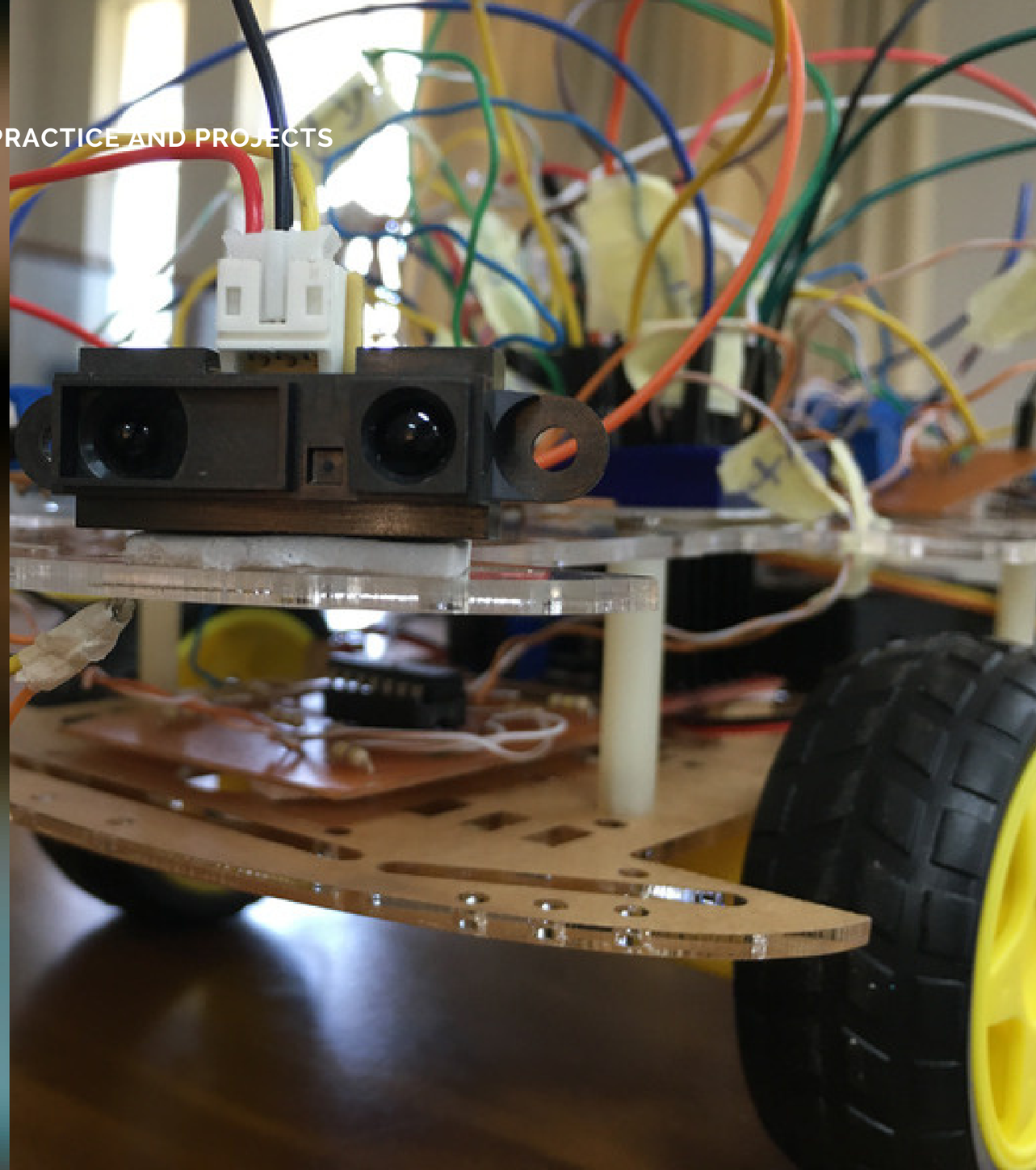
EN2091 LABORATORY PRACTICE AND PROJECTS

ANALOG WALL FOLLOWING ROBOT

USING PID CONTROLLERS



Group 23

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200500L - RAJARATHNA G.K.M.I.D.
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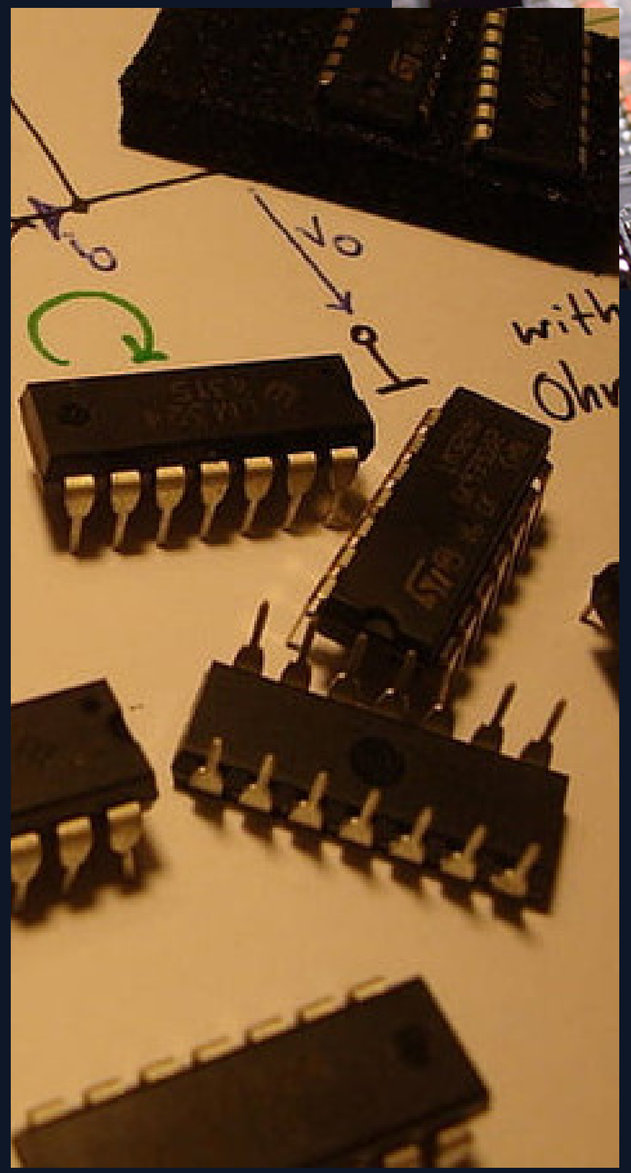
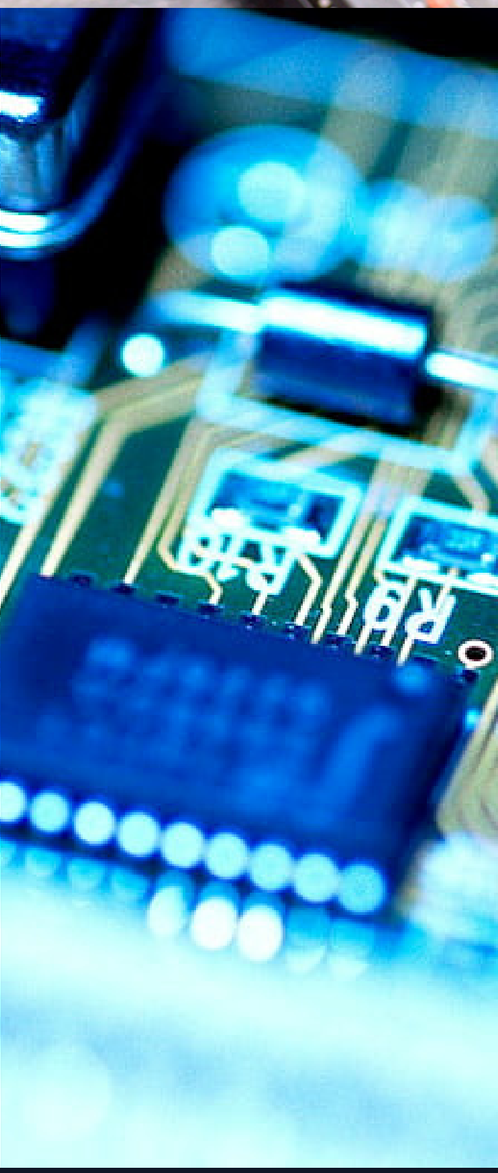
CONTENT

- Introduction
- Theory
- Functional Block Diagram
- Initial Circuit Diagrams
- Schematic Diagrams
- PCBs
- Enclosure Design
- Final Prototype
- Our Team





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INTRODUCTION

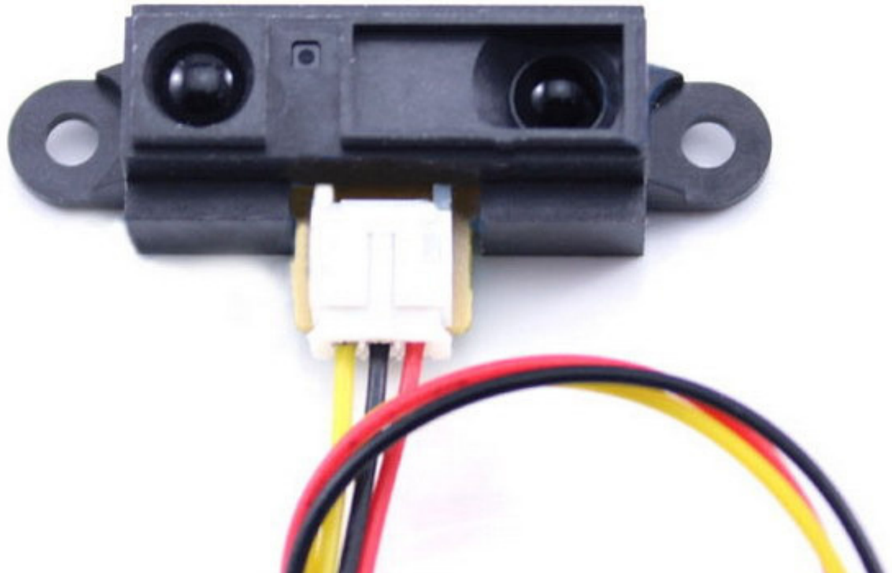
- Wall following robot is a common yet a polular project among the robotics enthusiasts.
- Using a microcontroller like Arduino, this project is very simple and easy.
- But implementing the project only using analog components can be challenging.

- The main task behind a wall following robot is to maintain a constant distance from the two walls.
- If the robot drifts either towards the left or right wall, it should have the ability to correct its path so the disctance to the walls from robot is same.

THEORY

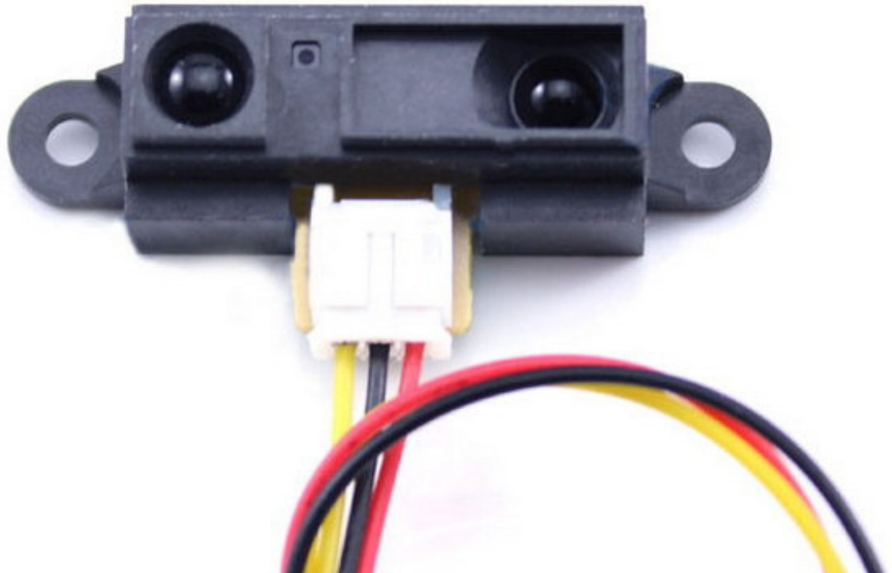
- Measuring the distance from the wall is the key and the first task of this robot.
- 2 commonly used sensors to measure distance,
  - Ultrasonic sensor
  - Sharp IR sensor

- Ultrasonic sensor is difficult to handle in an analog domain because it should be triggered using a PWM signal and its output is also a PWM signal.
- So, sharp IR sensor was selected since it has a voltage signal as the output which is inversely proportional to the distance.



THEORY CTD...

- 2 sharp IR sensors are used to measure the distance from the 2 walls and the outputs will be sent through an instrumentation amplifier.
- The output of the instrumentation amplifier which is the error signal will be given to the PID controller.
- The output of the PID controller then will be given to the turn adjustment circuit where for one motor, it will be added and for the other one, it will be subtracted.
- Then, using a trangular wave generator, the required PWM signal will be generated for the 2 motors to be driven.



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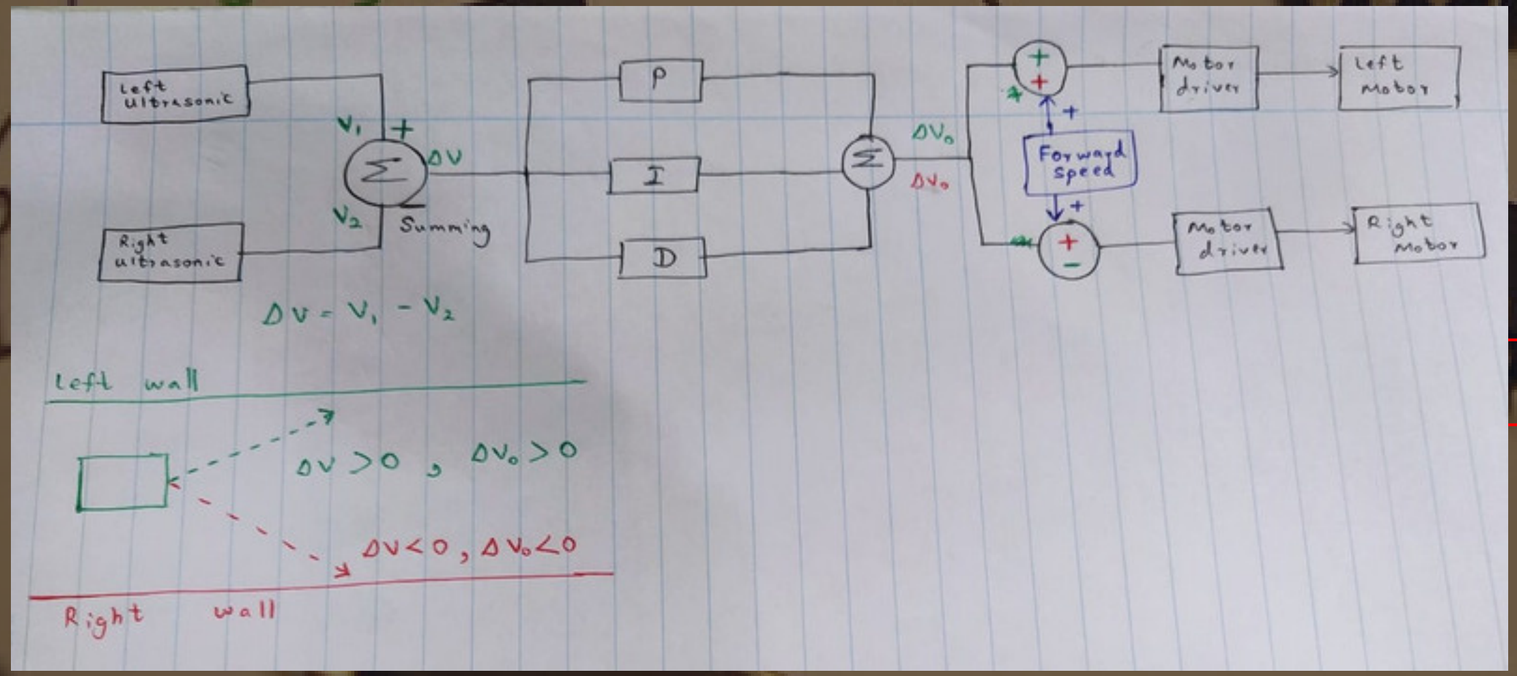
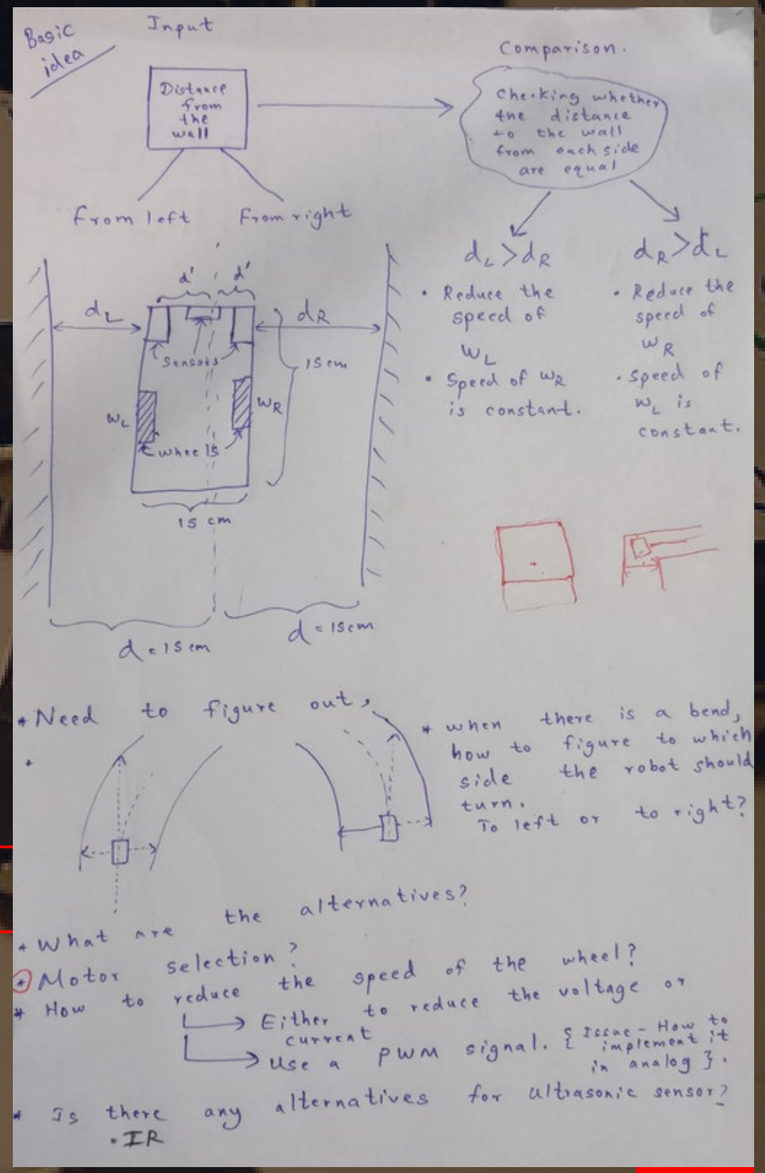
FUNCTIONAL BLOCK DIAGRAM & INITIAL TASK DOCUMENT





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INITIAL CIRCUIT DIAGRAMS

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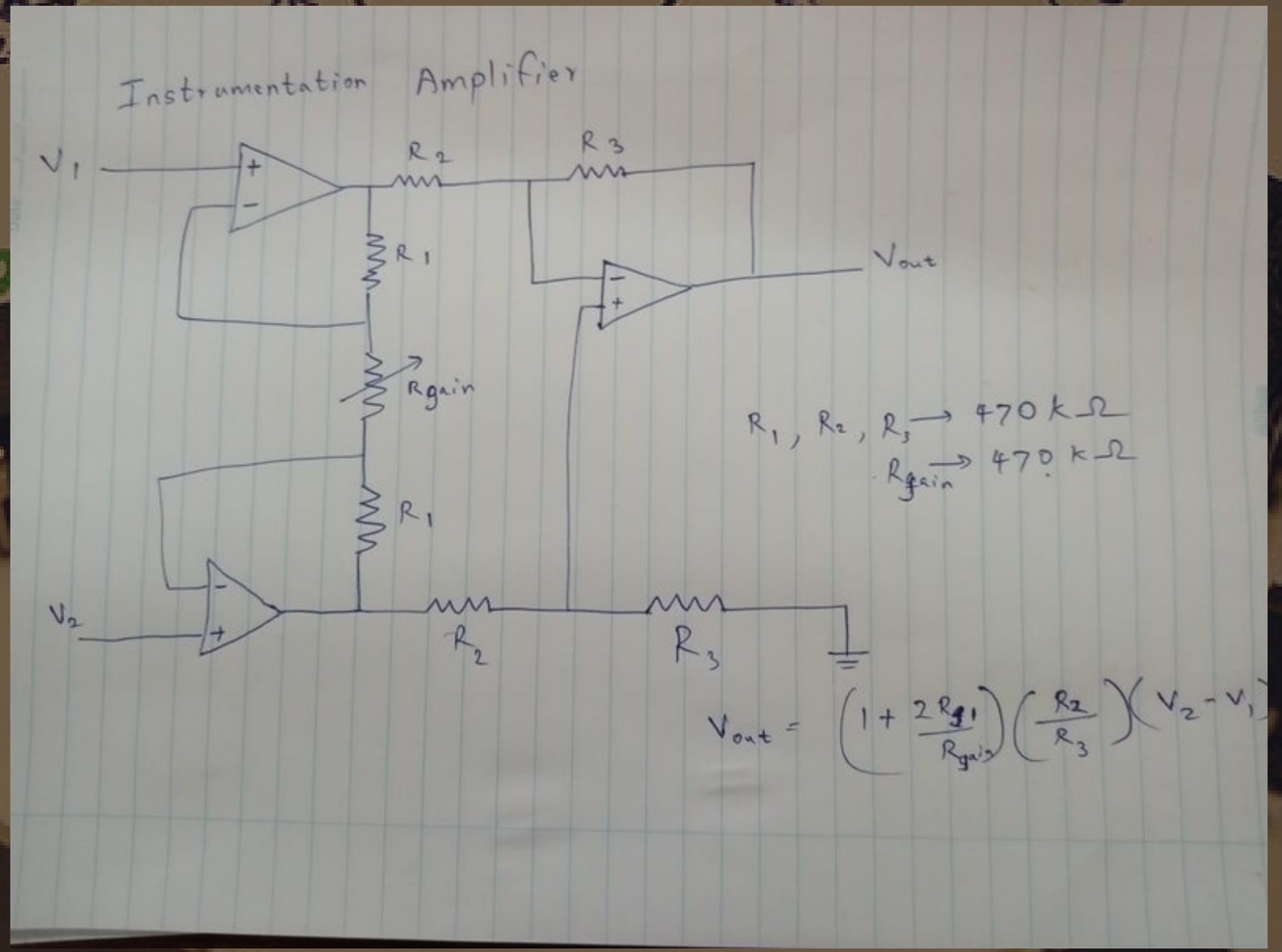
INSTRUMENTATION AMPLIFIER



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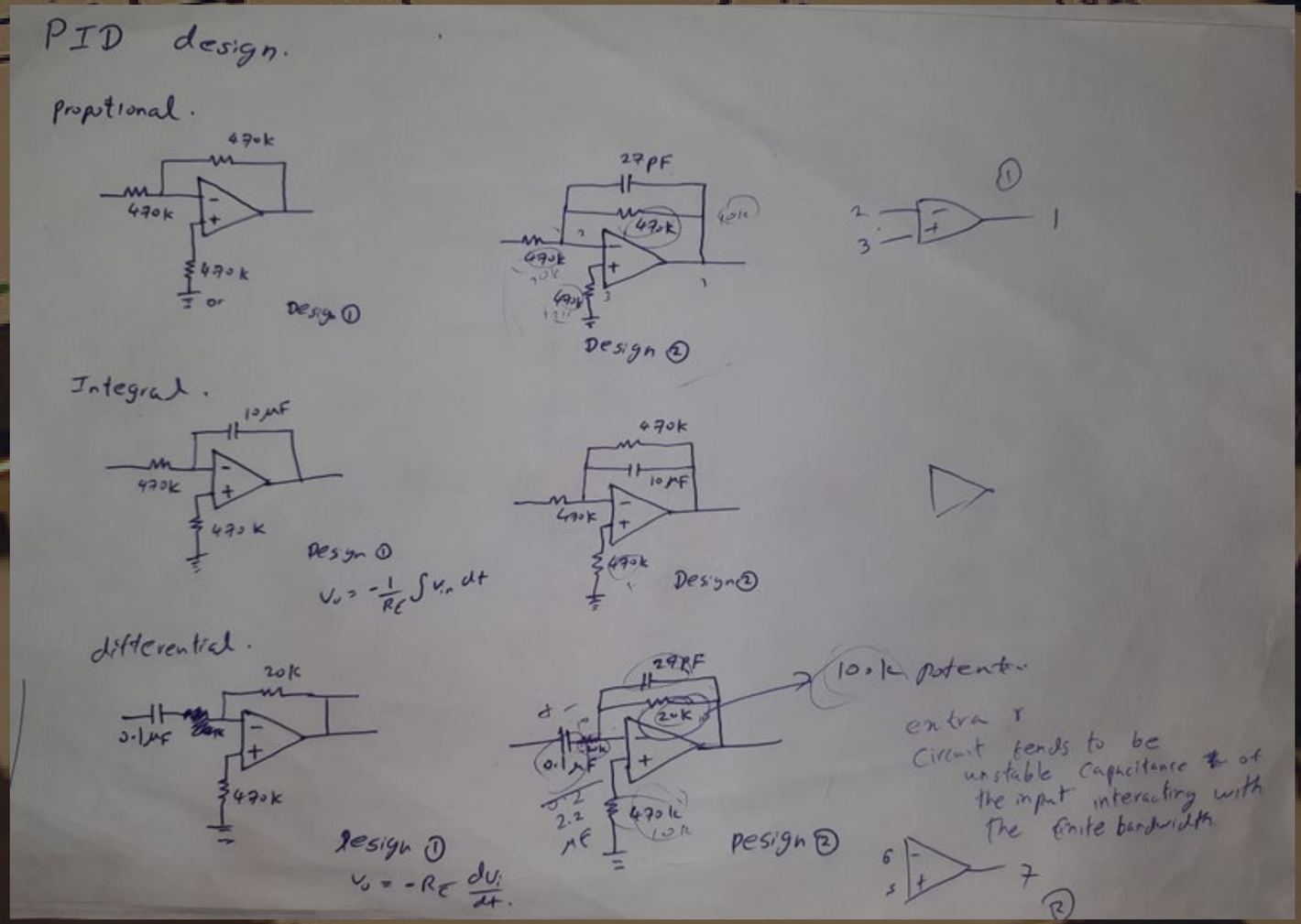
PID CONTROLLER



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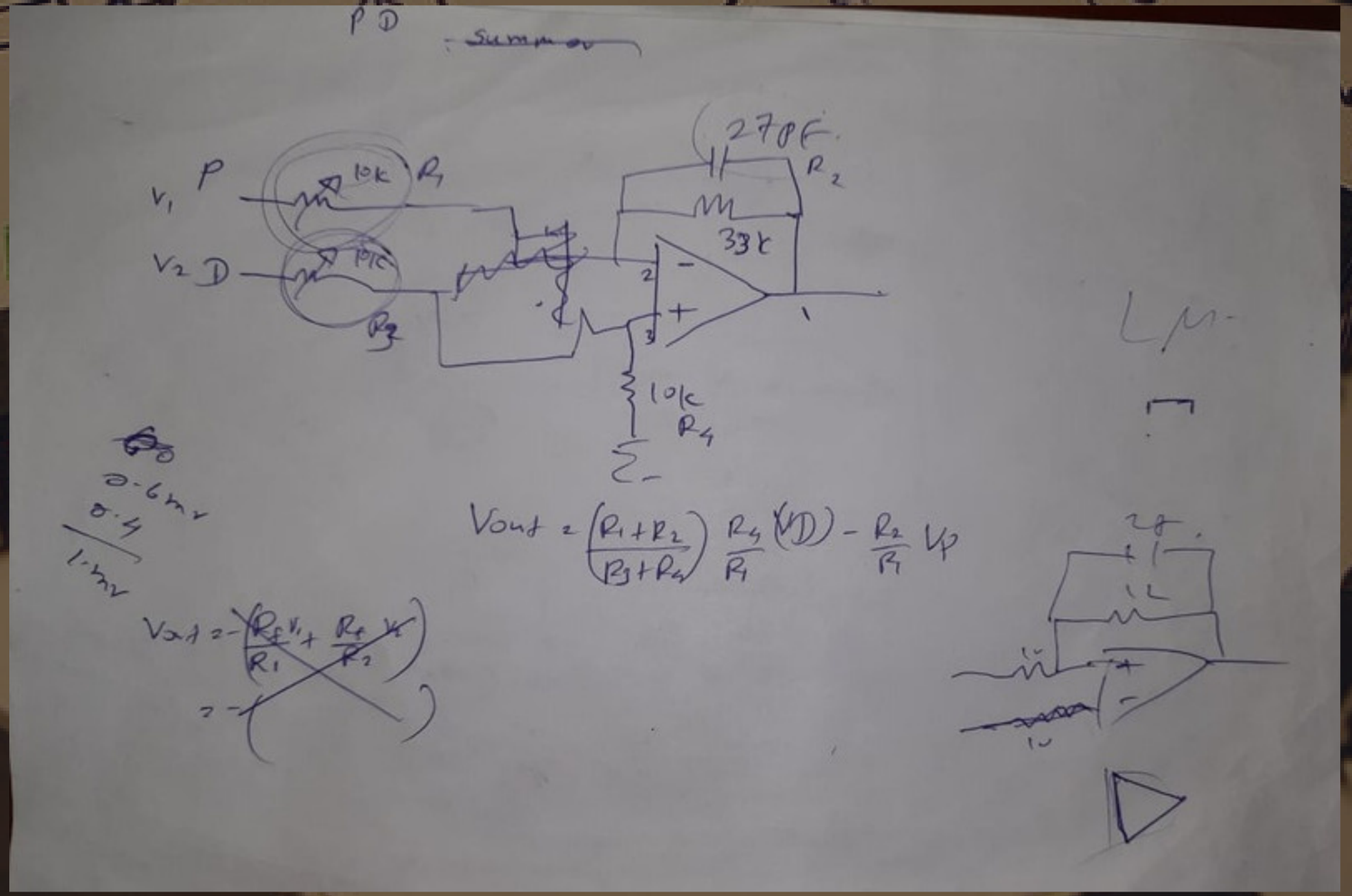
SUMMING AMPLIFIER



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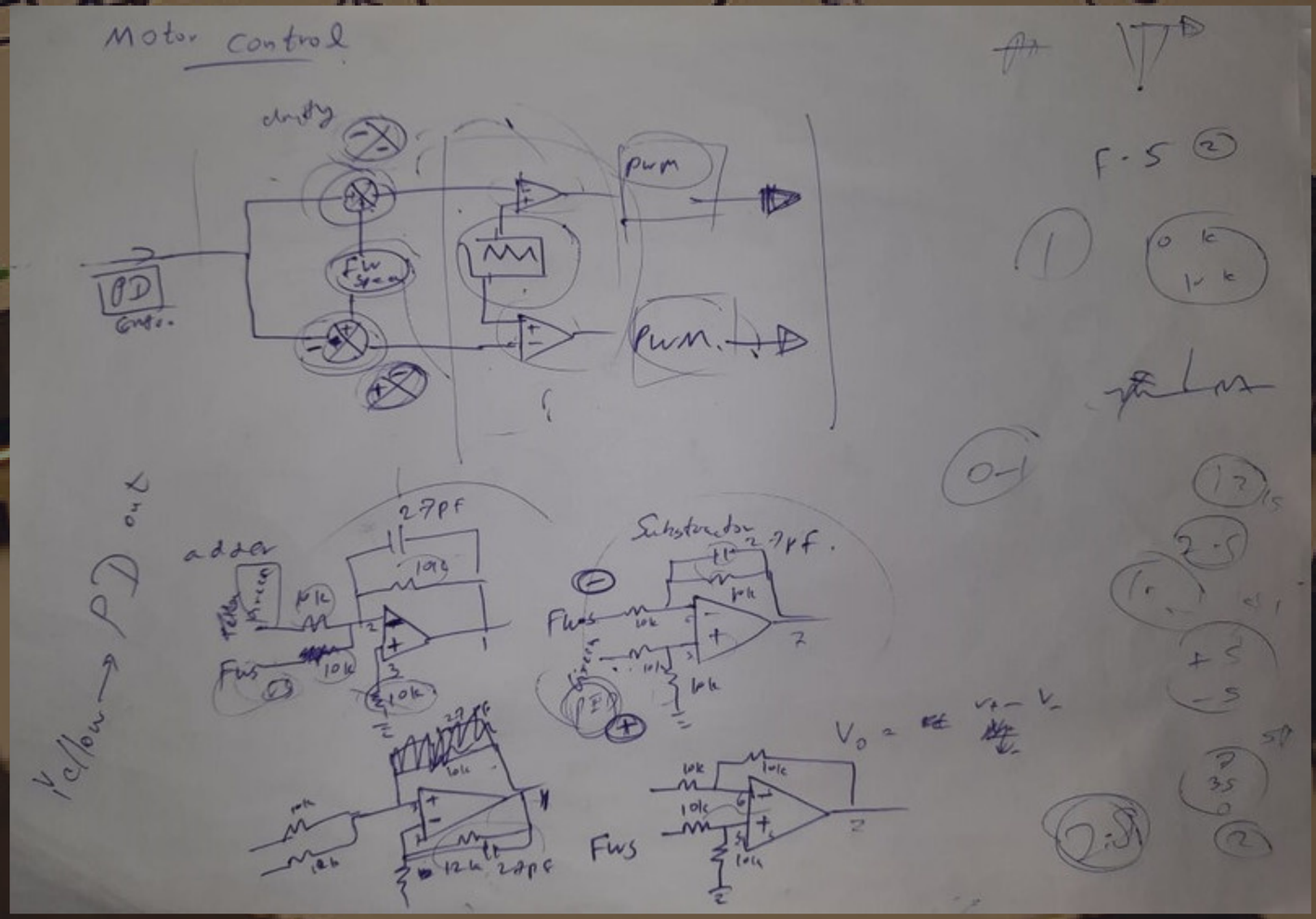
TURN CONTROLLER



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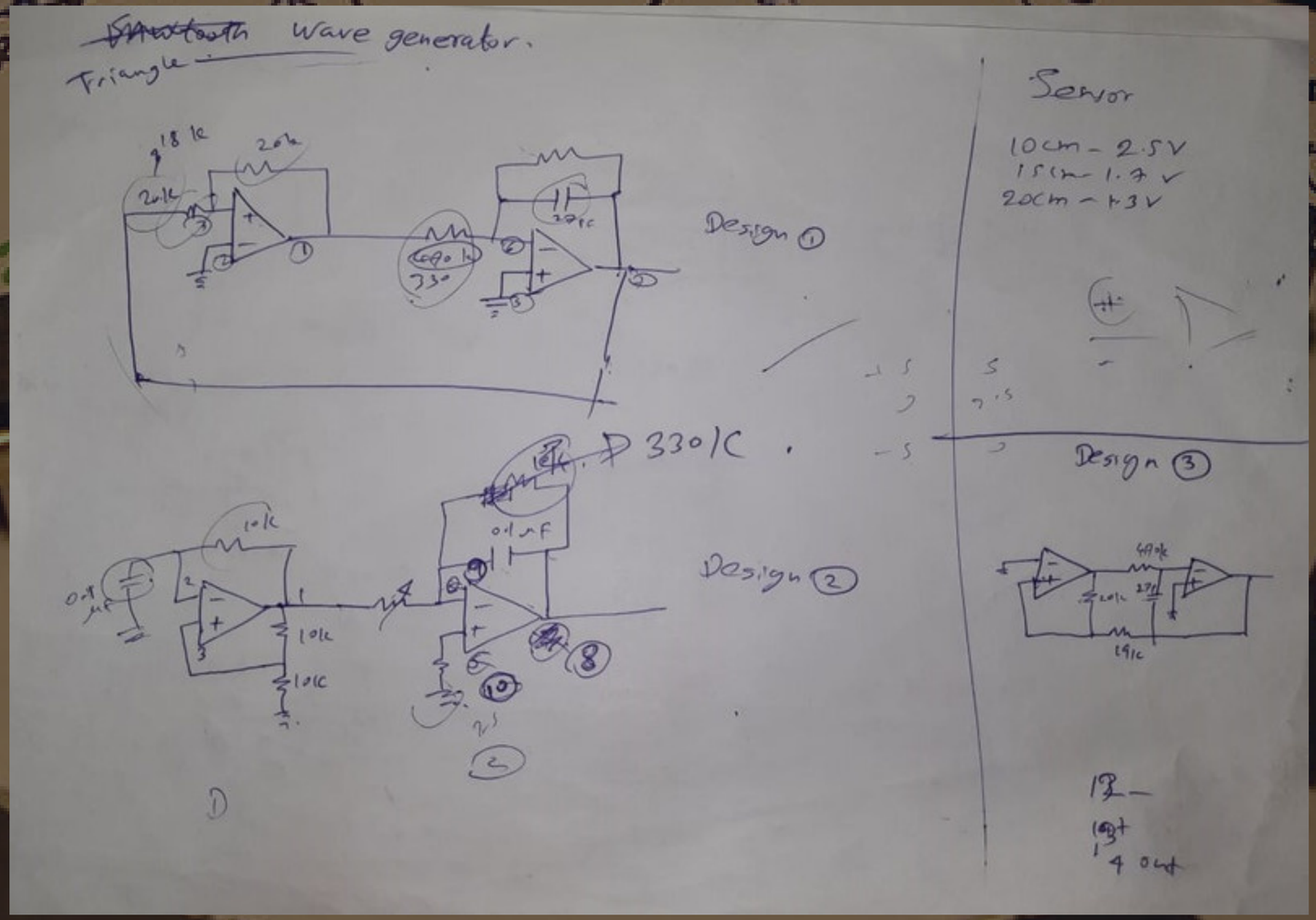
TRANGULAR WAVEFORM GENERATOR



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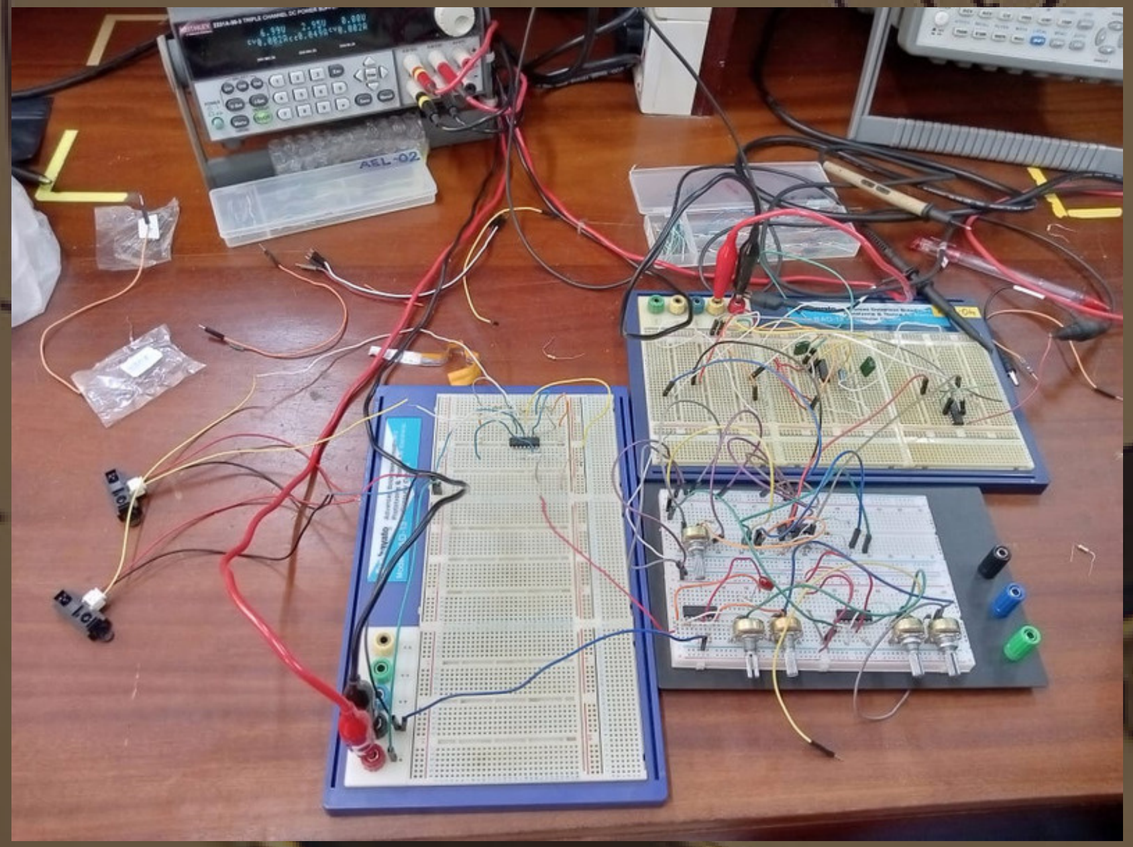
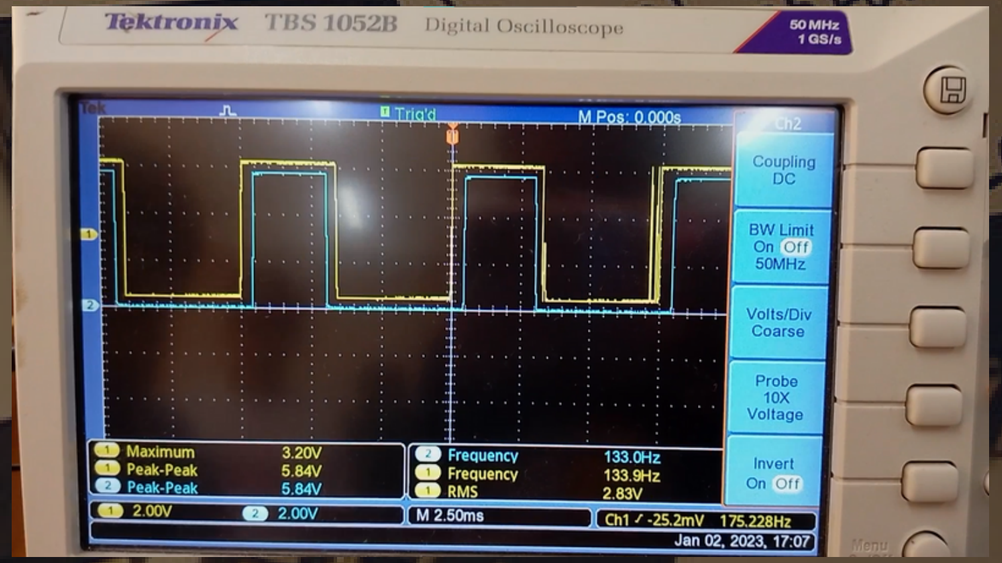
BREADBOARD IMPLEMENTATION AND THE OUTPUT





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SCHEMATIC DIAGRAMS

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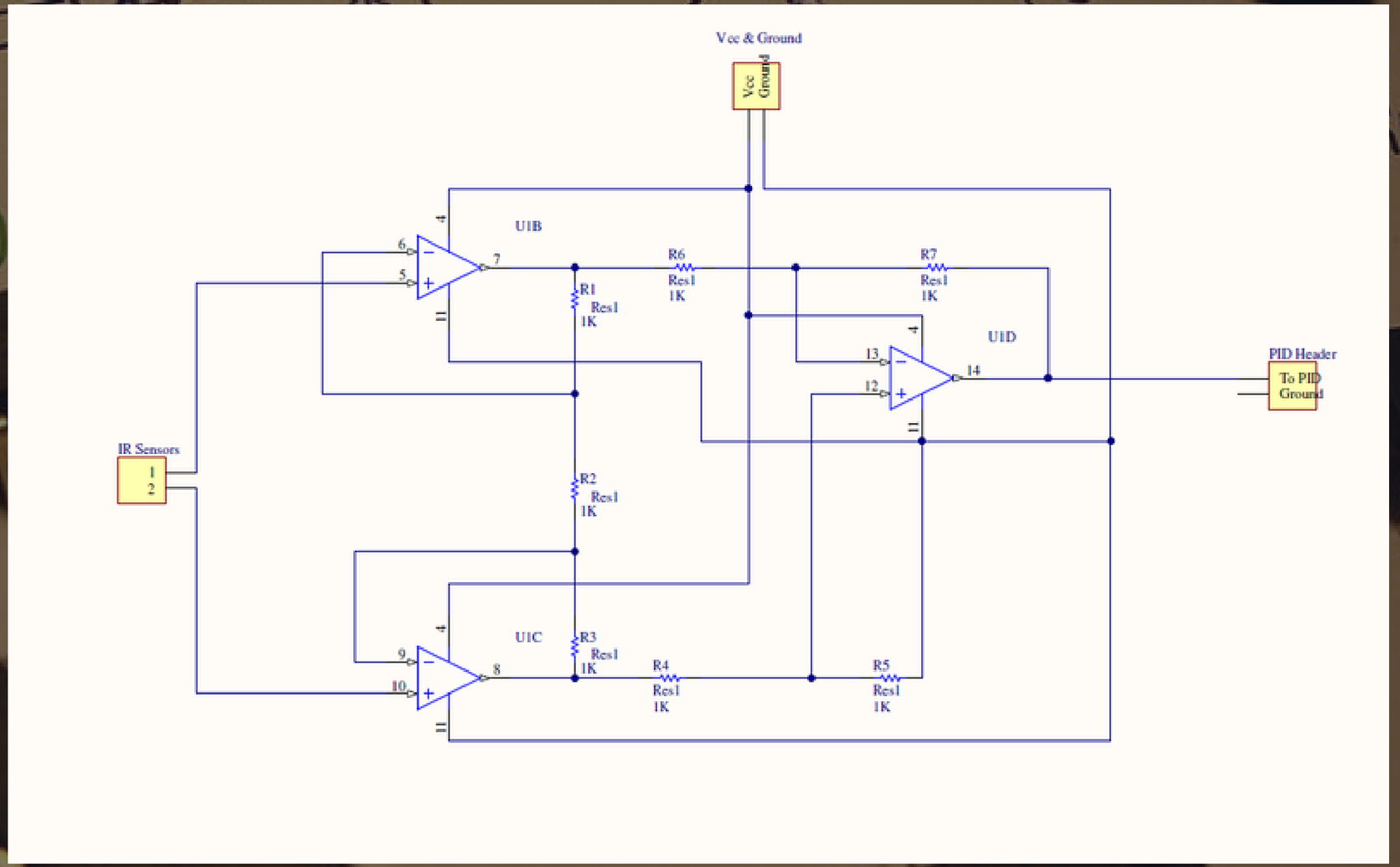
INSTRUMENTATION AMPLIFIER



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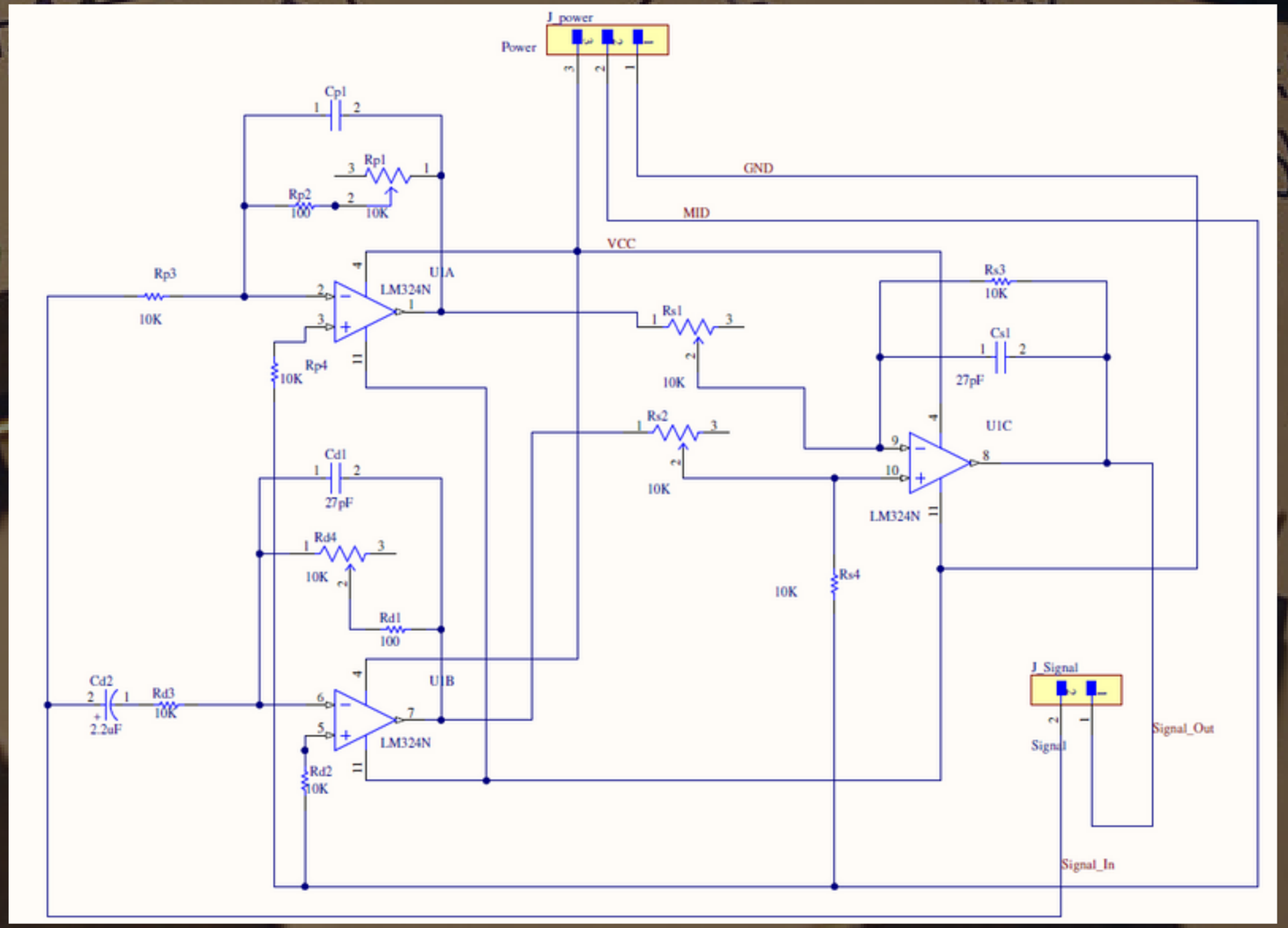
PD CONTROLLER



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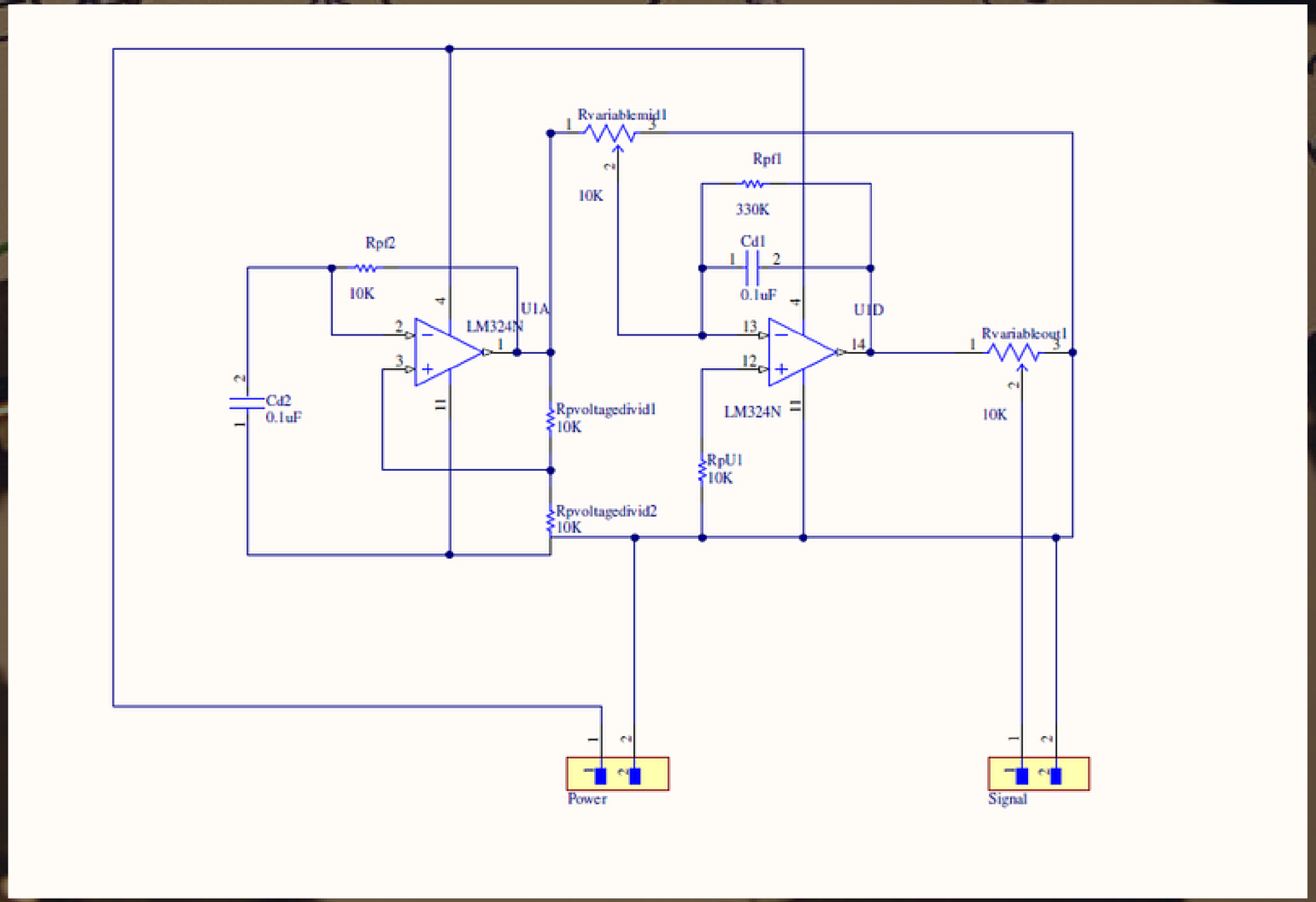
TRIANGULAR WAVE GENERATOR



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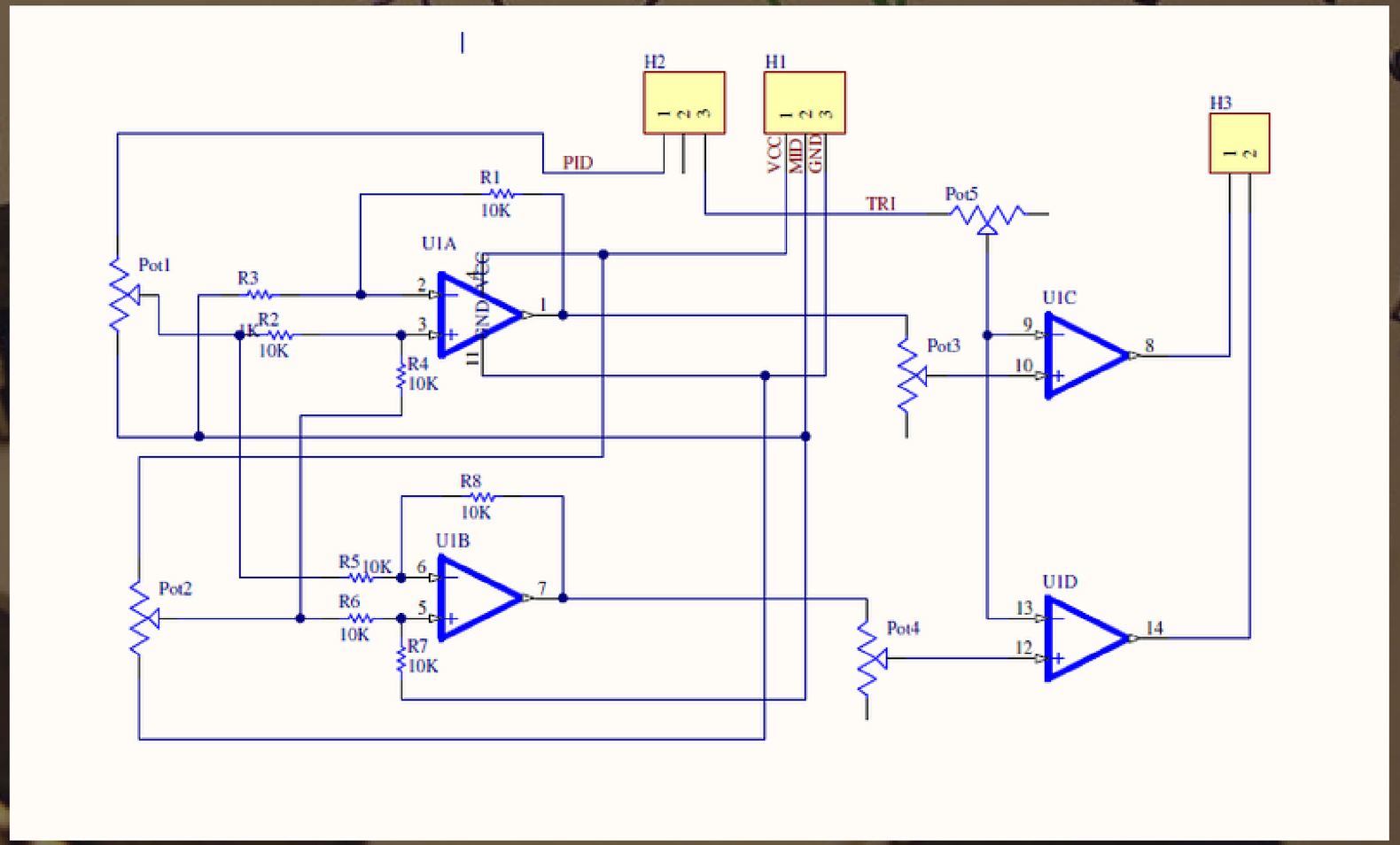
PWM SIGNAL GENERATOR AND TURN CONTROLLER



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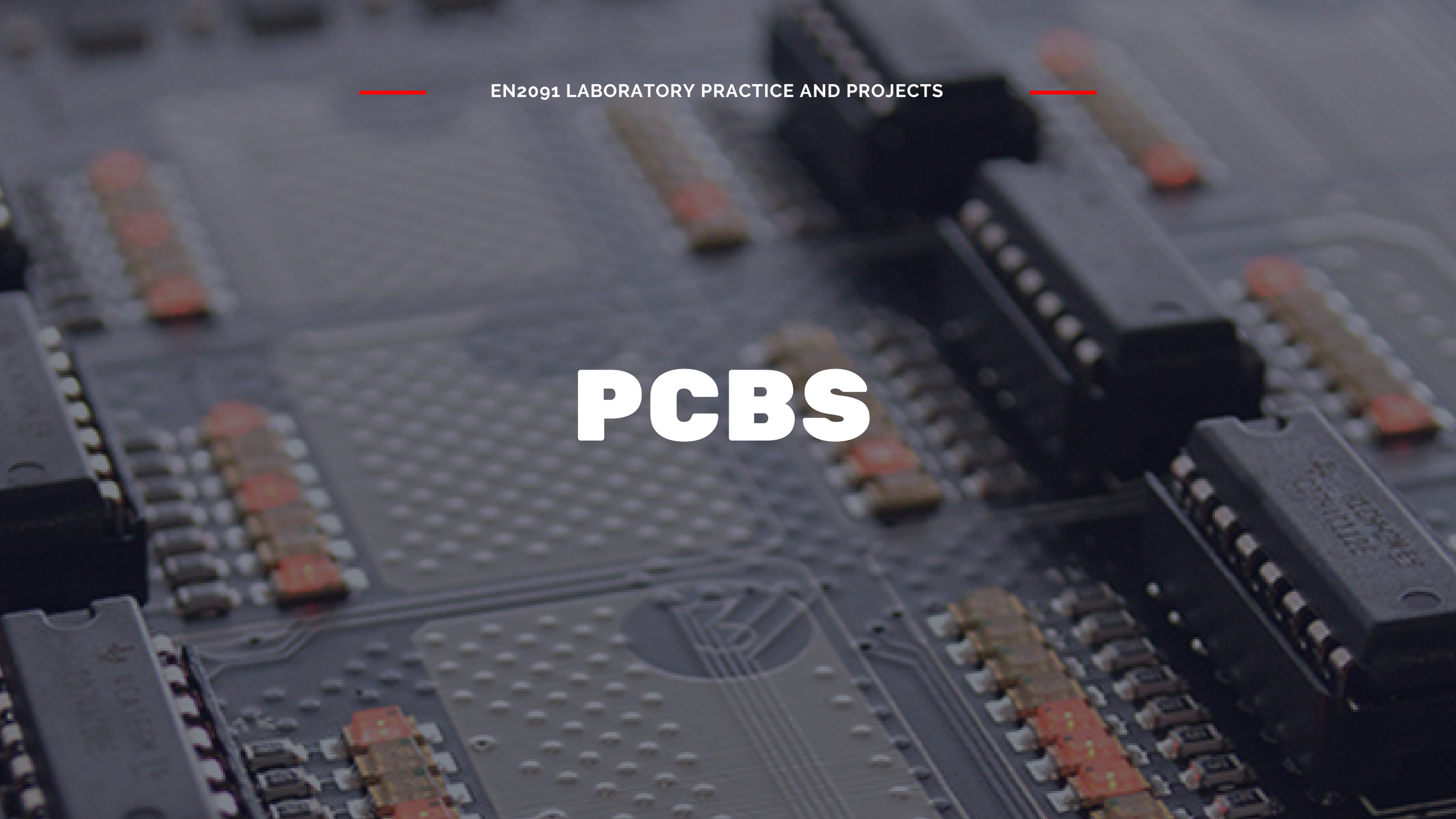

PCBS

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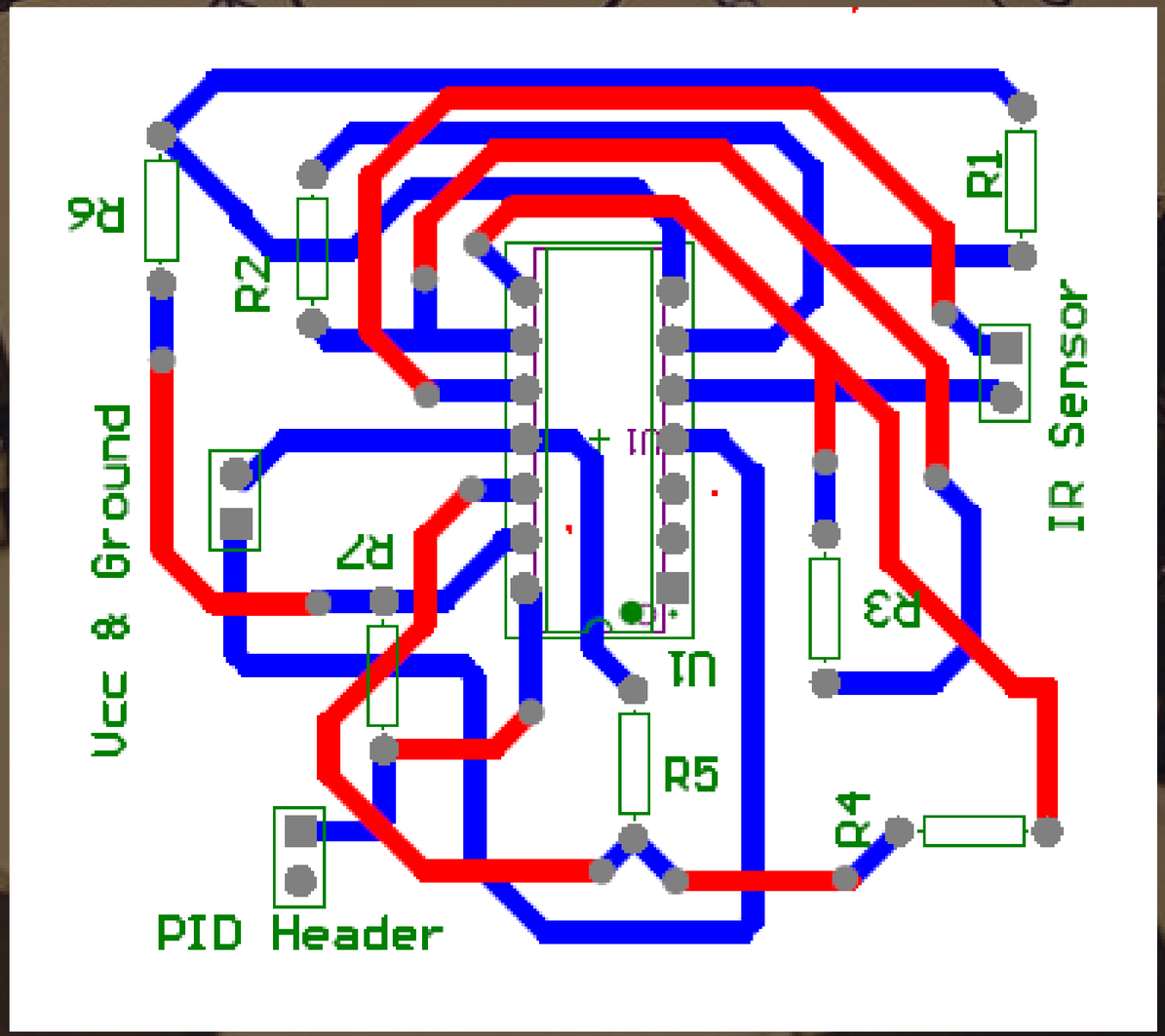
INSTRUMENTATION AMPLIFIER



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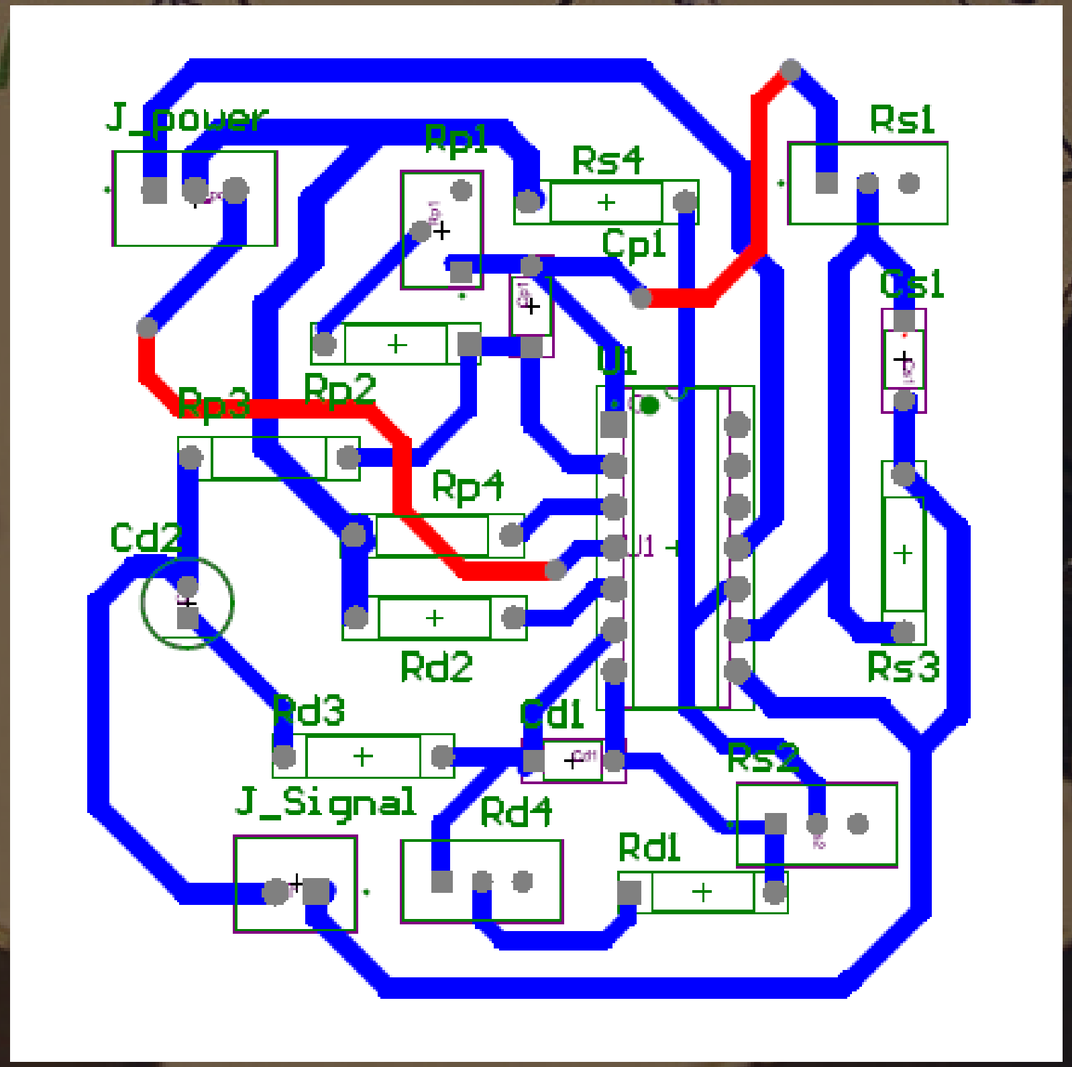
PD CONTROLLER



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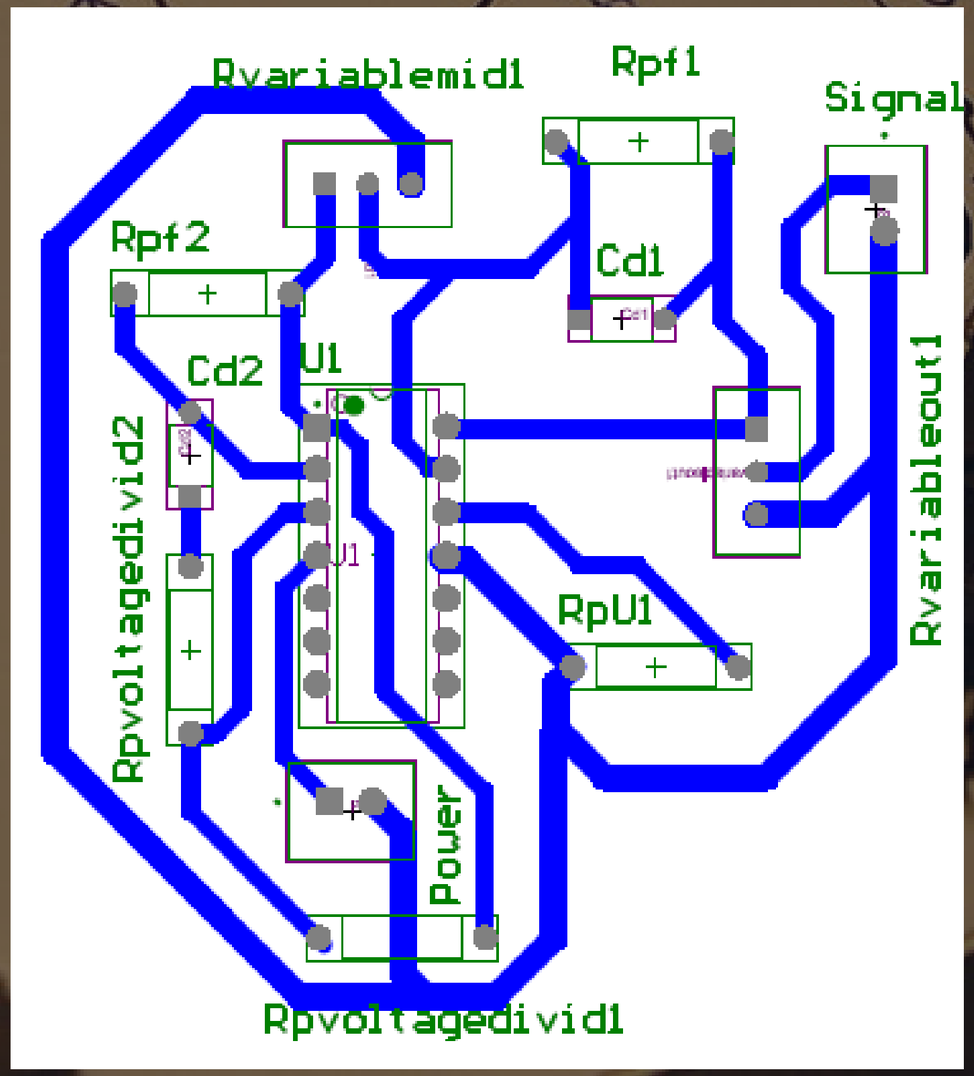
TRIANGULAR WAVE GENERATOR



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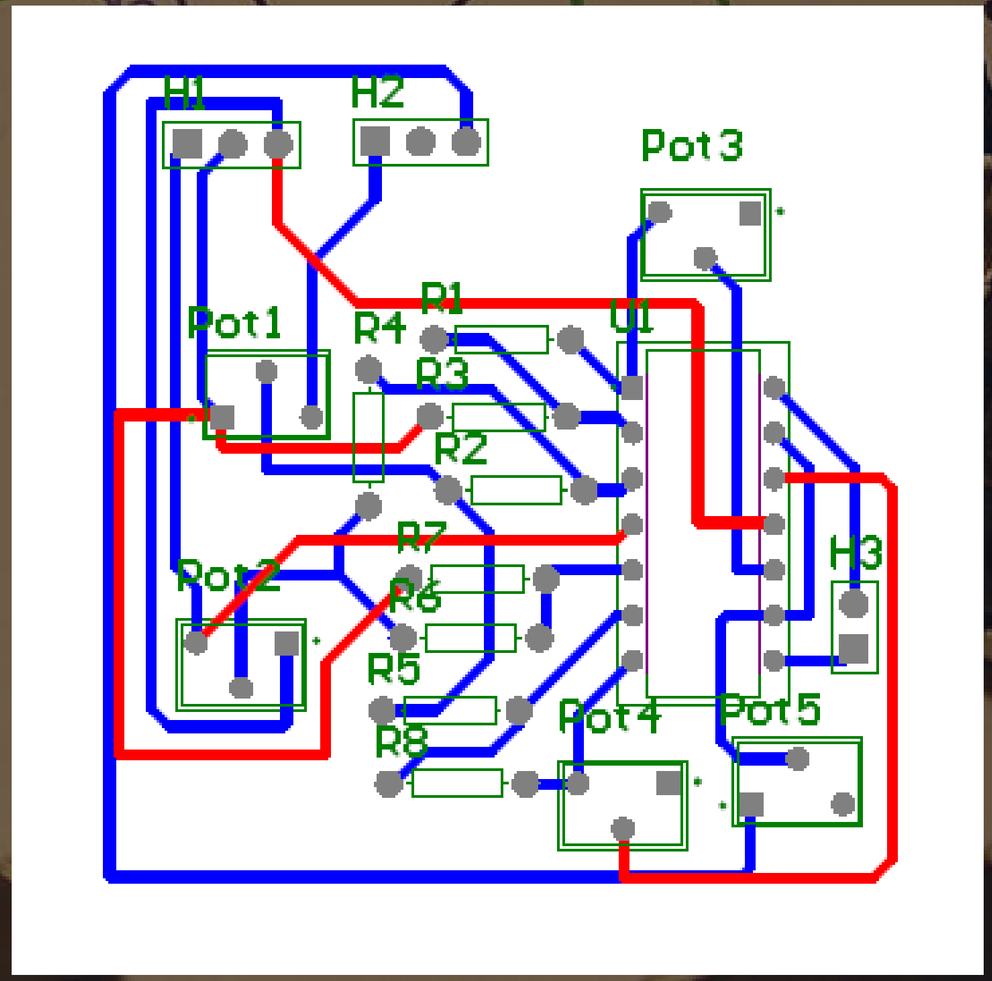
PWM SIGNAL GENERATOR AND TURN CONTROLLER



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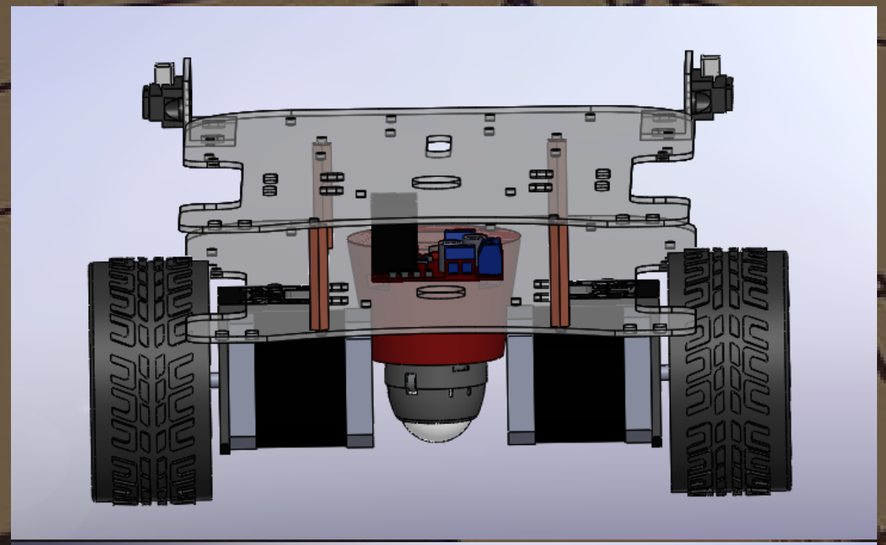
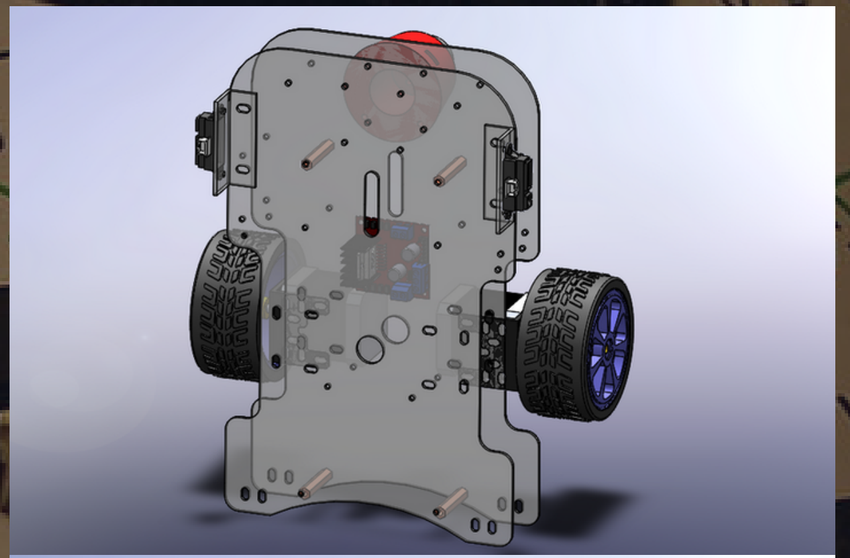
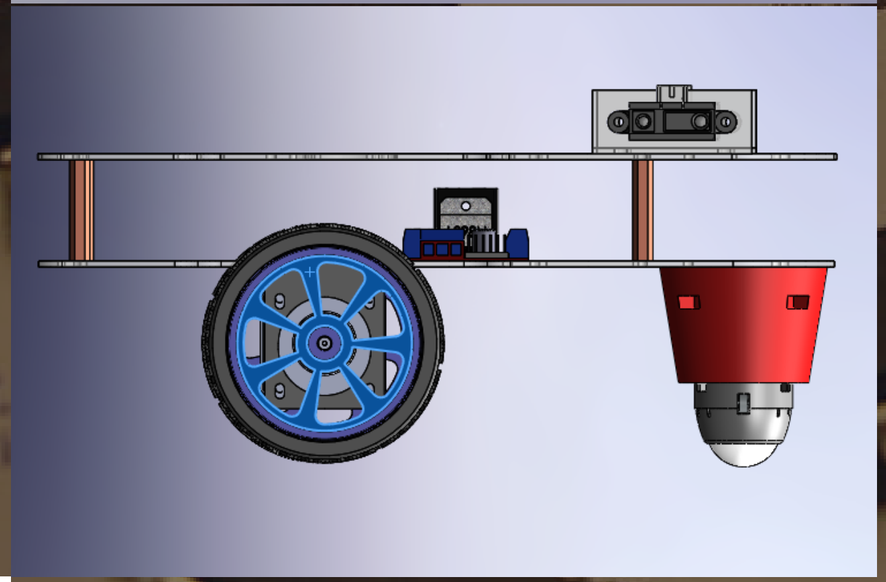
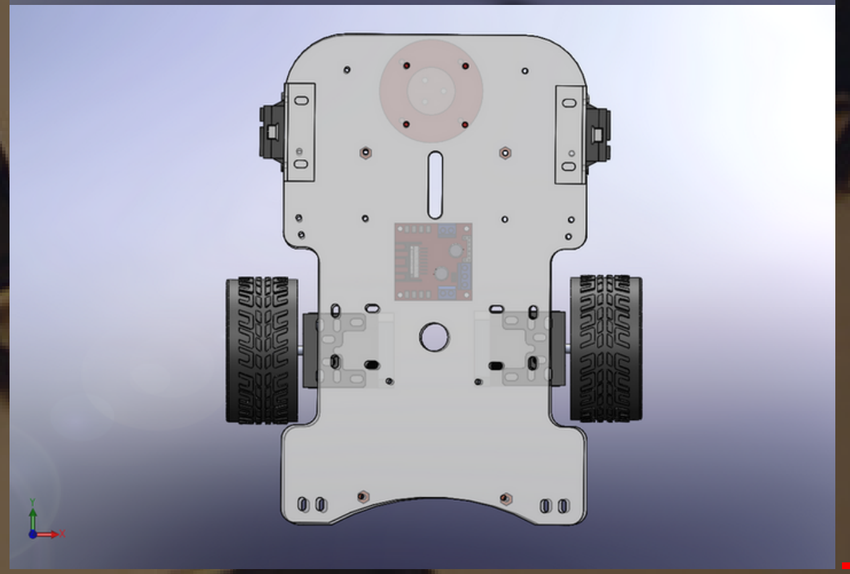
ENCLOSURE DESIGN









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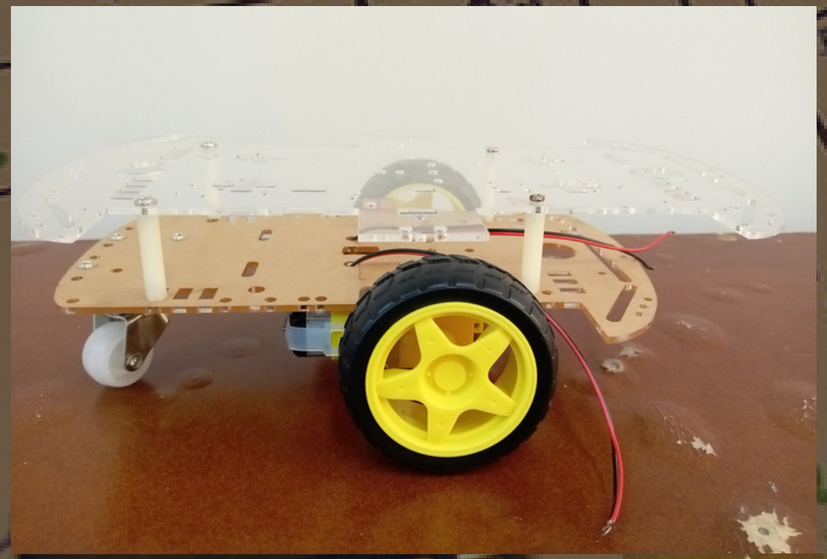

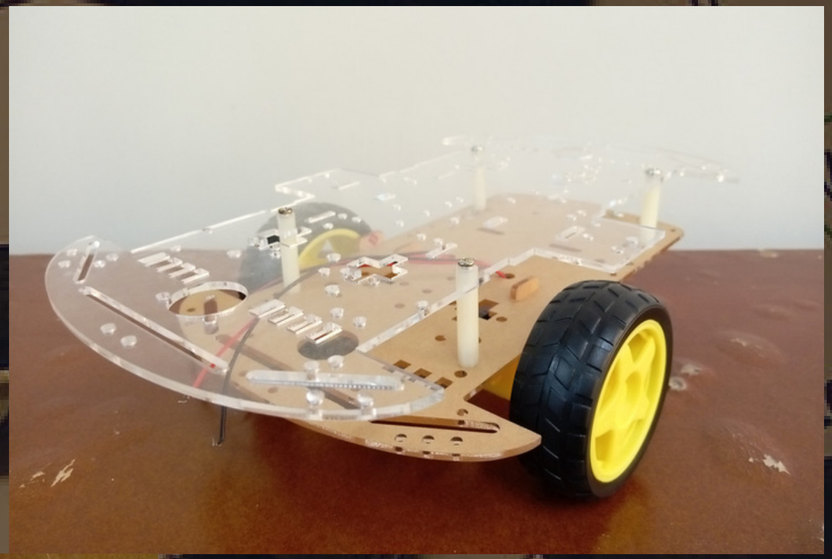

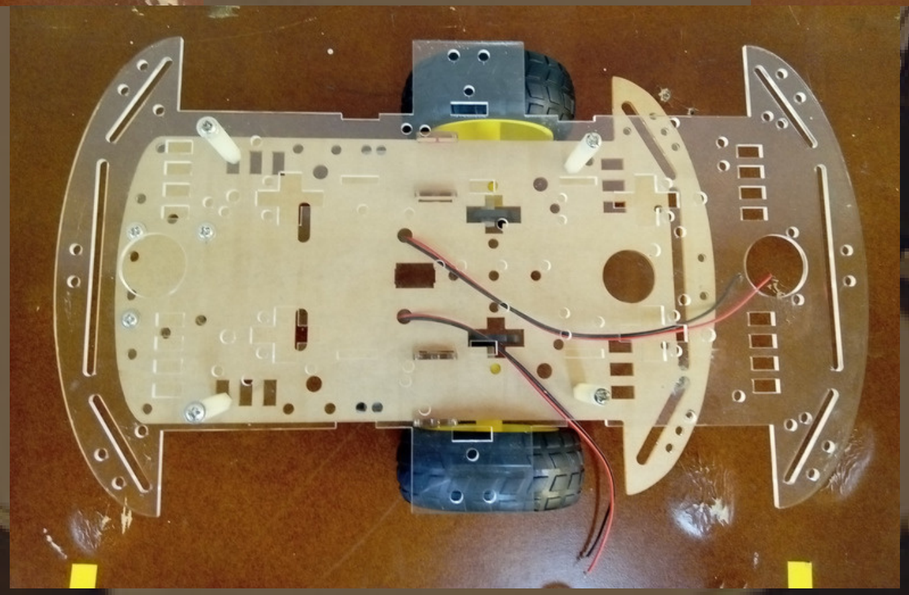

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FINAL PROTOTYPE

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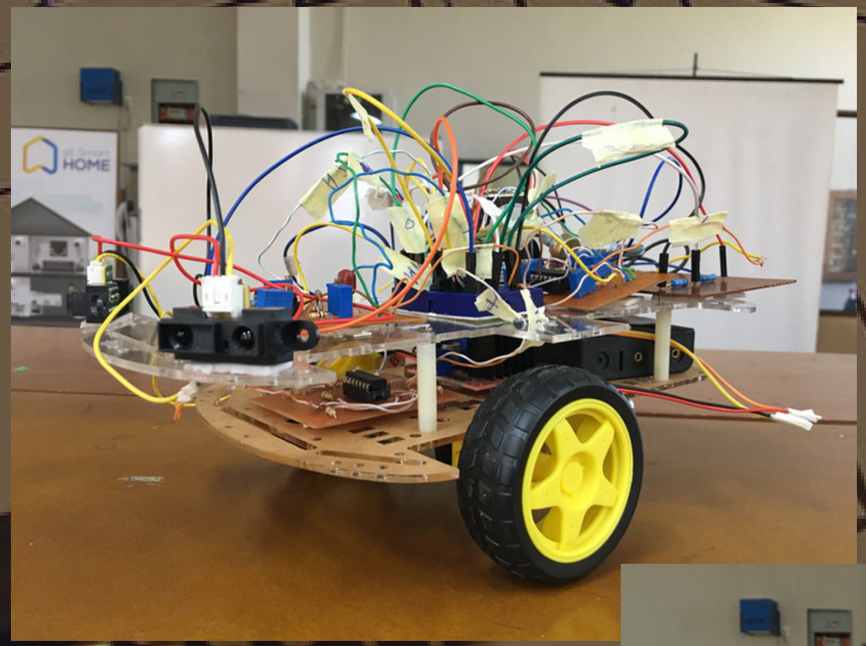

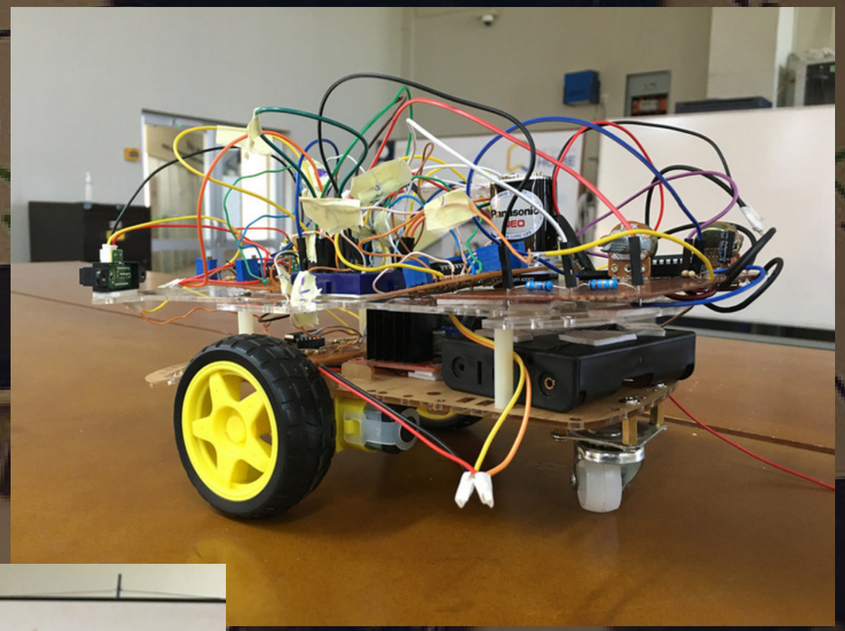

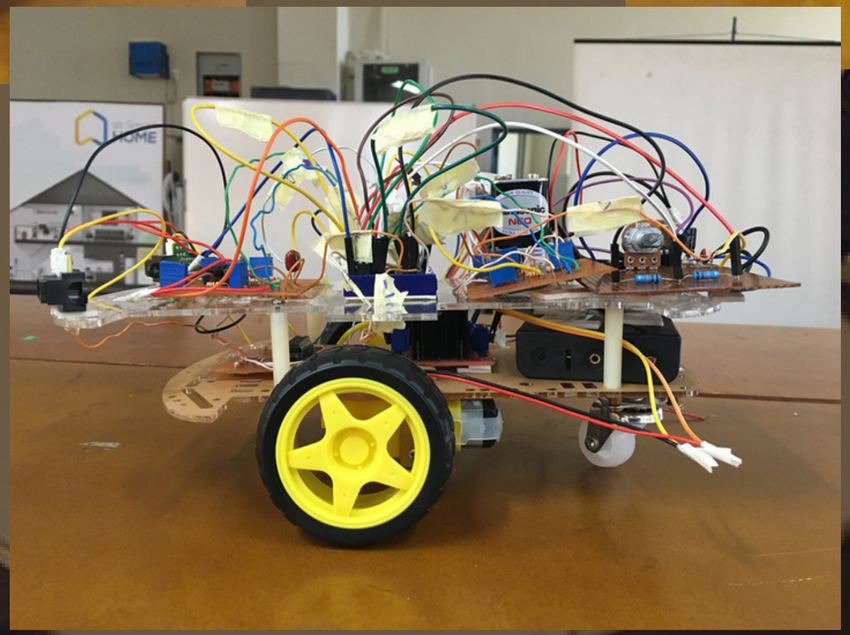

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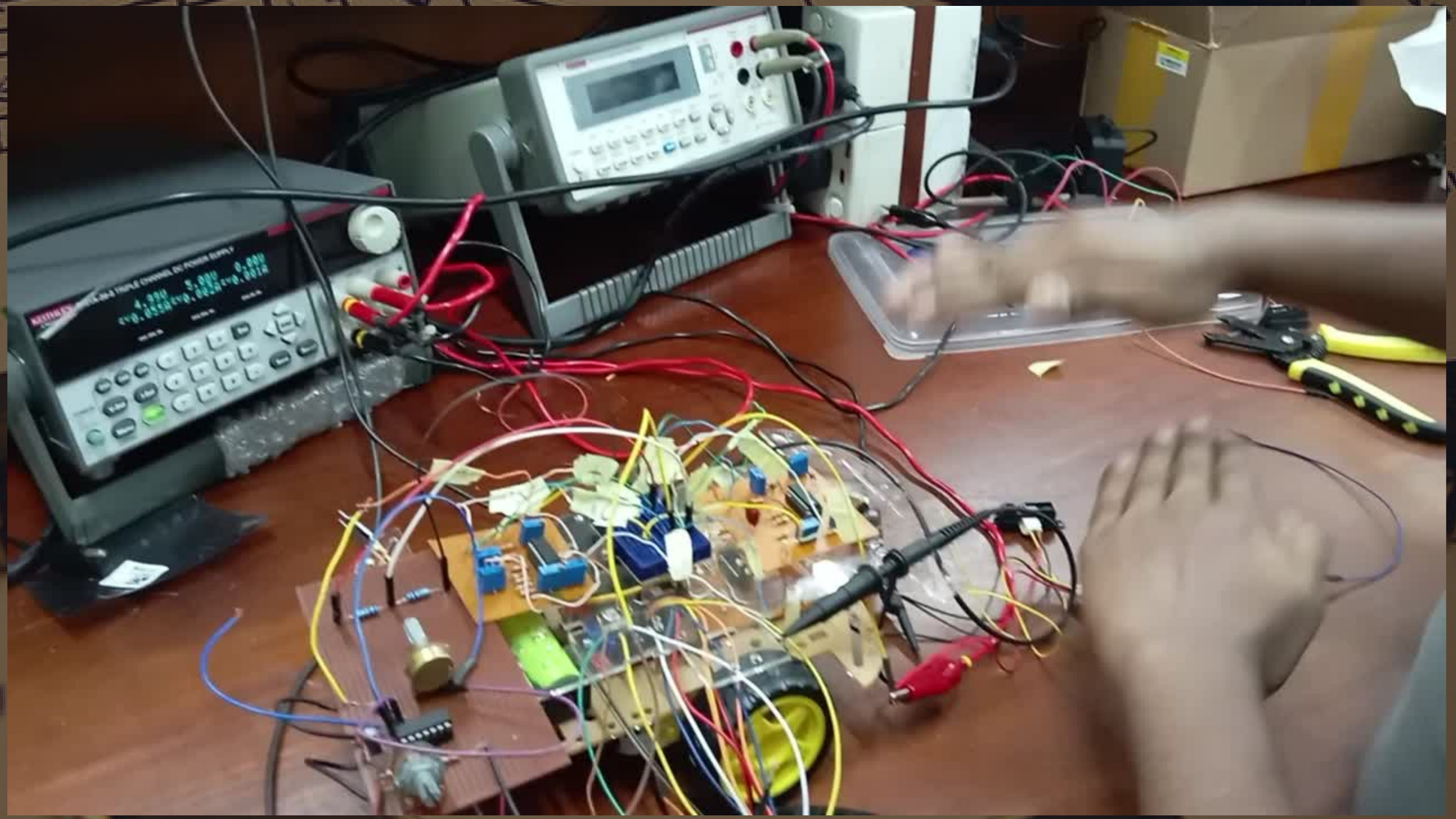

EN2091 LABORATORY PRACTICE AND PROJECTS

OUR TEAM

Project Supervisors

- Pahan Mendis
- Hasantha Nadeeshan
- Hiruna Vidumina

Team Members

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- 200345N - LIYANAARACHCHI D.S.G.L.S
- 200500L - RAJARATHNA G.K.M.I.D.
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THANK YOU