it together.

So far so good, now we put everything together what we have so far. Also get some wood glue.

Schematics

This here are the schematics. This is how I put everything together.

Like I said I burned my 9 volt cables, so I needed to change some things, but because of that you should be able to do it like this without resistors.

The yellow cables are used for code, red is for the buttons and black is the ground cables. If you understand this the rest makes more sense.

Code

This step is for the code, if you don't have this you can't do anything. I'll add the code as a zip file.

Putting Everything Together

You can now compile and upload the code, get the cables and you should be done. At least as far as I got.

I could not finish it yet, but I can finish it later. So far you could see what I try to do, and maybe you can finish it yourself.

Design Choices

Why did I chose for this project?

In the first 2 weeks we needed to think what I wanted to make. But I could not think of something to do. At some point a classmate, Mark Smith told me that he would make a crossbow. After he told me that we discussed and I decided to make an catapult.

Why did I chose for those dimensions?

I wanted to make a big catapult, but also I did not have much money to buy new wood. What I did was go to woodworking and see if I could get free wood from leftovers. That's also what I used.
From the free wood that I had I measured and chosen those sizes so it can look the most like a catapult as well work properly.

Why did I scour?

I chose to scour because when I placed the wooden blocks they would not move well. To fix that problem I scoured it.

Why did I drill and pin it?

To let the catapult shoot while being stuck to the rest of the construction, I needed a moving mechanism. For that I drilled a hole in all the wooden pieces and put there an iron bar.
And for the wooden piece for the angel I needed that to be as stiff as possible so that it won't come off when you shoot.

Why did I use plastic?

I used plastic because I did not have enough wood, also I taught using wood to much would make the whole thing look ugly. Furthermore I found it simpler to saw some space in plastic for my servo that in a wooden piece.
I also used fretsaw to make space for the servo, this could be done with laser cutting, but I could not do this on time. Mainly because I needed to make an appointment which took too long.

Why did I make the schematics the way it looks now, and why did I use that code?

For the schematics I worked some time on it. Mainly because I did not get the whole idea how the cables where connected. At first I made 1 servo work, but the way how I placed that I could not make other servos attach to it. After 4/5 different attempts I understood how the cables worked and where I could put them to make more than 1 servo work the way I wanted it.
The code that I used was a sort extension what we used in the lessons. I do understand the code because I am a programmer myself, but for me a new language like this is not learned that easily. Even if it is a relative easy language.

Reflection

I found this project fun to do, but also very tiring. I learned a lot from this project. How the circuit works, how the code works and also the almost infinite ways to use Arduino.

What I did not like at the beginning of this project where the first 2 weeks. I felt like thrown in a pit and see what happens. The lectures where long and uninteresting while giving no real help. When you have a question they don't come or can't come because there are too many students that have problem and just 1 or 2 teachers that are available.

The second week I had my idea so I could at least work on it and see how far I could come. I got great help in woodworking and ironworking spaces. The teachers there where very helpful and ready anytime. I learned the different work methods in those working spaces, the next time I go there I can work faster, because I now know how those machines work.

But what I liked the most in this project was the end moment, when I made the 3 servos work end you could see what I want to achieve if I could finish it.

This pdf has 2 parts. 1 is the text that I also put in instructables and the second part is my design choices with my reflection on the whole project.

Link for my instructables is here: http://www.instructables.com/id/Catapult-With-Arduino/