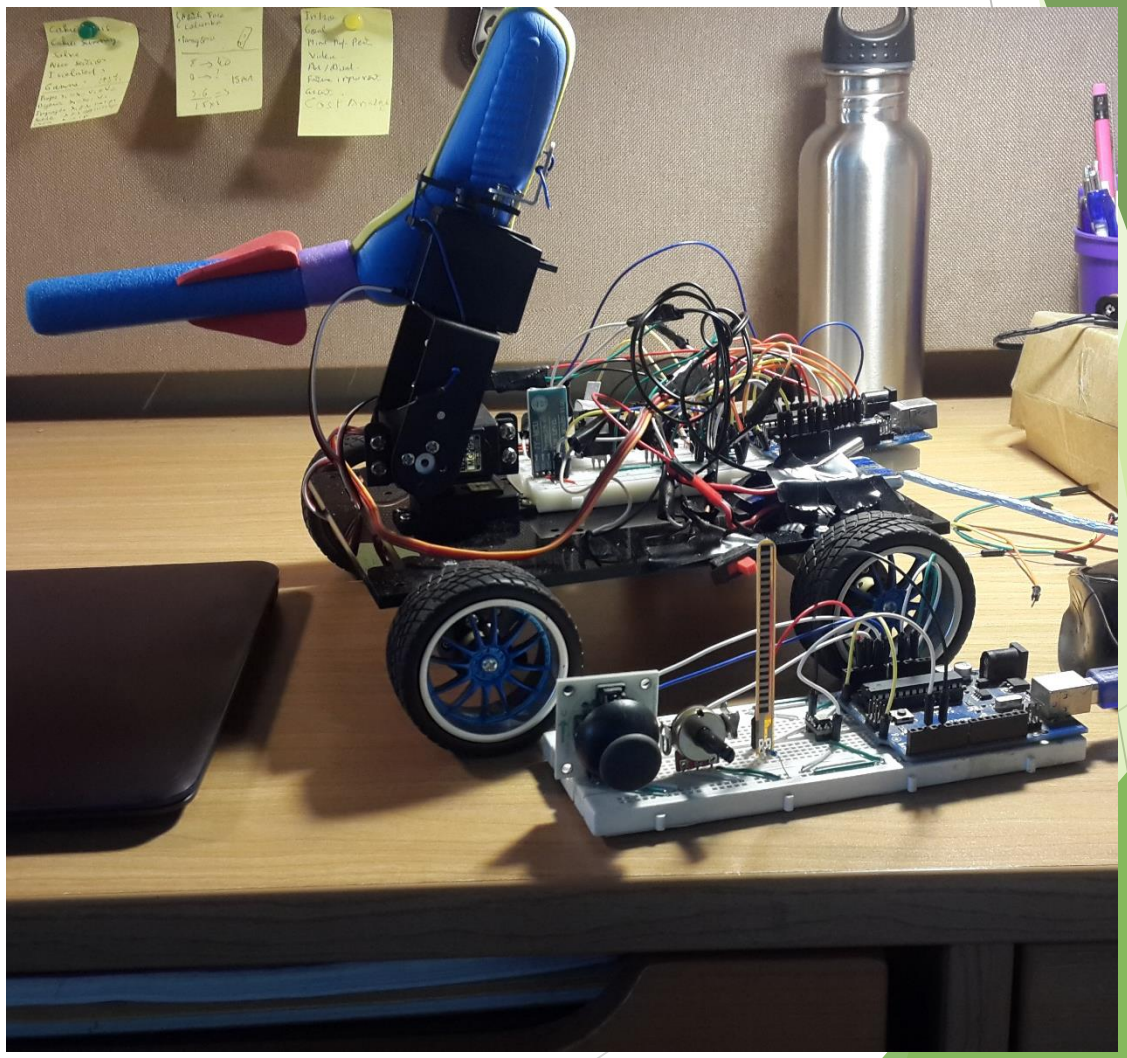
# Hand Gesture Military Robot

Mechatronics Final Project




Presented By:

Siddharth Bisht

Karim Chamaa

Michael Kohlios


Presented to:

Dr. Vikram Kapila

# Outline

- Introduction
- Project Statement
- Solution Proposed
- Management of Work
- Building the Prototype
- Circuit Design
- Coding
- Guidelines for Safe Operation
- Cost Analysis
- Advantages vs Drawbacks
- Future Improvements
- Conclusions
- References

# Introduction

- The use of robotics technology in military led to a new field called Military Robotics
- Military robots come in different shapes and sizes as per the task they are created for
- Main function of robots nowadays is to assist and support the armed forces.

# Problem Statement

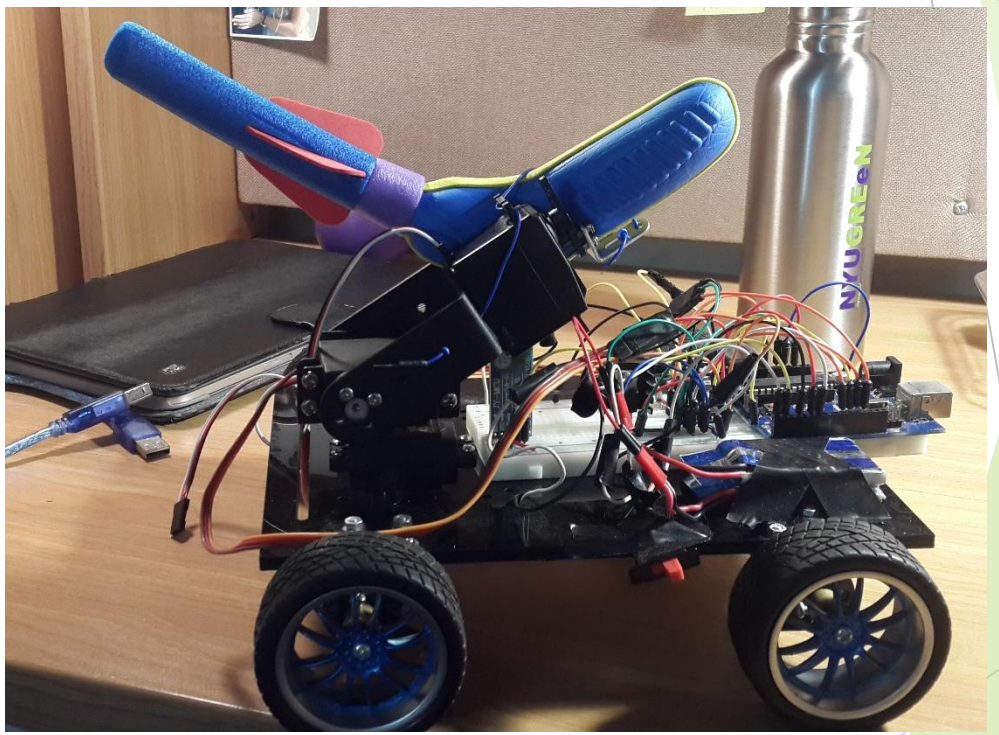
- USA and many other countries are losing many military personnel during war on terror.
- A way of fighting a war, while preserving the lives of as many armed forces members is paramount and is the problem we are looking to solve.

# Solution Proposed

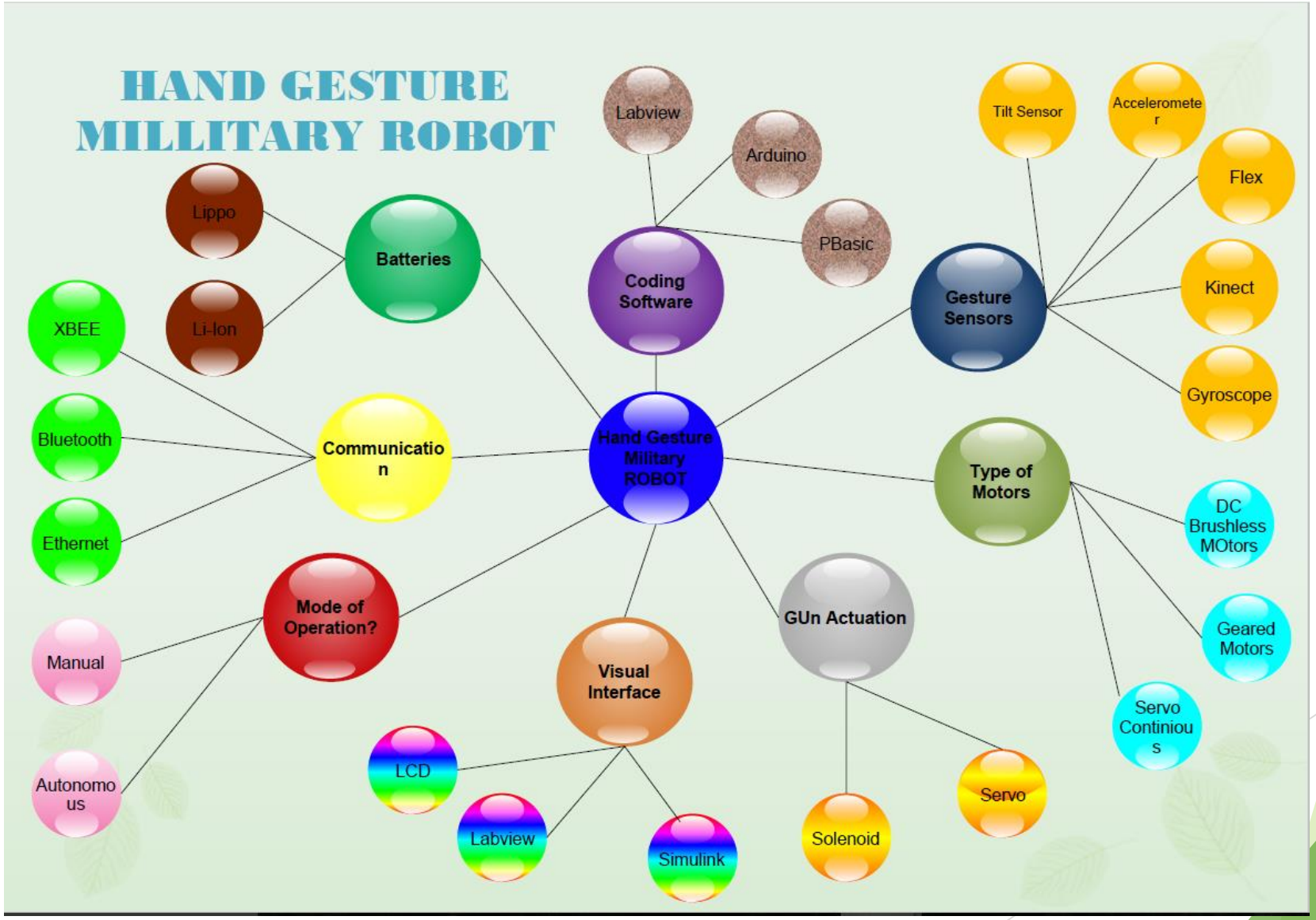
Building a hand gesture military robot:

Goals:

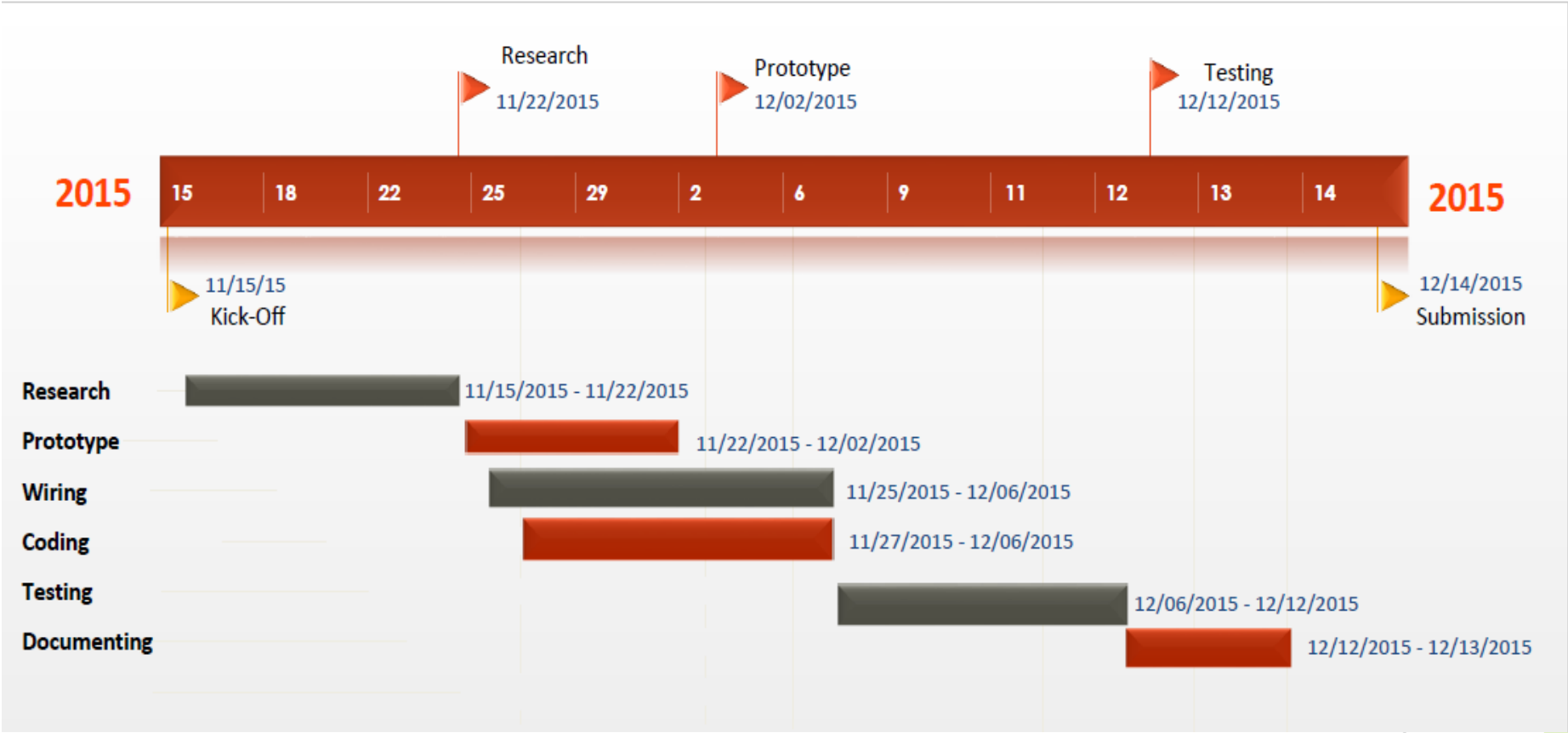
- Ensure safety of field officers
- Fast deploying in a war battle
- Overcome harsh terrain
- Provide feedback
- Control arm by hand gesture
- Aim at a target
- Fire a projectile at it



# Management of Work:
## Mind Mapping



# Management of Work:
# Program Evaluation and Review Technique (PERT)



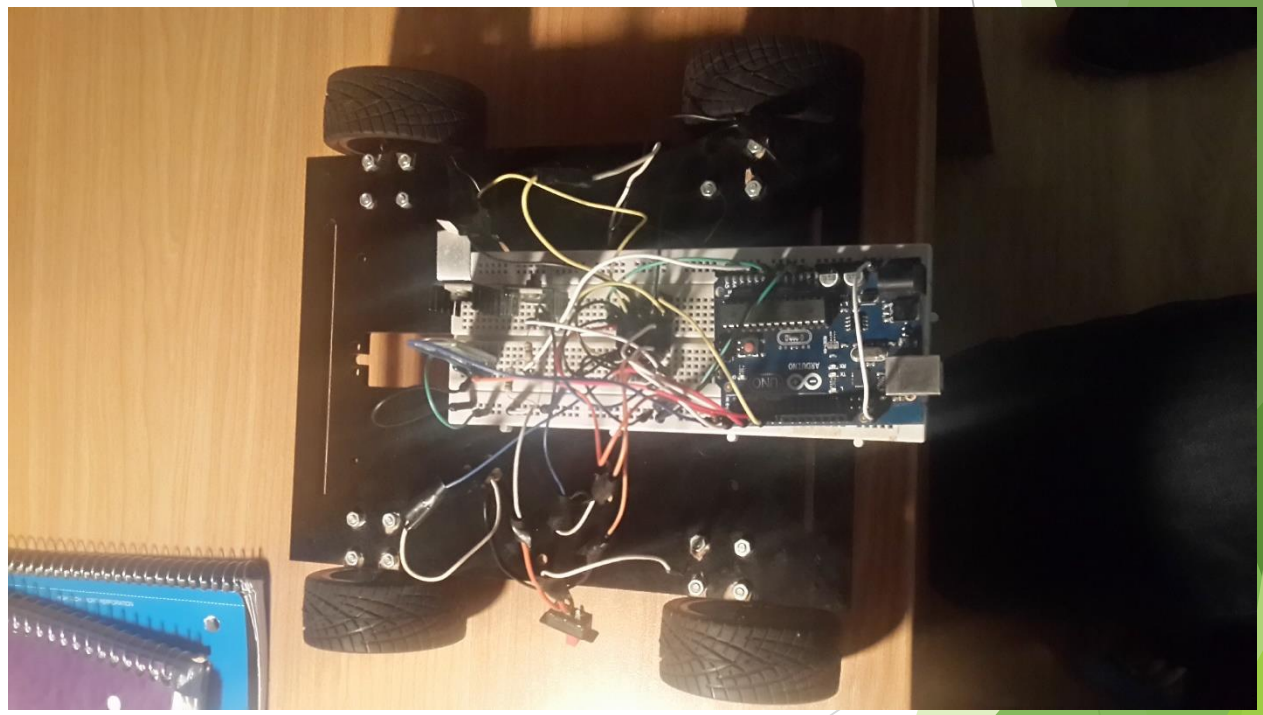
# Building the Prototype:
## Assembling Robot Chassis and Wiring motors

### Selection Criteria:

- Overcome harsh terrain
- Good manoeuvrability
- Robust

### Chassis selection:

- Geared DC motors
- 4 wheel System
- Skidding steering



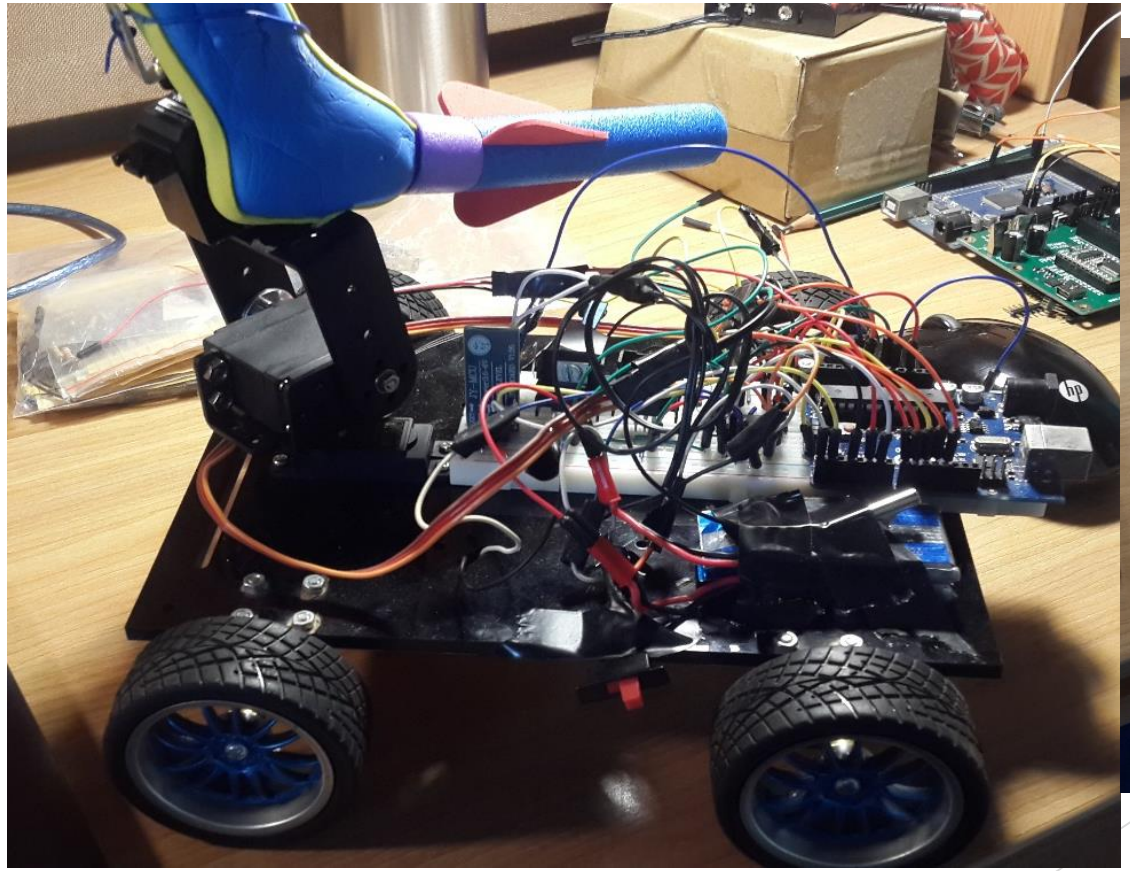
# Building the Prototype: Aiming at the Target

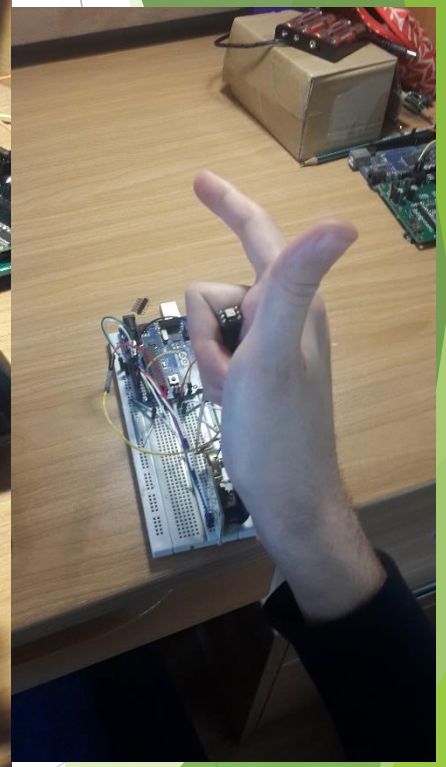
## Selection Criteria:

- Cover a large area
- Easily controlled
- Fast response
- Cheap

## Chassis selection:

- 2 DOF Servo System
- Standard Servos
- Tilt Sensor

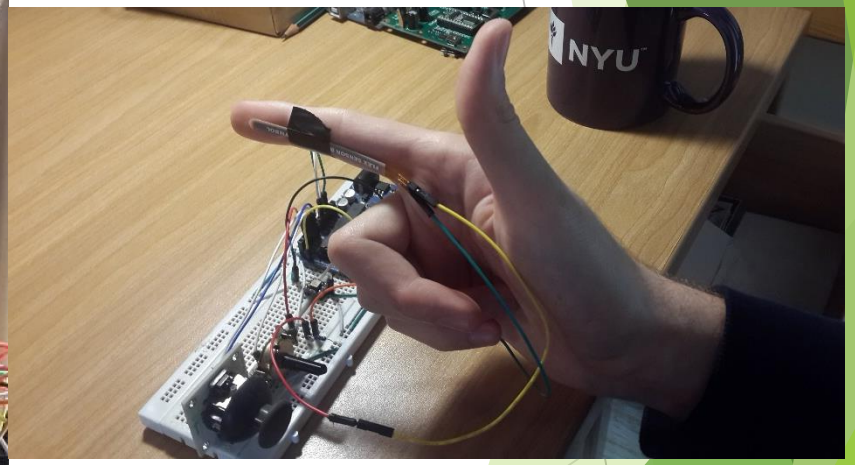




# Building the Prototype: Shooting

Mechanism Consisting of:

- Wire
- Gun
- Standard Servo
- Flex Sensor



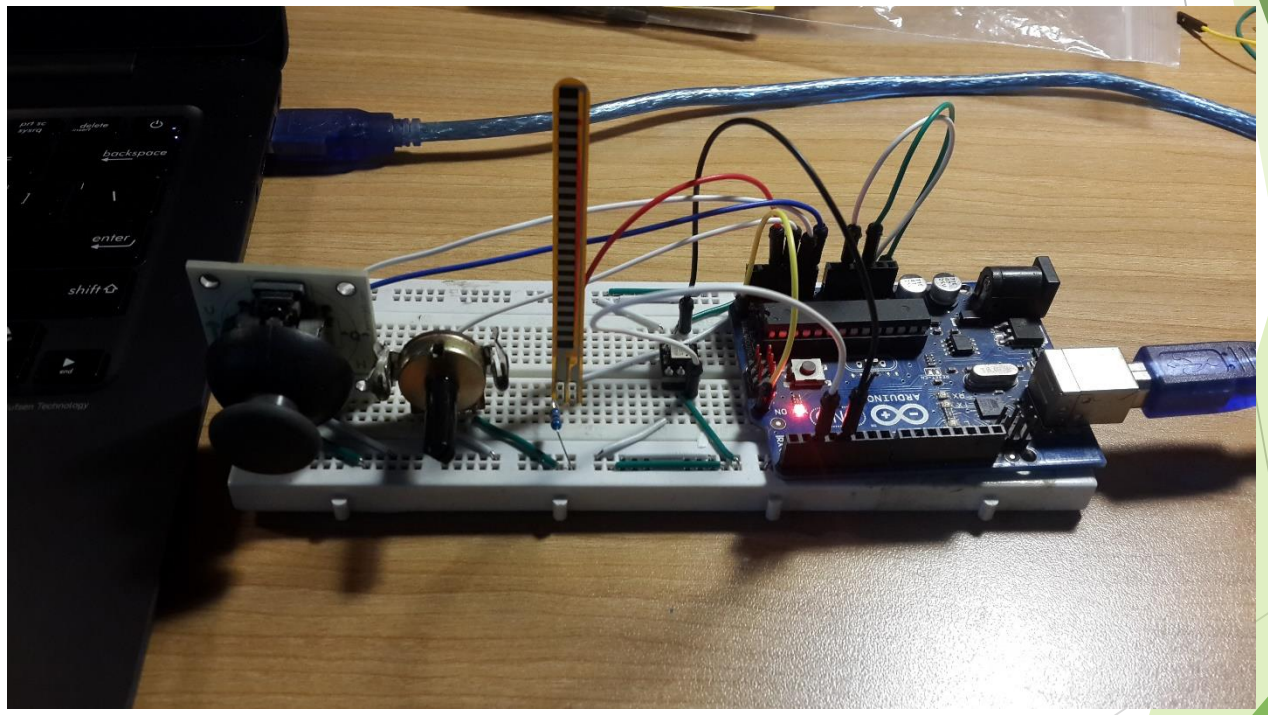
# Building the Prototype: Control Base Platform

Hand Gesture Control of Servos:

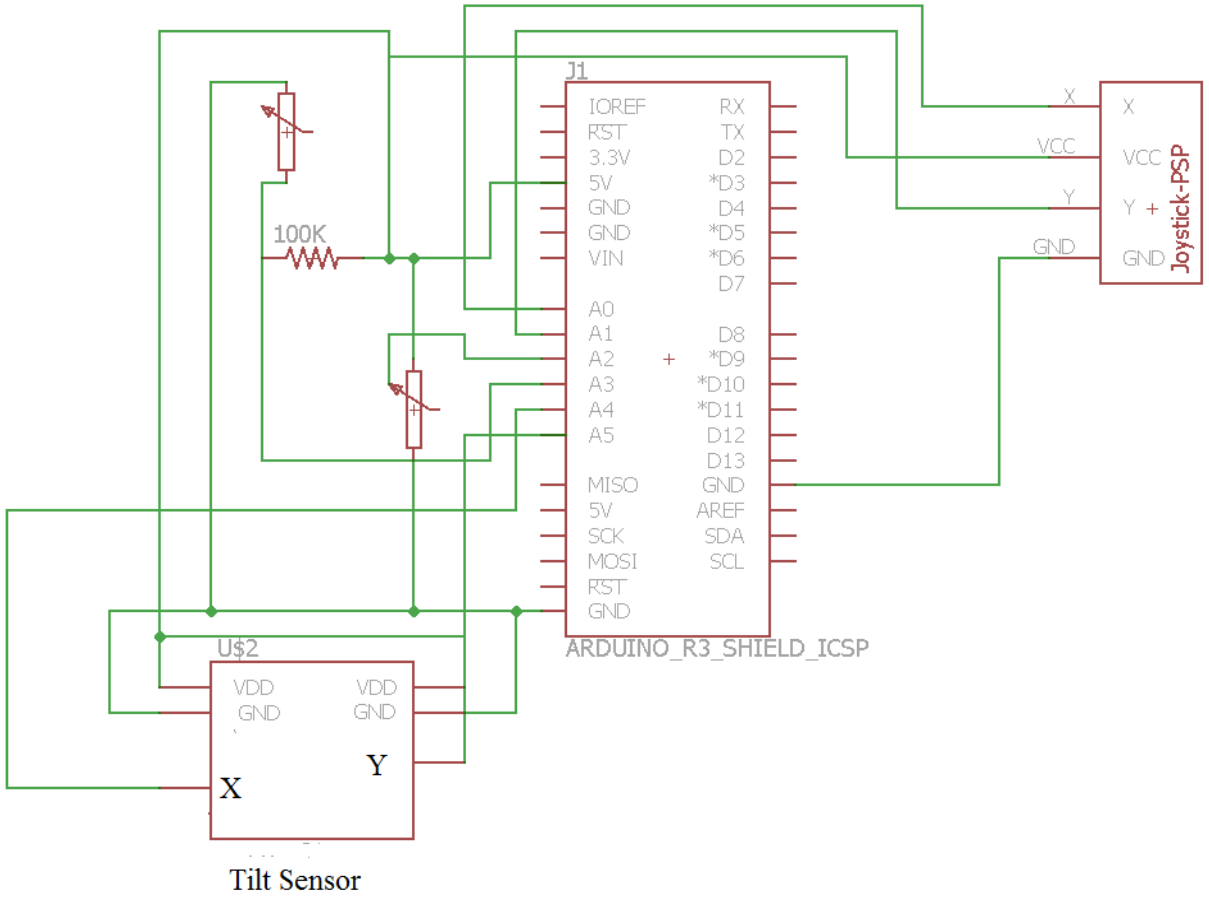
- Tilt Sensor → Aiming
- Flex Sensor → Shooting

Mobile Robot Control:

- Joystick → Direction
- Potent → Speed

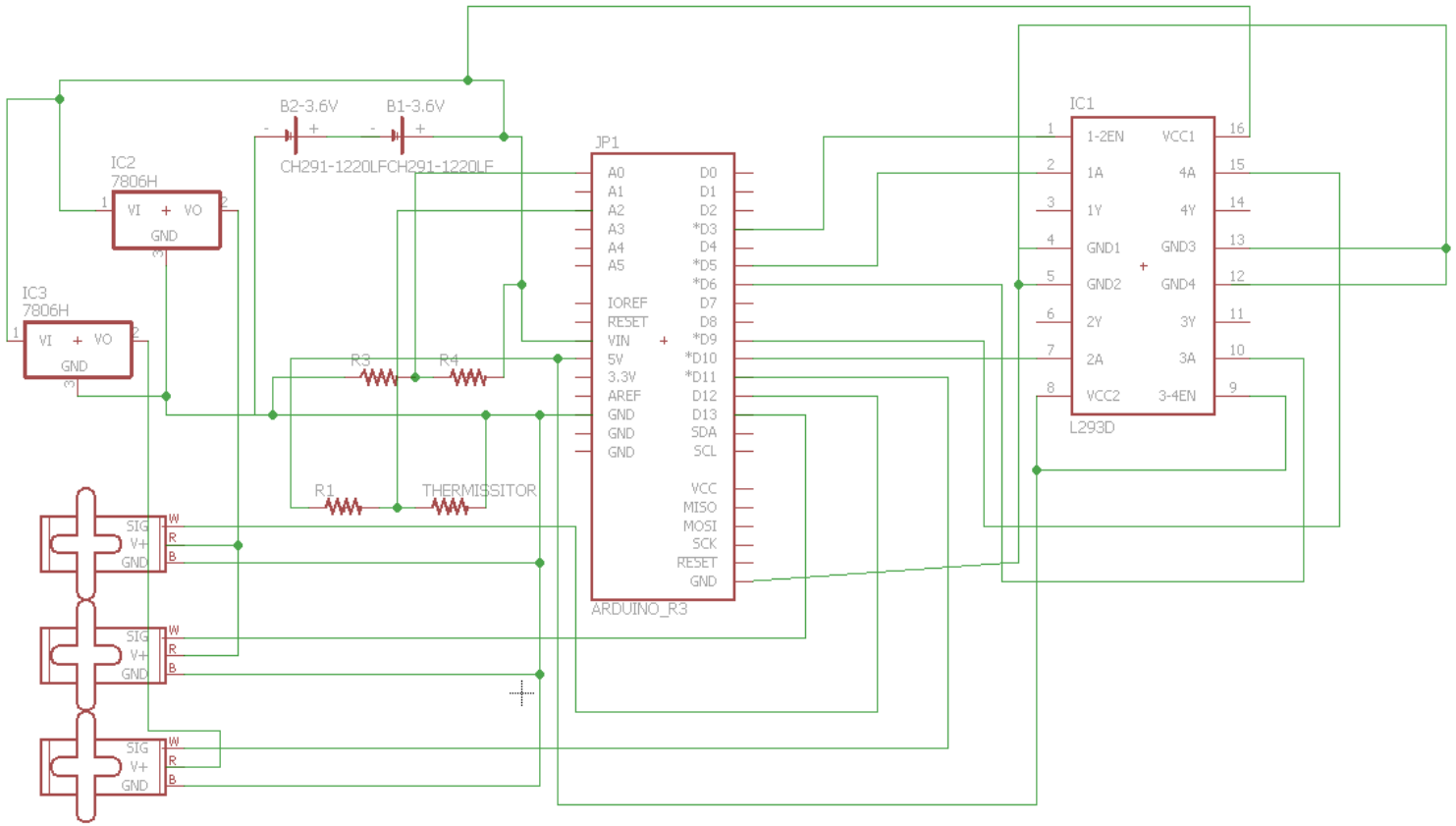


# Circuit Design:
# Control Base

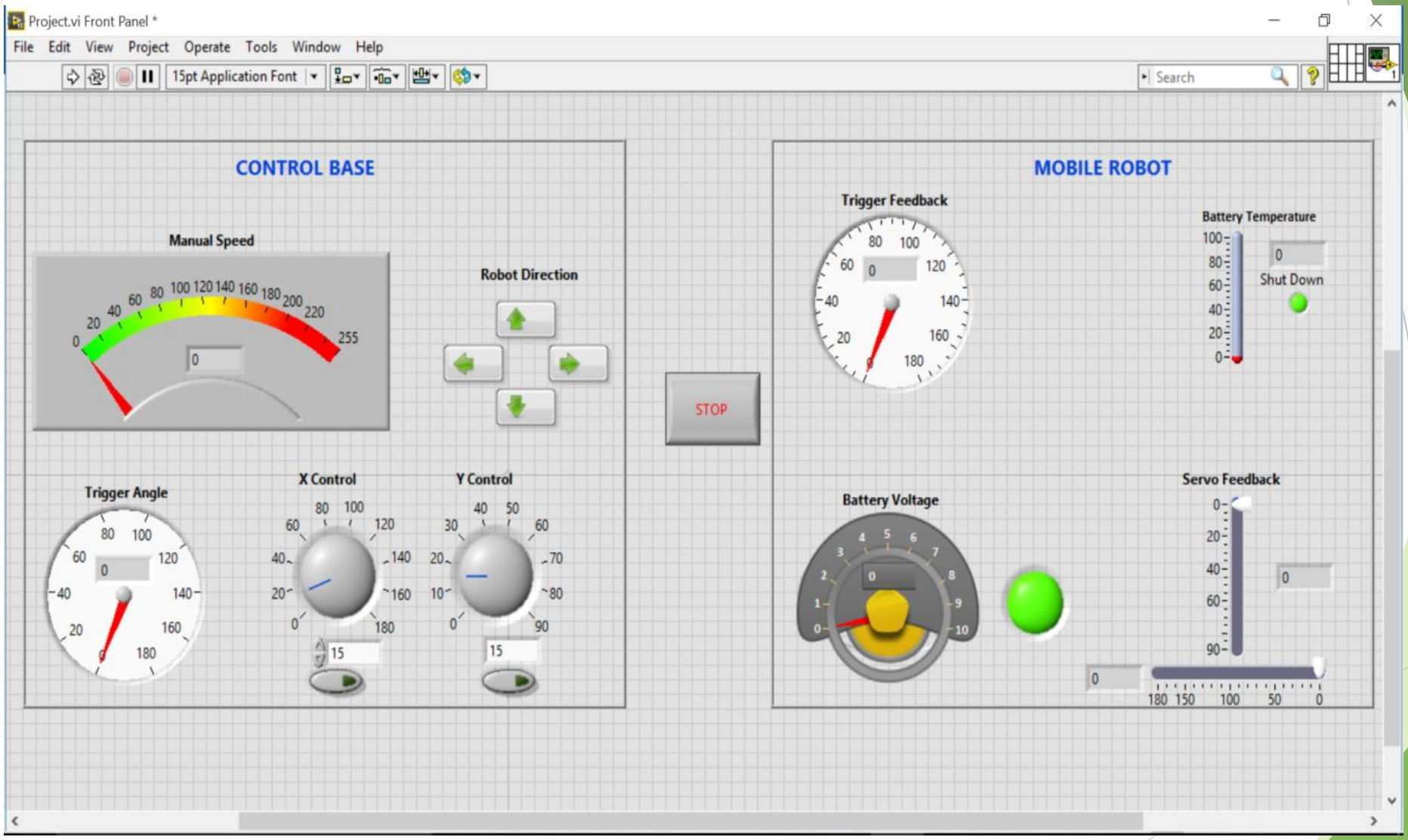



Tilt Sensor

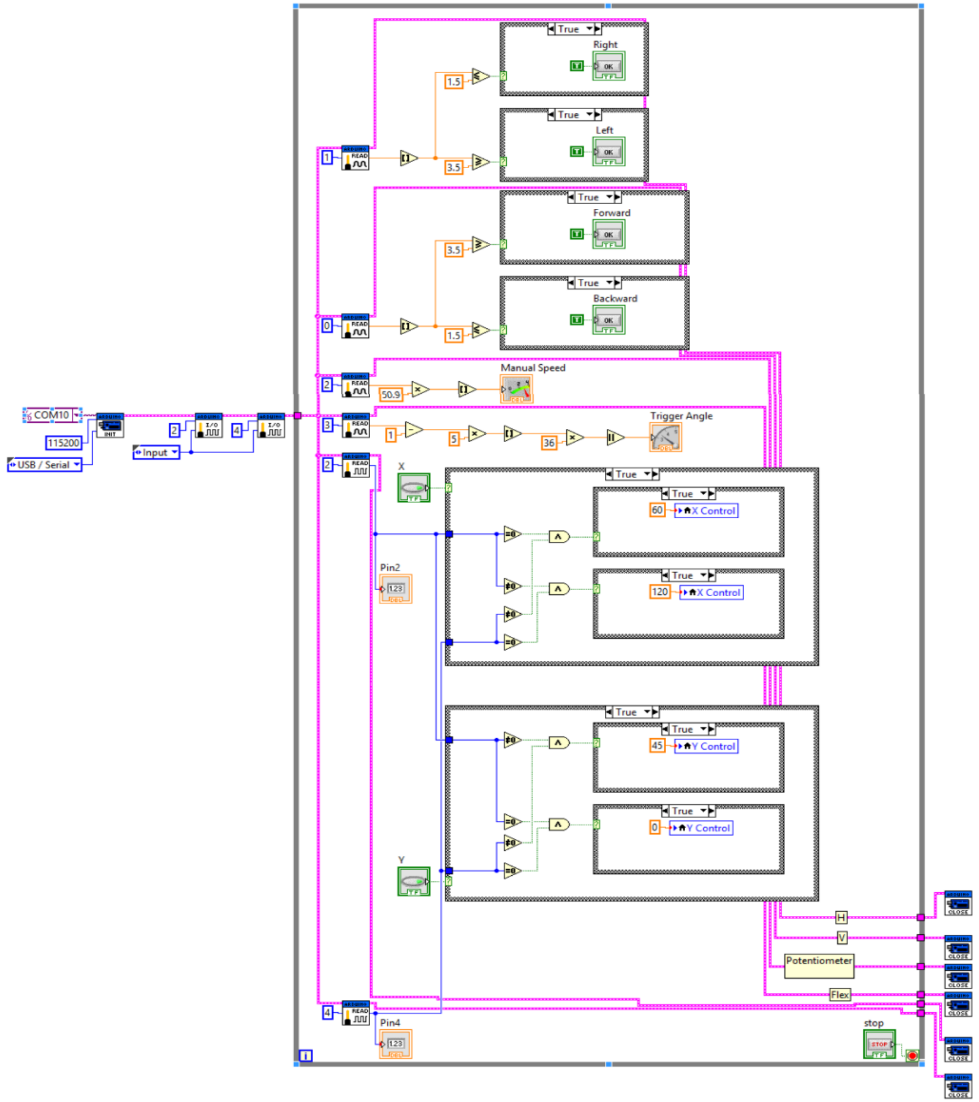
# Circuit Design:
# Mobile Robot



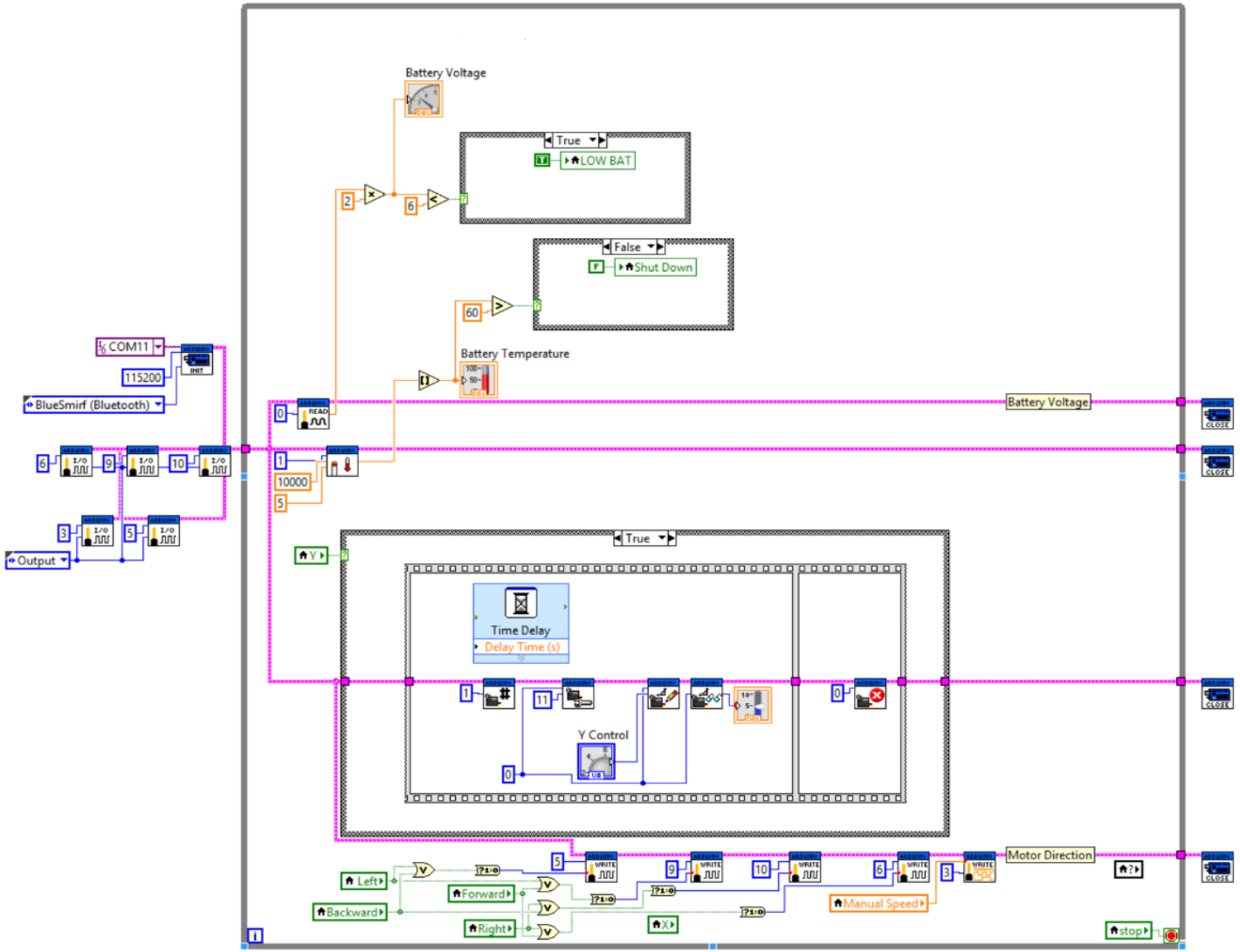
# Coding


Project.vi Front Panel *
File Edit View Project Operate Tools Window Help
15pt Application Font
Search
CONTROL BASE
Manual Speed
Robot Direction
Trigger Angle
X Control
Y Control
STOP
MOBILE ROBOT
Trigger Feedback
Battery Temperature
Shut Down
Battery Voltage
Servo Feedback

# Coding:
# Control Base Code



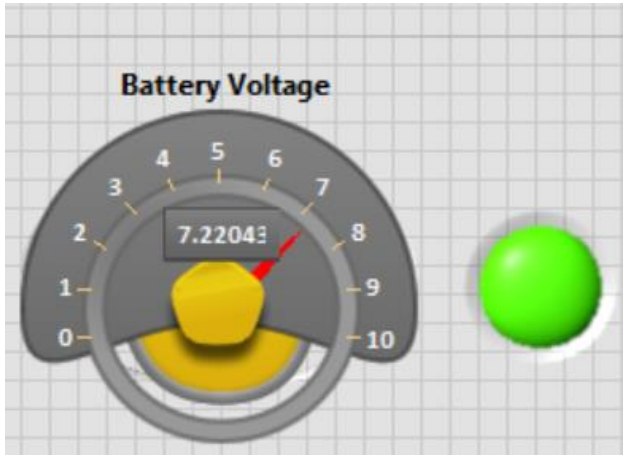
# Coding:
# Robot Code



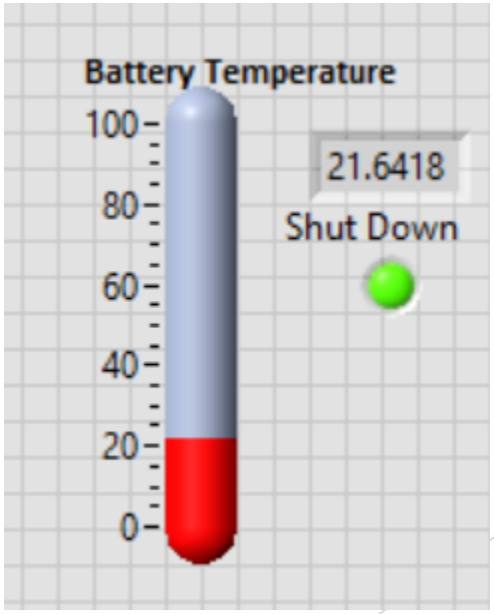
# Guidelines For safe Operation

**Two main features:**

1)Monitoring battery voltage




2)Monitoring battery and surrounding temperature



# Cost Analysis

| Materials | Quantity Usage | Unit of Measure | Unit Cost | Usage Cost |
|---|---|---|---|---|
| Robot Chassis | 1 | Each | 50$ | 50$ |
| Flex Sensor | 1 | Each | 10$ | 10$ |
| Parallax Tilt | 1 | Each | 10$ | 10$ |
| Arduino R3 | 2 | Each | 5$ | 10$ |
| Joystick | 1 | Each | 2$ | 2$ |
| 10K Pot | 1 | Each | 1$ | 1$ |
| Resistor Package | 6/600 | Each | 2.5$ | 0.025$ |
| Breadboards | 2 | Each | 5$ | 10$ |
| Jumper Wires | 2 | Each | 7$ | 14$ |
| 2DOF Servo | 1 | Each | 30$ | 30$ |
| Lippo Batteries | 2 | Each | 10$ | 20$ |
| HC_05 Bluetooth | 1 | Each | 15$ | 15$ |
| Voltage Regulator | 2 | Each | 1$ | 2$ |
| L293D H-Bridge | 1 | Each | 0.5$ | 0.5$ |
| Thermistor | 1 | Each | 3$ | 3$ |
| Parallax Servo | 1 | Each | 25$ | 25$ |
| | | Prototype Total Cost= | | **202.525$** |

# Advantages and Drawbacks

- Military work without risking human lives
- Relatively Inexpensive
- Easy to use and deploy
- Robot can be more mobile than human units

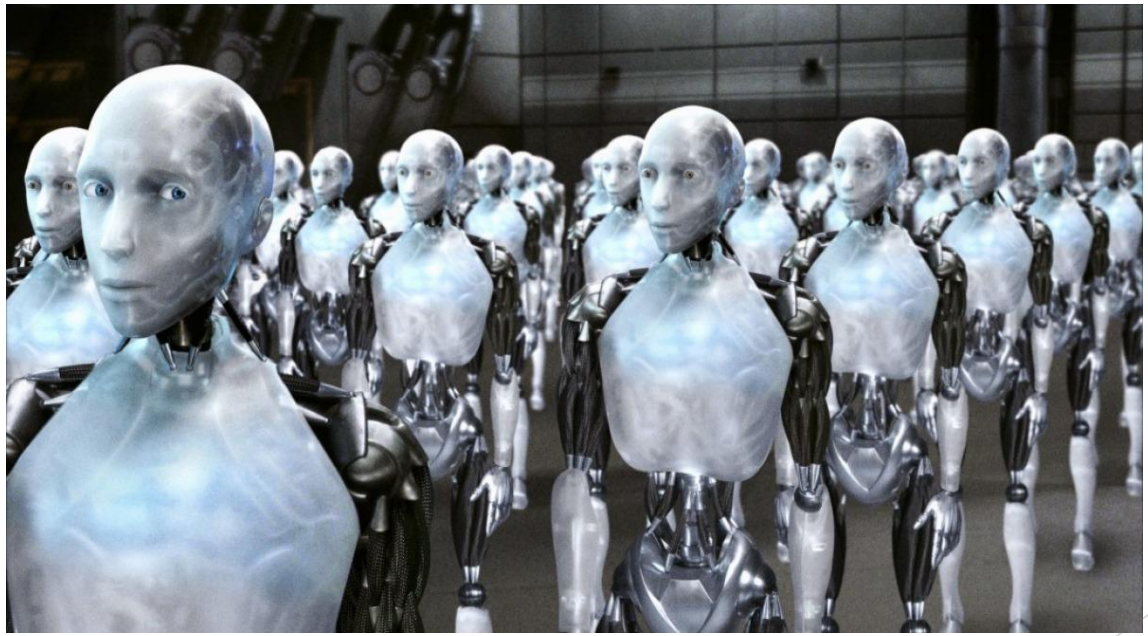
- LabVIEW should always remain running on a pc.
- Slow response due to number of data sent and received.
- Robotic systems tend to make a lot of noise, which can reveal their position to enemies.
- Use of Robot is limited by range of communication

# Future Improvements

- Include real time vision system
- Communication using satellite connection
- Hand gestures mimicked using a combination of gyroscopes and accelerometers
- Going even further than the military field, similar robotic systems can be used in many different facets of life!

# Conclusions

- Implementation of this robot would reduce the casualties of war.
- The system consisted of a remote controlled four wheeled robot that utilizes hand gestured to be controlled.
- Future work may include improvements in the hand gesture, communication and vision.



# References

[1] Banzi, M. (2010). In “Getting Started with Arduino”. Published by Make: Books and imprint of Maker Media, Inc.”

[2] Blum, J. (2013). In Exploring Arduino: Tools and Techniques for Engineering Wizardry”. John Wiley and Sons, Inc. (Wiley, 978-1-118-54946-0).

[3] Warren. J. & Adams, J. & Molle, H. (n.d.). In “Arduino Robotics”.

Thank You

Questions ?