

Prosthetic Arm

Robotics Club Project



Mid - Term Evaluation

SnT Summer'17 Camp

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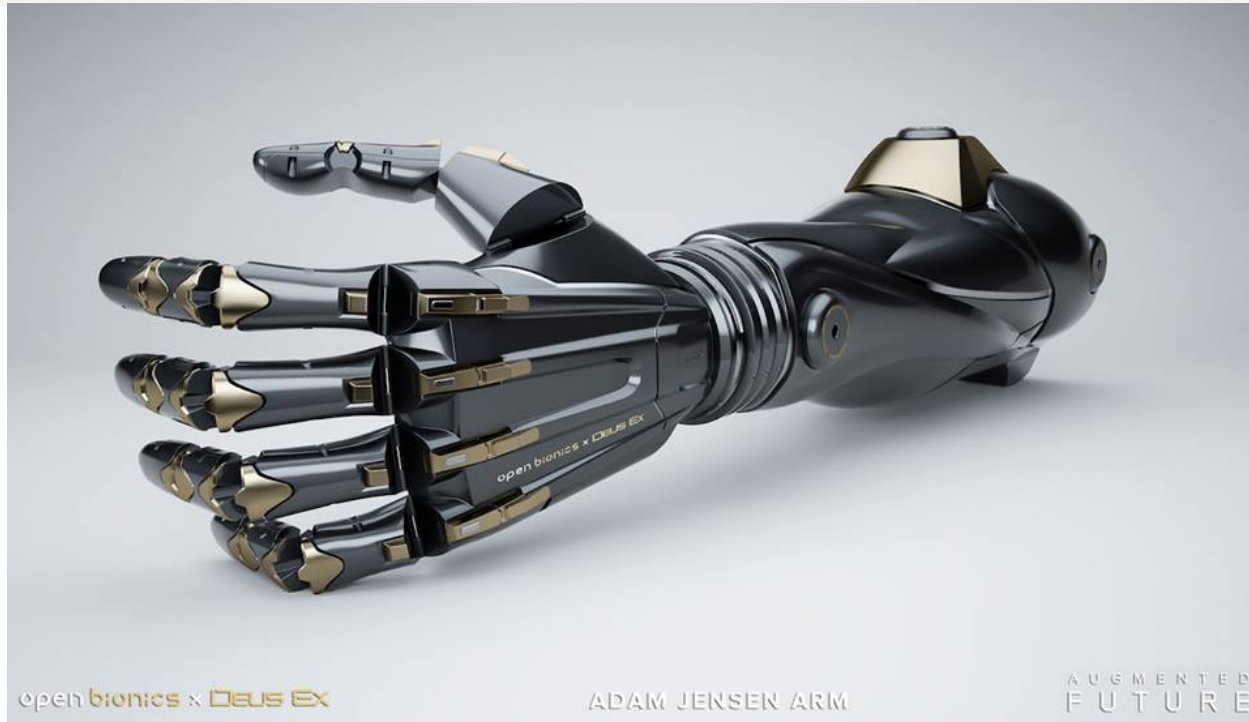
Vipul Bajaj

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Aim of the Project :

- Building a Prosthetic Arm which can do gripping of certain objects through hand gestures.



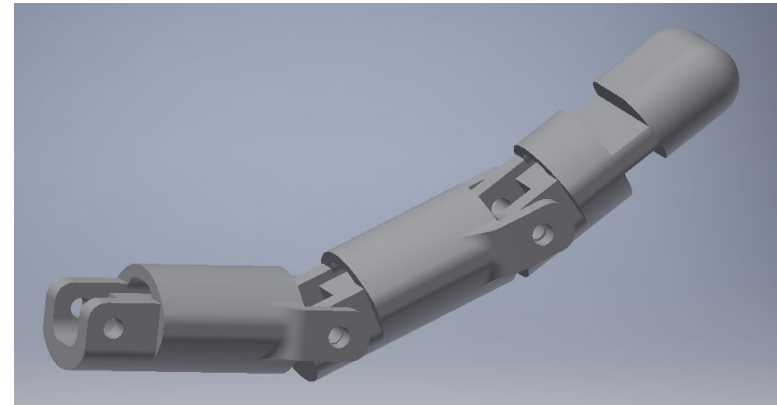
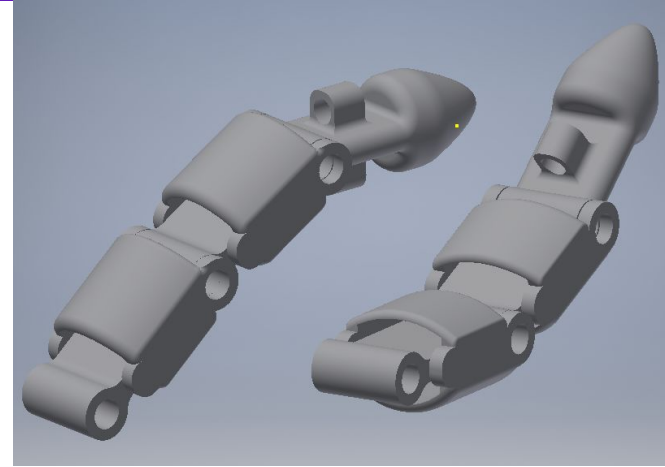
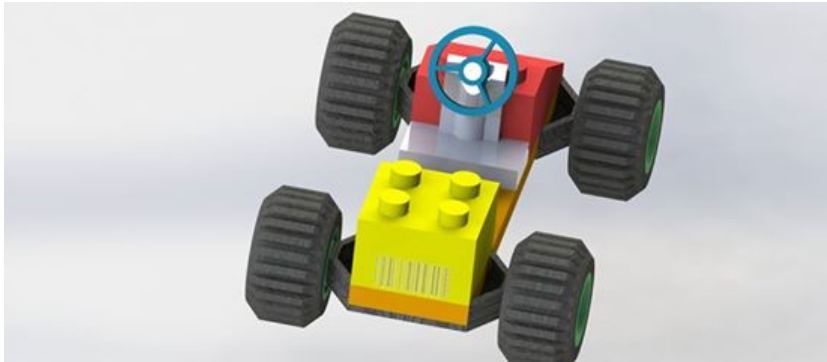
Abstracts and Objectives :

Our Objective is to design a Prosthetic arm which can grip objects . We control it by motion of our fingers by transmitting signals through bluetooth module via hand glove . Our 3-D printed prosthetic arm works by thread mechanism , arduino and servo motors .



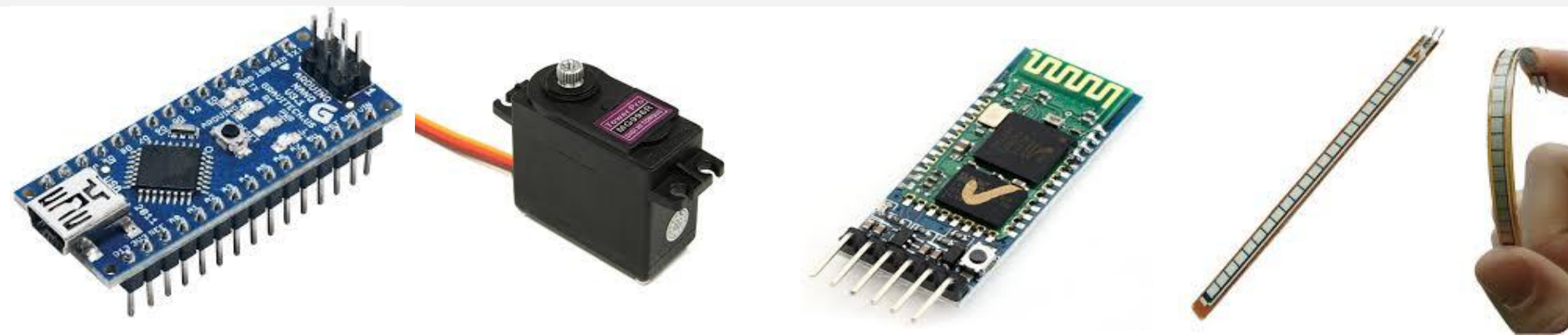
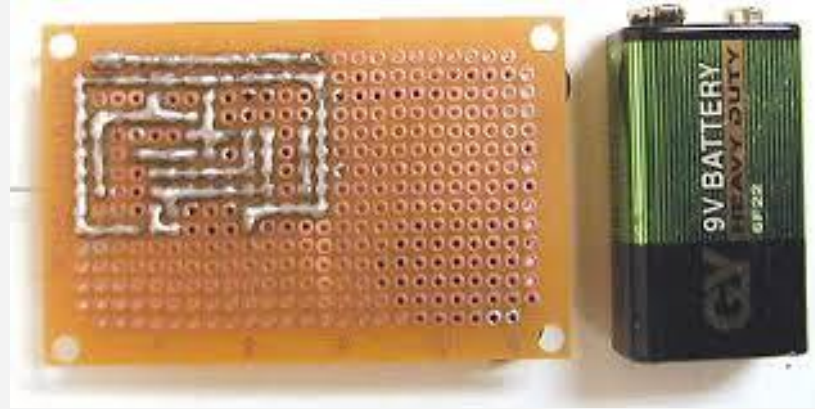
Work Done : Mechanical Work

- ❖ Learnt Inventor and designed a Lego car
- ❖ Studied the various designs of hand available on internet
- ❖ Studied the design a of plastic hand previously made in school
- ❖ Finalised the basic working mechanism and finished first design
- ❖ Testing of 3-D printed model and rectification
- ❖ Finalised design of the finger (rectifying all errors till now)



Work Done : Electrical Work

- ❖ Worked On--
 - Arduino UNO and NANO
 - Flex Sensors
 - Servos (MG-946R)
 - Bluetooth Module (HC-05)
 - Soldering
 - Made the Circuit for Hand Glove



Problems faced and solutions :

- **Flex Sensors shows variable reading for same position after every use.**
 - Take average of min and max voltage and set that as threshold voltage.
- **Sending signals from 5 different inputs.**
 - We considered the input as 5 digit binary number and converted them to base 10 for transmission.
- **3-D Printing - quality of printing**
 - The quality of 3-D printed finger wasn't upto our expectations and so we had to scale our designs.
- **Soldering**
 - When we tried soldering in starting, it got short-circuited. Then we learnt that properly and did it more precisely.
- **No proper Physical Constraints in our first design of finger**
 - Previous design didn't have any sort of physical constraints and hence could have worked only if the joints were equally smooth. The new design is however constructed in a way to provide physical constraints so that the uneven motion can stop.
- **Budget Constraints**
 - We wanted to use Force Sensors but due to constraint of budget we couldn't do so.

Unresolved Problems :

- Placement of servos
 - We were confused whether or not to include wrist motion in our project or not, so we could not place the servo motors in the design.
- Motion of Thumb
 - We had planned for motion of thumb in 2 directions. Initially we thought of doing it by using 2 motors for thumb but it became a very complex design. So we tried how to overcome this problem and are still working on this part.
- Taking analog inputs from Flex Sensors
 - Difficulty in sending very large numbers via bluetooth module.
- Poor quality of 3-D printing

Timeline - Electrical Part :

- Learning Arduino
- Testing Servo Motors
- Working On Flex Sensors
- Circuit Designing
- Learning about Bluetooth modules
- Pairing bluetooth modules together
- Serial Communication between bluetooth modules
- Soldering the circuit for hand Glove
- Worked to get input in form of arrays for 5 different inputs from different fingers

Timeline - Mechanical Part :

- Inventor Workshop
- Designing Lego toy car
- Studying the design of human hand on net
- Studying the design of plastic hand made for a school project
- Understanding the thread mechanism for finger motion
- Designing Finger
- Designing Thumb
- Palm Design
- Joining the components
- Design Optimisation

Future Works :

- To make the hand glove and complete the Model of it by sewing flex sensors with it.
- Printing and assembling remaining components of prosthetic arm.
- Working on the design and placement of servo motors.
- Connecting all 5 flex sensors with motors and working on it.
- If time permits or if we continue it as a long term project after Summer ,then we will work on wrist motion and arm motion.

Codes and Tutorial Links

[Report on Previous Finger Design \(for Internal Evaluation\)](#)

[Latest Designs](#)

[Old Models](#)

[Hand Design and instructions for Joining 3-D components](#)

[Connecting HC-05 bluetooth modules with arduino](#)

[Flex Sensors theory and circuit connections](#)

[Servo Motor MG-946R](#)

Suggestions ?

THANK YOU !