

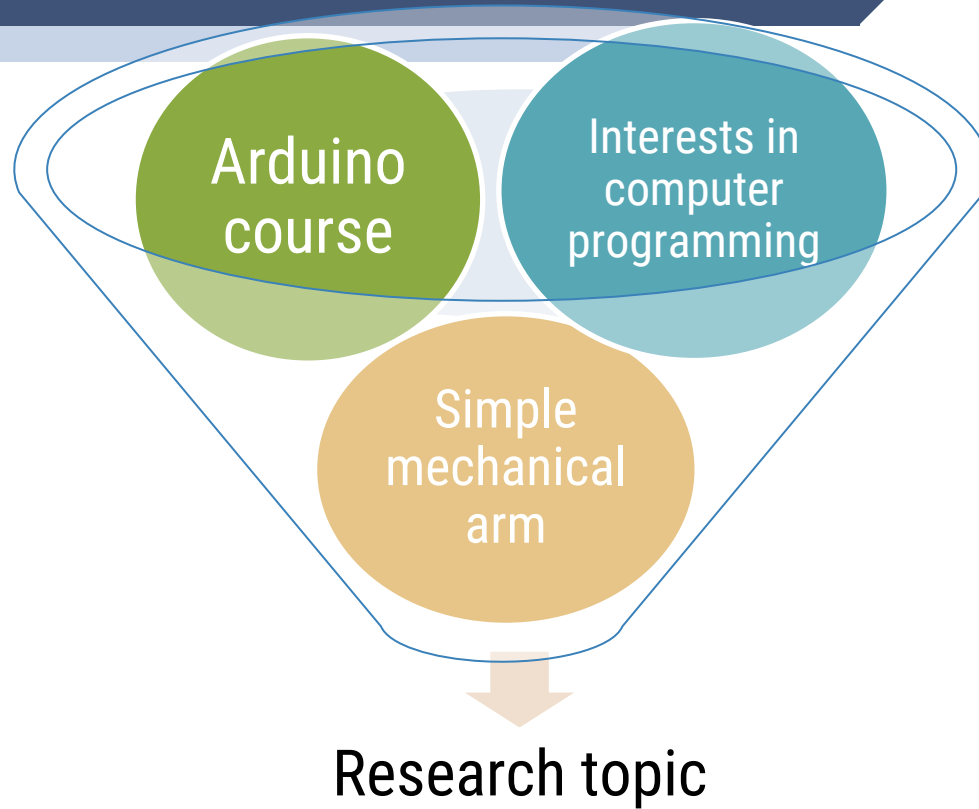
Independent Study- Remotely controlled Excavator

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Adviser: Ms. Chang, Mr. Wang



Motivation





Goal

Create a mini excavator

Scoops and
lifts

Can be
remotely
controlled

Introduction of the project

Introduce excavator at each stage

Introduction

Mechanical arm

First version

Second version

Third version
(Excavator Research project)

Chengche

Chengche & Yowei

“ First version-
Mechanical arm



1st Version – Mechanical Arm

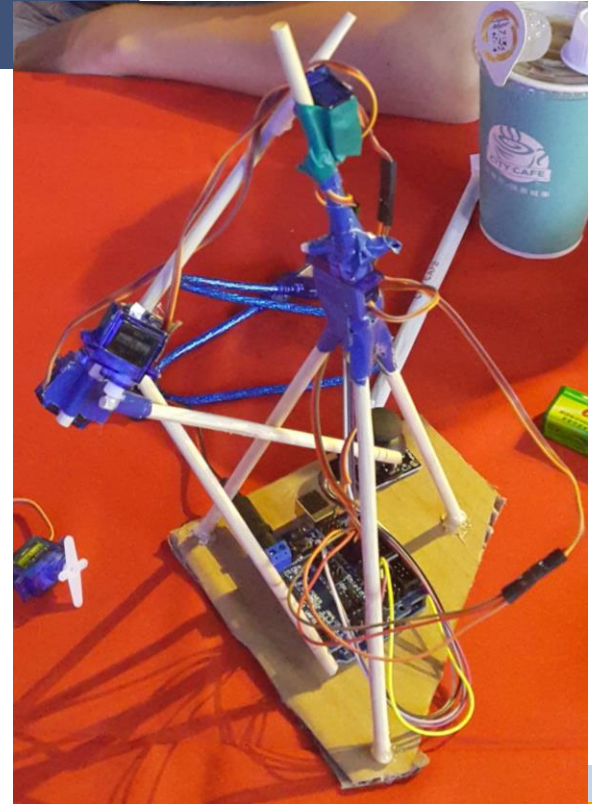
A simple version of mechanical arm

Hardware:

- Bamboo chopsticks
- Tape, hot glue
- Motors(sg90)
- Joystick

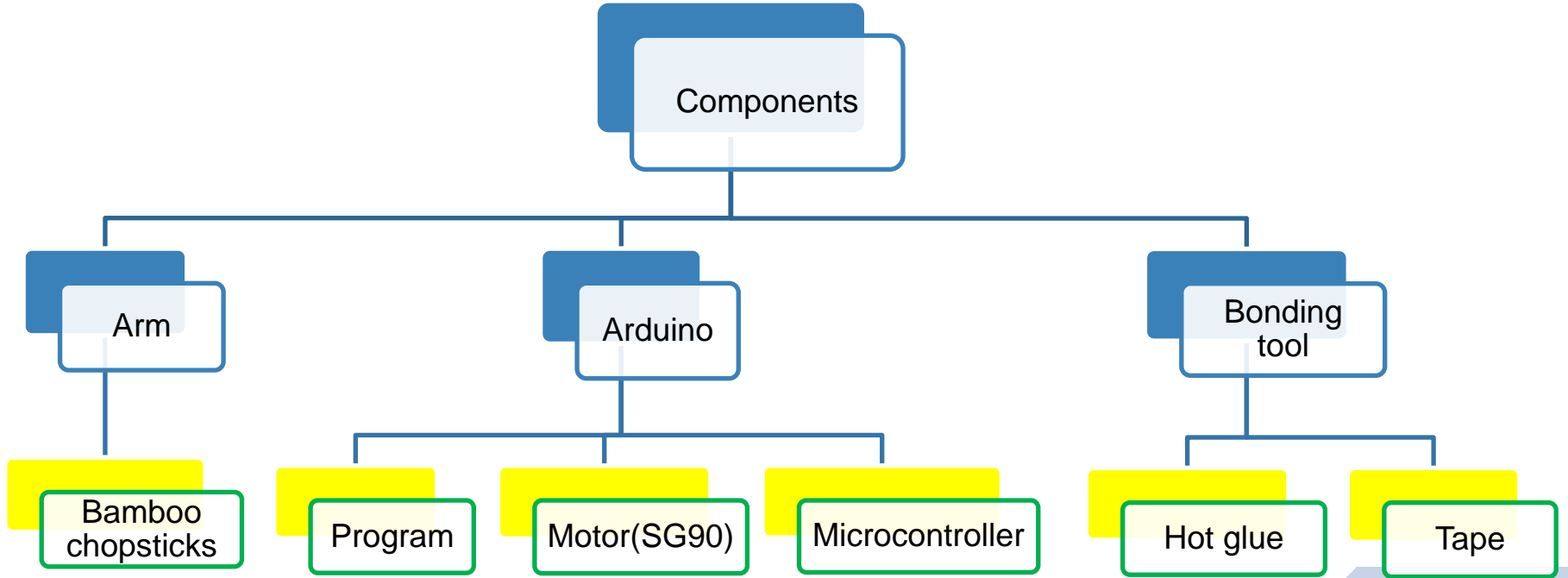
Software:

- Arduino IDE



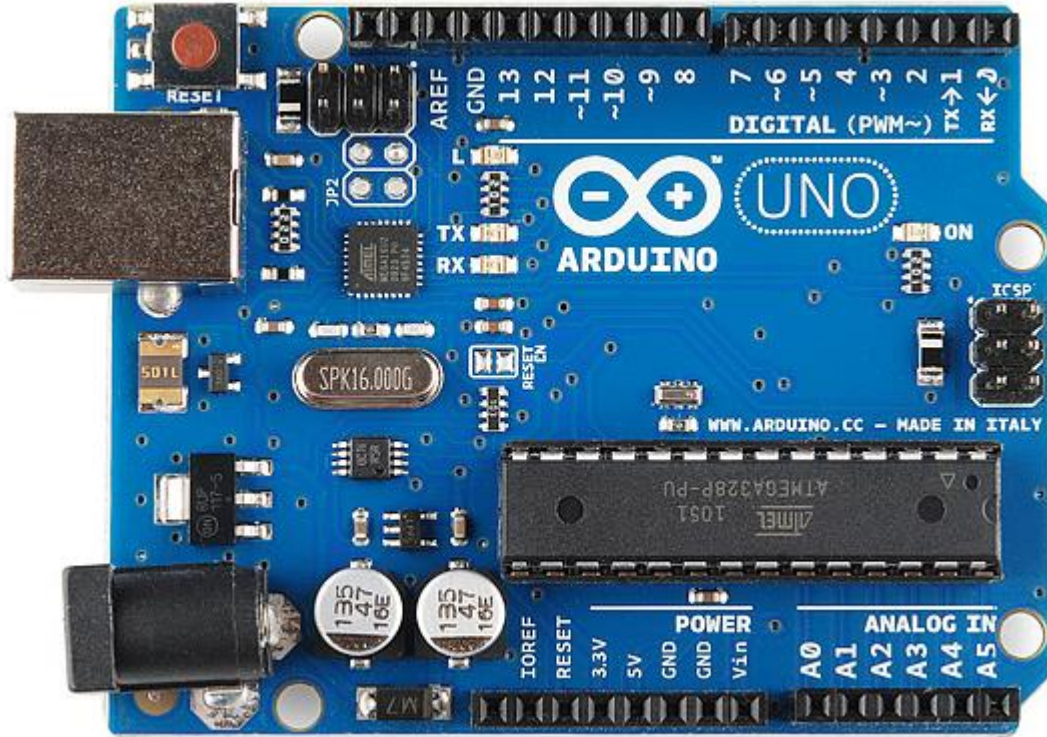


Components





Arduino board



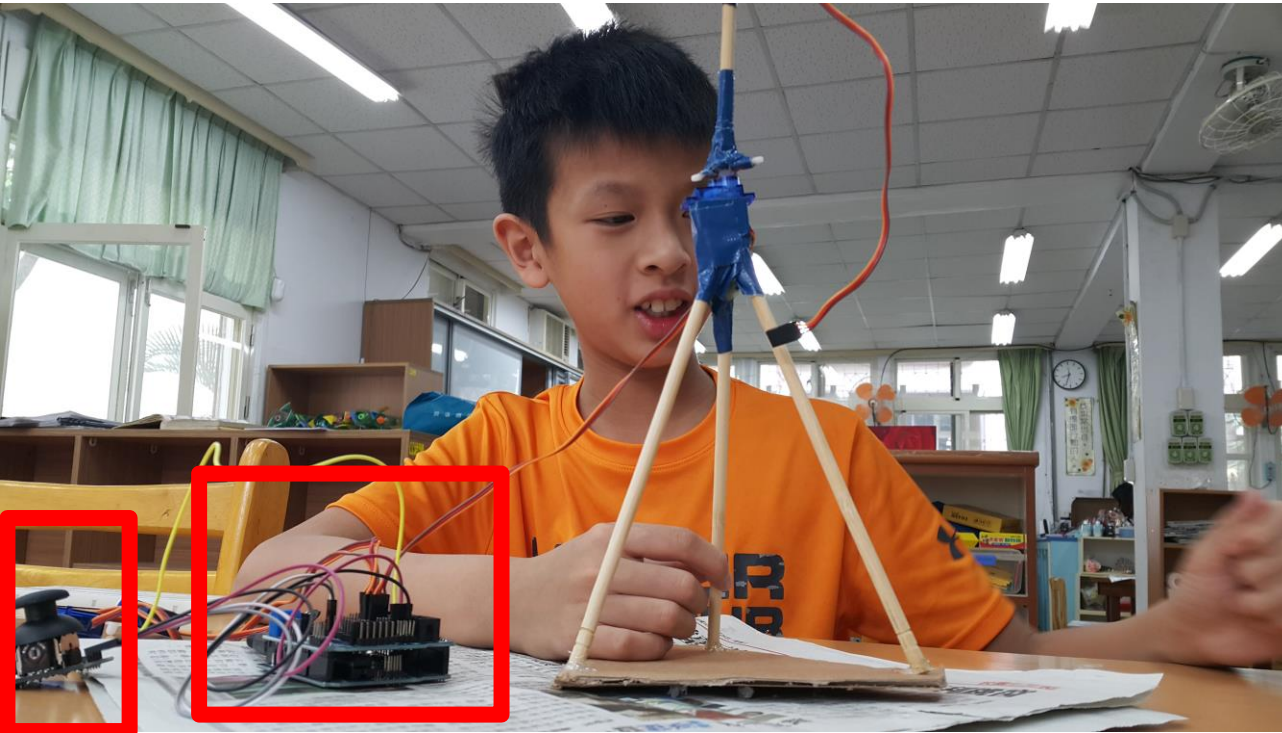
Arduino
course in
grade



Use Arduino to
write programs



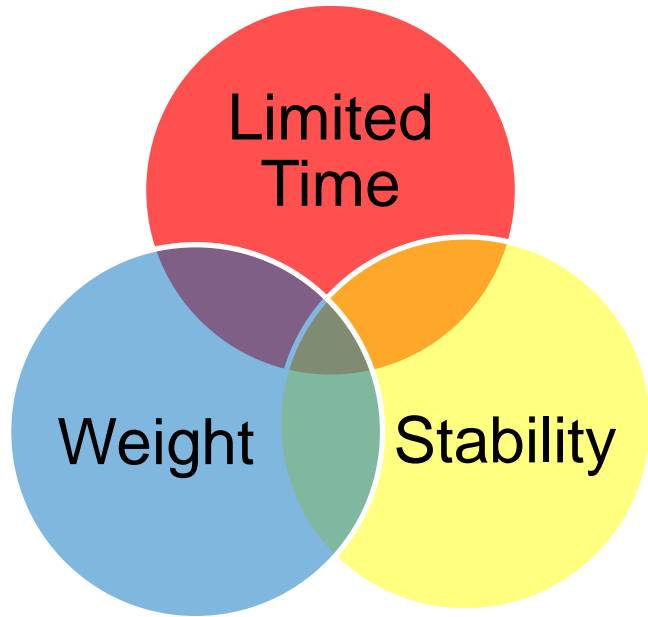
Pictures of work



Connecting motors and joystick to the Arduino board.



Problems



Second
version

“

Second version-
Mechanical arm



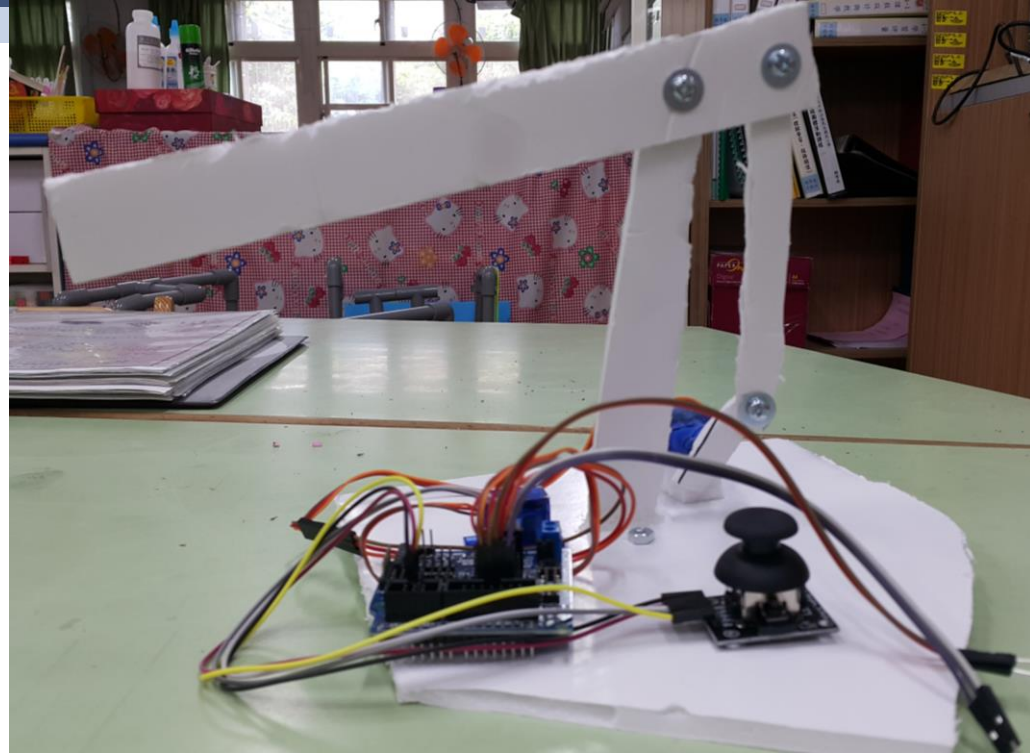
2nd Version – Mechanical Arm

Hardware:

- Foam board
- Tape, hot melt adhesive
- Motors(sg90)
- Joystick
- Screws

Software:

- Arduino IDE





Idea of design

Changes made to the base:

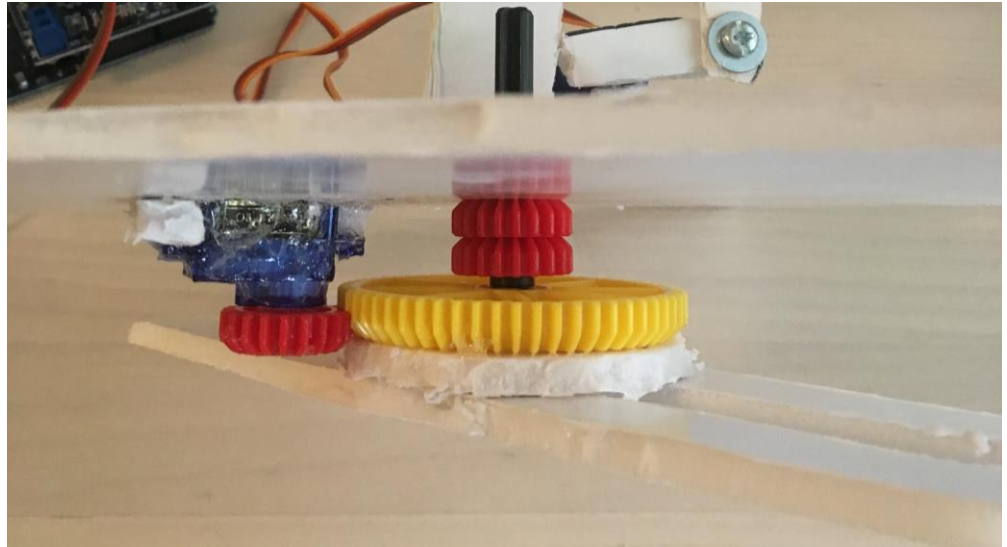
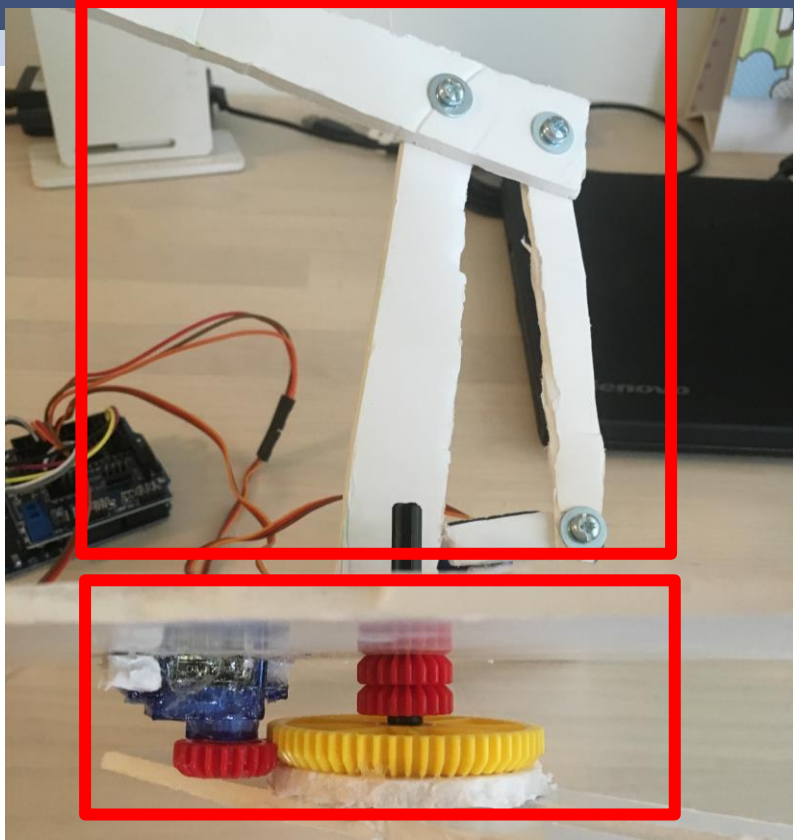
1. Use *three-bar linkage mechanism* to make the arm move
2. Add motors and gearwheels at the bottom



1. Reduce weight at the top of the structure
2. Make the base turn

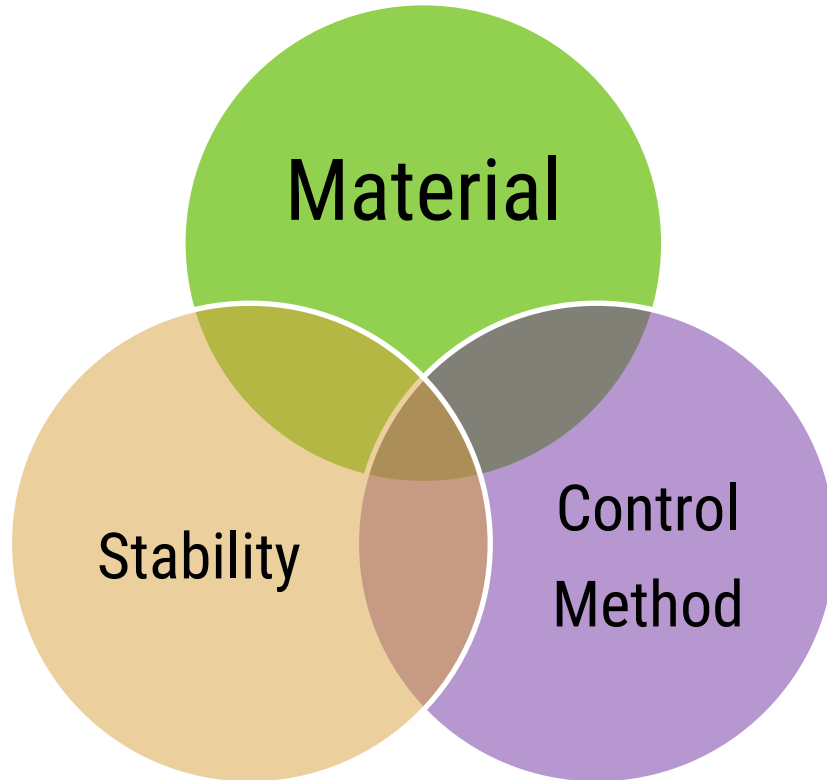


Changes to the base





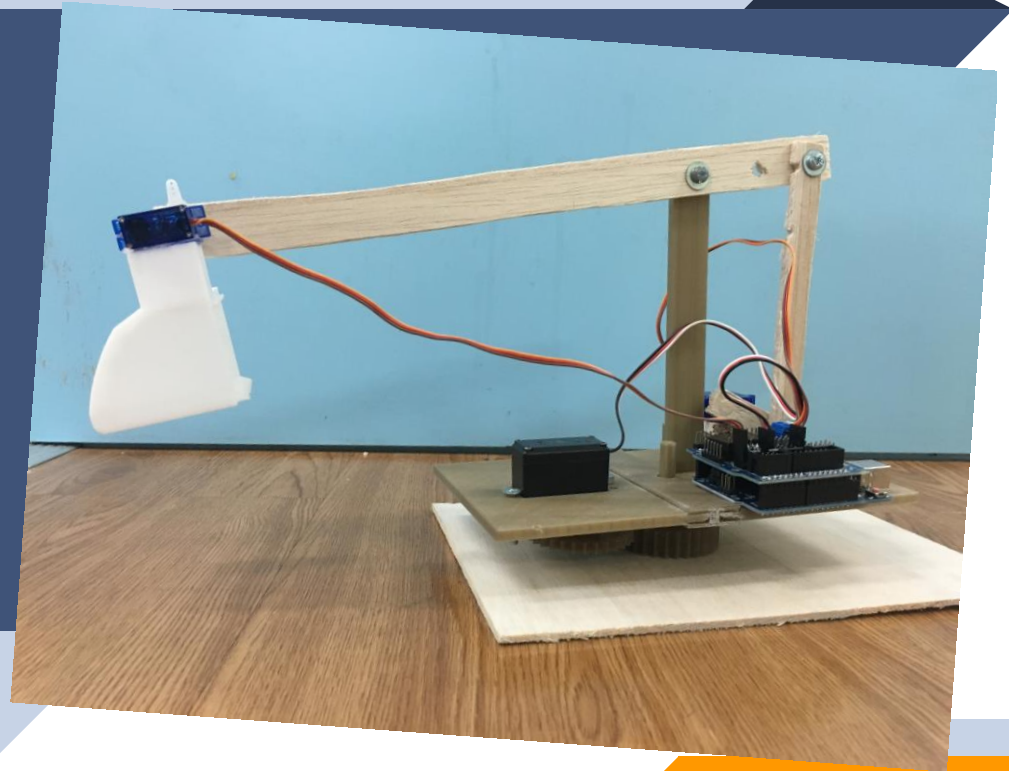
Problems



Third version

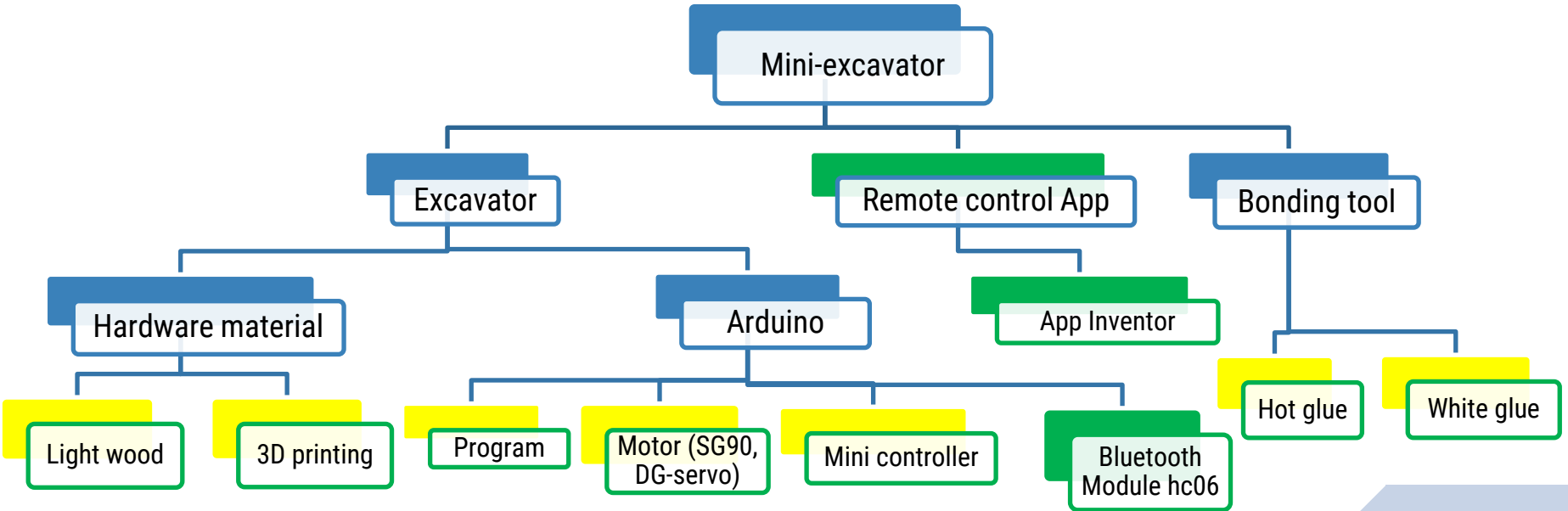
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Third version: Mini-excavator



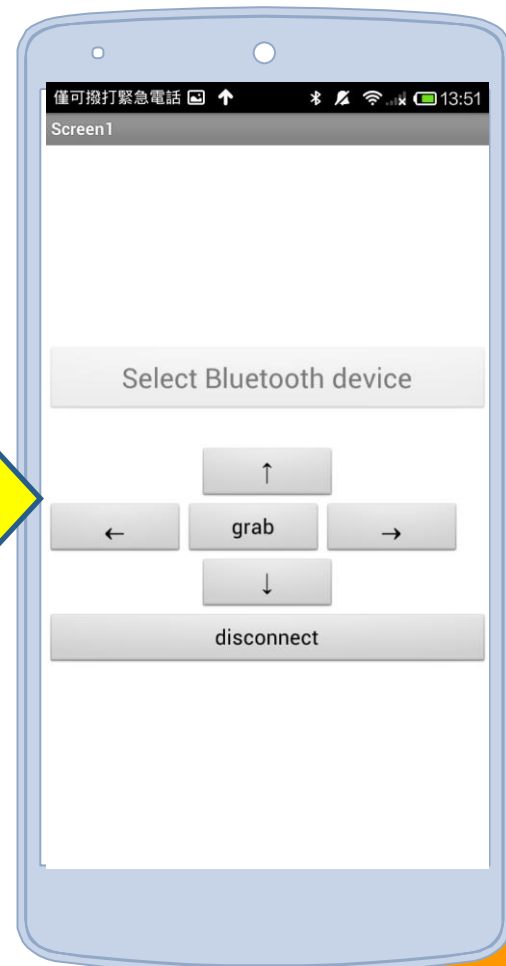
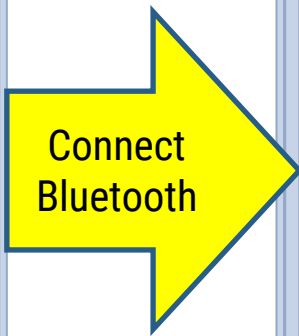
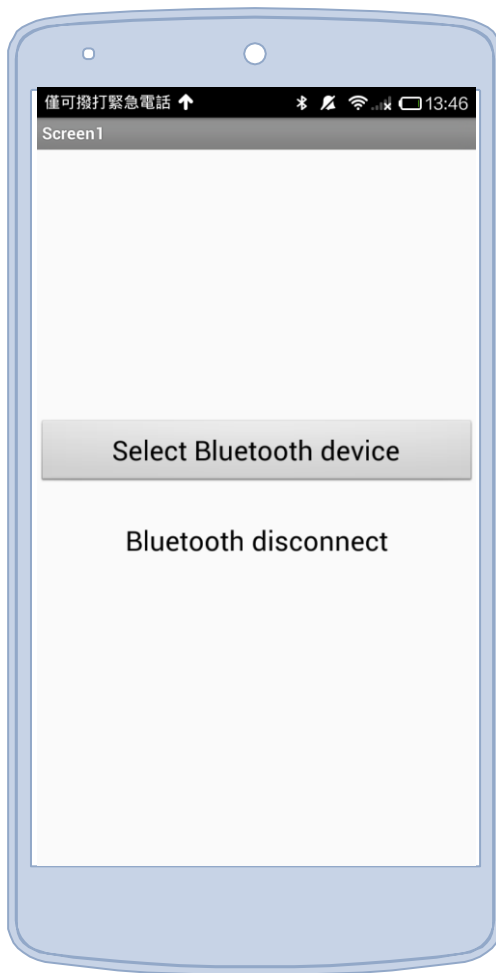


3rd Version Components





Use App Inventor to
build an app to control
the excavator.



Blocks

- Built-in
 - Control
 - Logic
 - Math
 - Text
 - Lists
 - Colors
 - Variables
 - Procedures
- Screen1
 - ListPicker1
 - Label2
 - Button1
 - HorizontalArranger1
 - Button2
 - Label1
 - Button8

Rename Delete

Media

Upload File ...

Viewer

```
initialize global button1Press to 0
initialize global button2Press to 0
initialize global button3Press to 0
initialize global button4Press to 0

when ListPicker1.AfterPicking
do if call BluetoothClient1.Connect address ListPicker1.Selection
then set Button1.Visible to true
set Button2.Visible to true
set HorizontalArrangement1.Visible to true
set Button8.Visible to true
set Label1.Visible to false
set ListPicker1.Enabled to false

when ListPicker1.BeforePicking
do set ListPicker1.Elements to BluetoothClient1.AddressesAndNames

when Button8.Click
do call BluetoothClient1.Disconnect
set Button1.Visible to false
set Button2.Visible to false
set HorizontalArrangement1.Visible to false
set Button8.Visible to false
set Label1.Visible to true
set ListPicker1.Enabled to true

when Button1.TouchDown
do set global button1Press to 1

when Button2.TouchUp
do set global button2Press to 0

when Button2.TouchDown
do set global button2Press to 1

when Button3.TouchUp
do set global button2Press to 0

when Button3.TouchDown
do set global button2Press to 1

when Button4.TouchUp
do set global button2Press to 0

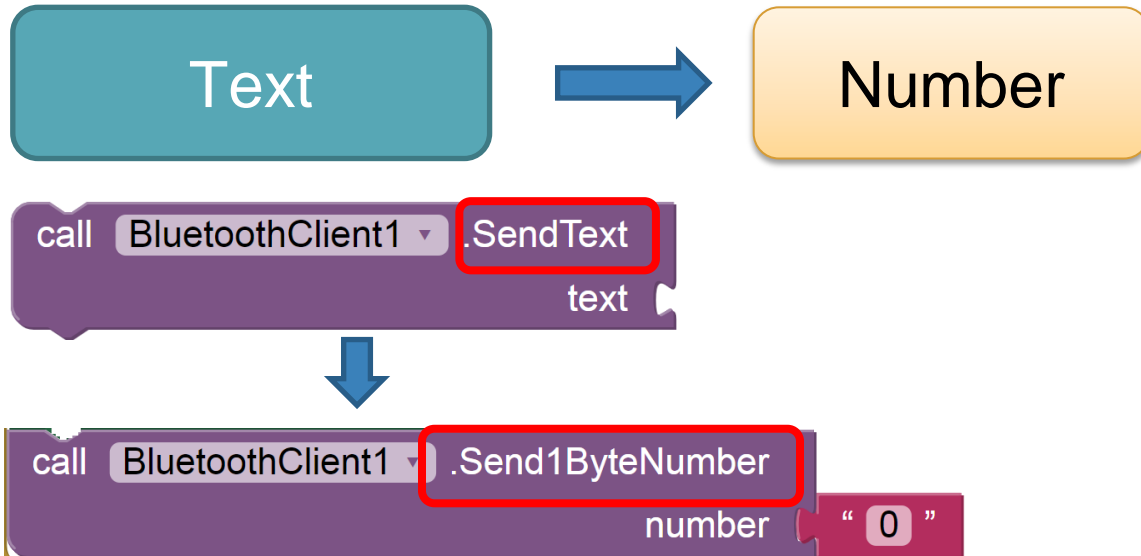
when Button4.TouchDown
do set global button2Press to 1

when Button5.Click
do if Button5.Text == grab
then set Button5.Text to open
call BluetoothClient1.SendByteNumber number 5
if Button5.Text == open
```



Difficulties with App Inventor

Debugging example:

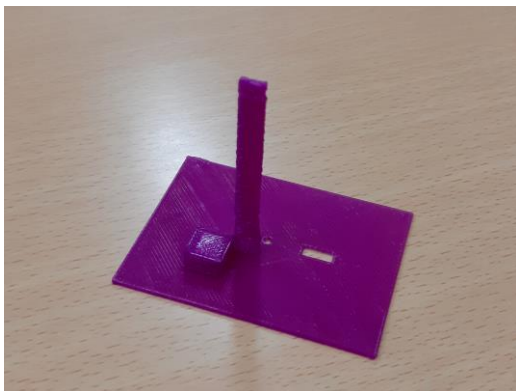




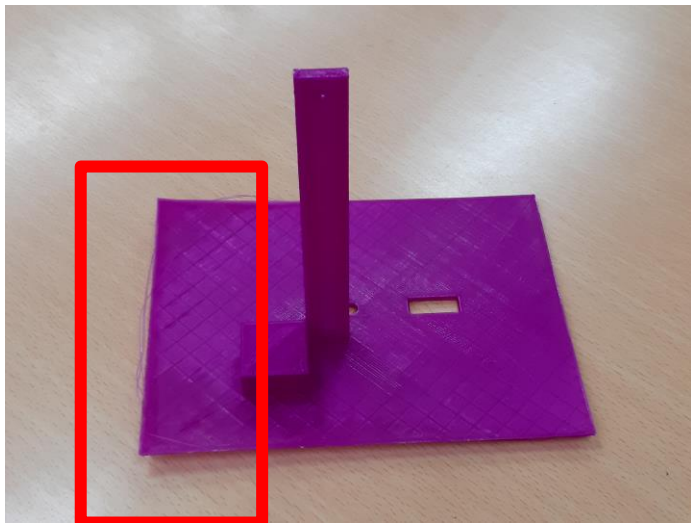
Problems- 3D printing

Sizing problem
Curved base

0.3 times



0.7 times



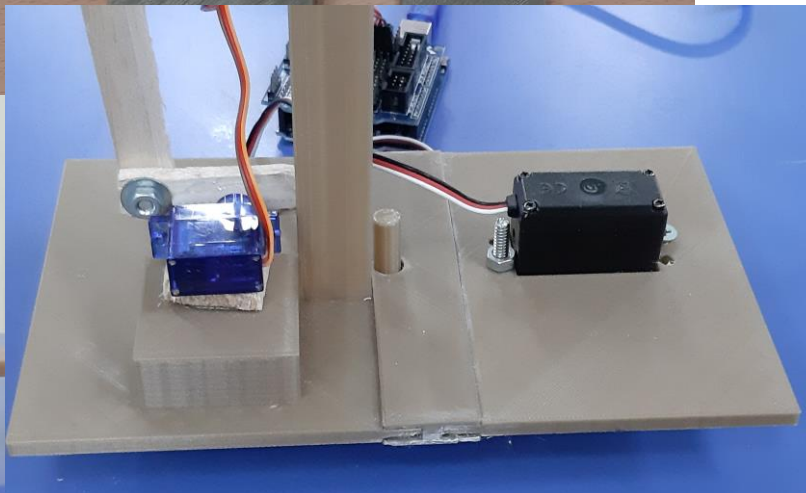
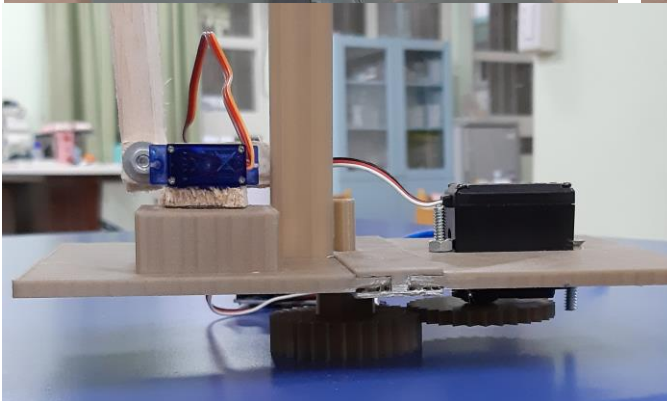


Problems- 3D printing

Uneven board



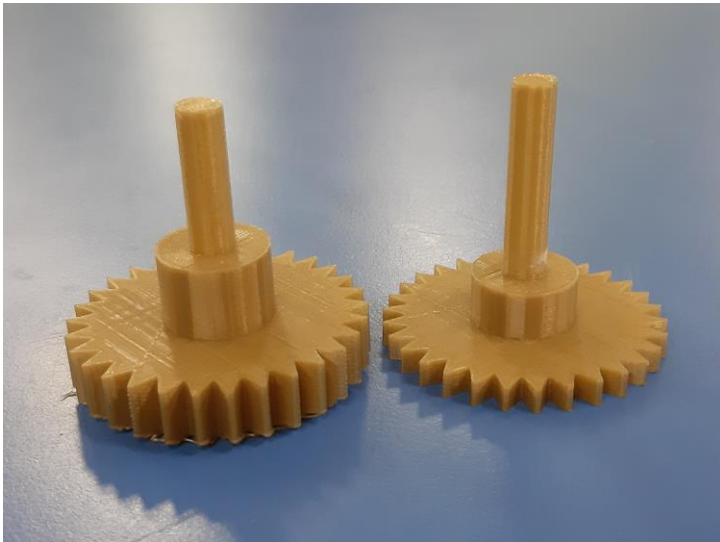
Repair 3D printing machine



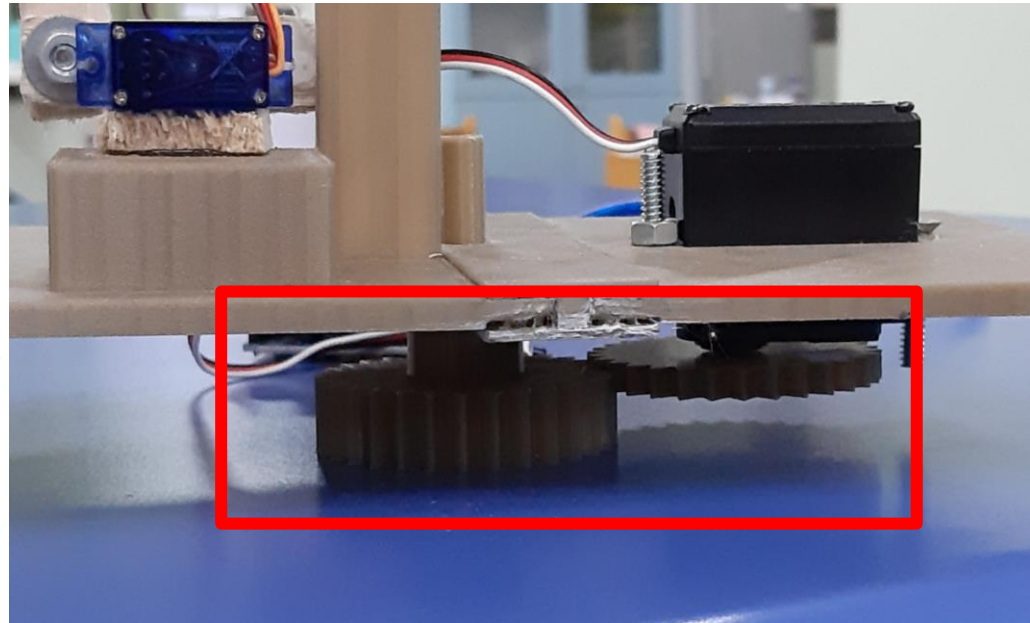


Problems- 3D printing

Printing the gear wheels



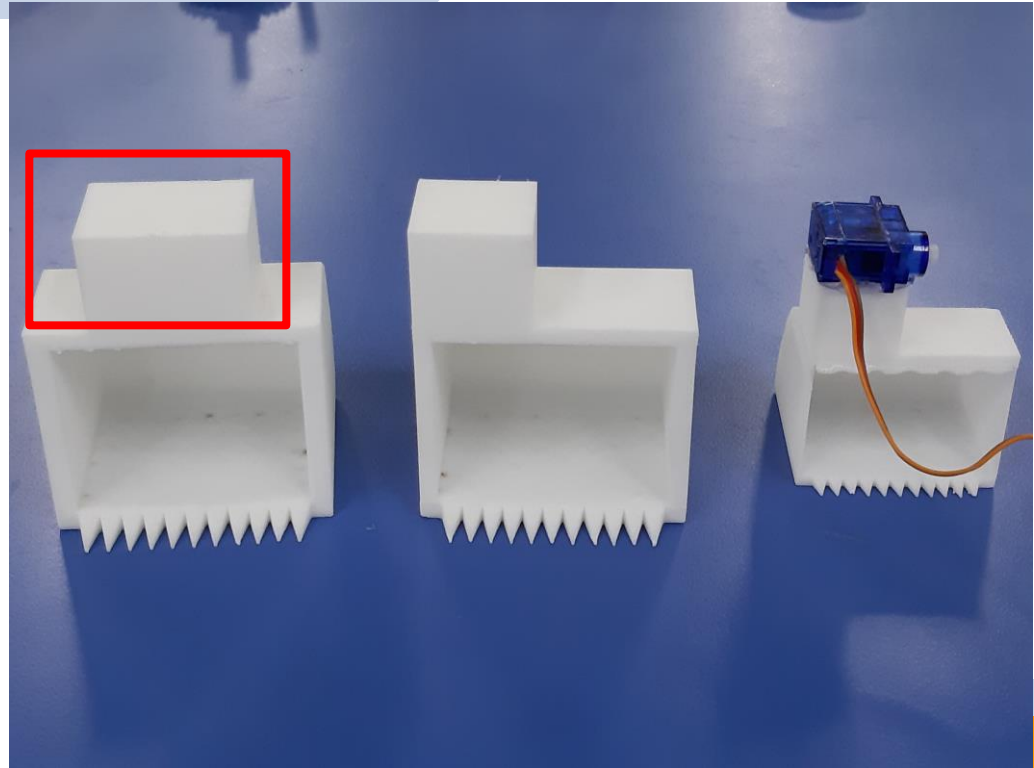
Resize





Problems- 3D printing

3 different models





Change of Motor

Motor



The motor can't turn because of the weight.





Problems- Arduino

Bluetooth module
can't be powered

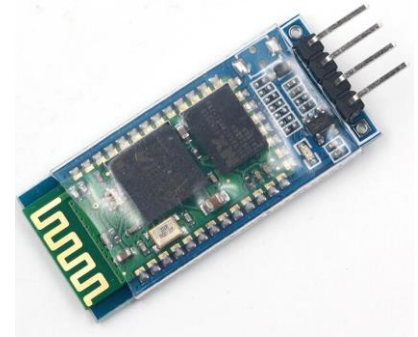


Change
a bluetooth
module

Unable to connect

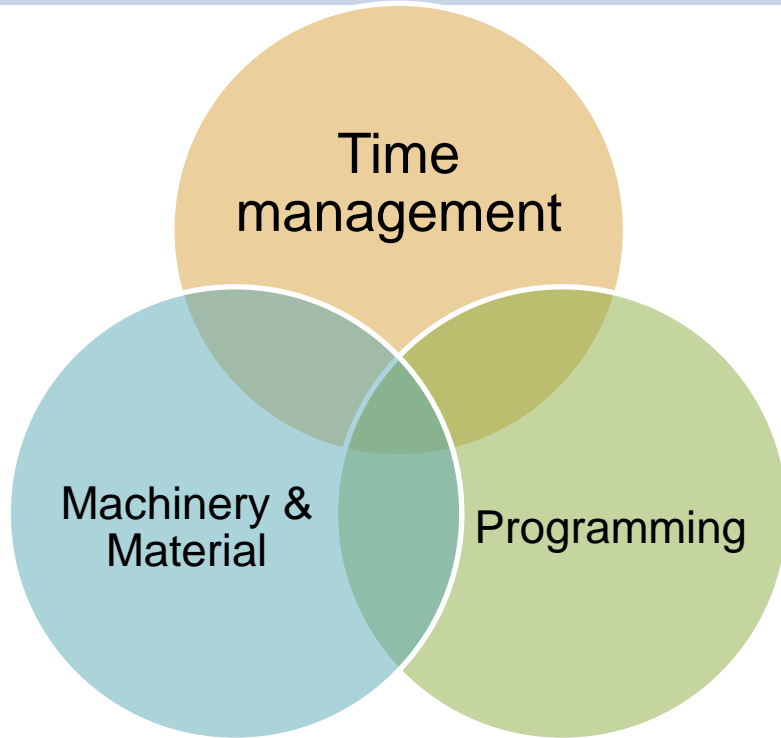


Change
a phone





Experience and Suggestion





Thanks!