AUTONOMOUS LINE FOLLOWING GROUND VEHICLE

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ABSTRACT

The purpose of this presentation is to outline the work performed during the Microprocessors and Applications MECH 6621/471 course. The final goal was to program a PIC18 microcontroller in assembly language making a small ground vehicle to follow a predetermined path. In addition, the required tasks were building the actual vehicle and developing the appropriate electrical schematics prior to proceeding with microcontroller programming. The work presented in this report shows all of the necessary steps the team took in order to complete the project.
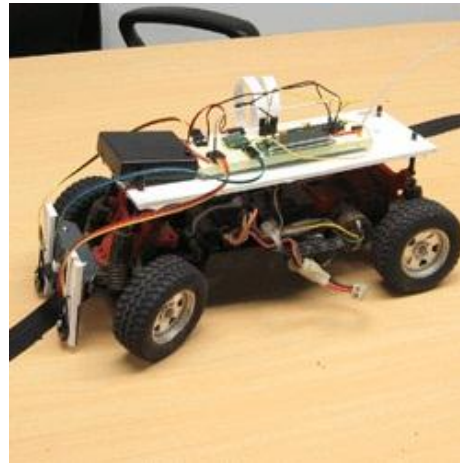
NAVIGATION SYSTEMS

Externally guided:

- Laser – similar to the principle of Laser guided missiles.

- GPS Based – Most modern method in exploratory robots which can estimate its own location within meters.

Self guided:

- CCD camera- Detection using machine vision which uses contrast to detect edges.
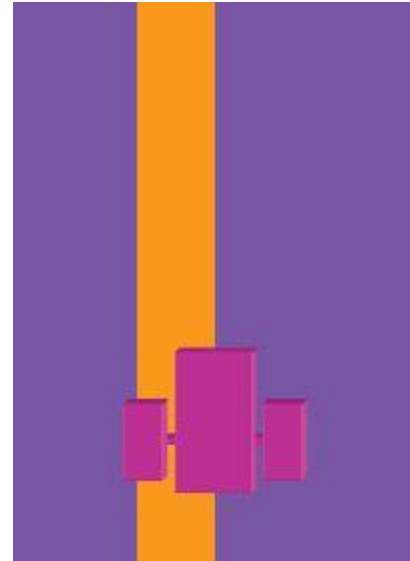
- Reflective Object Sensor

# LINE FOLLOWING ROBOTS

SENSOR PLACEMENT

Single sensor:

- **Detects edge**

- **Directs power alternately to two motors**

- **Advantages**
  - Single Sensor
  - Suitable for sharp edges
- **Disadvantages**
  - Jerky motion
  - If robot leaves path

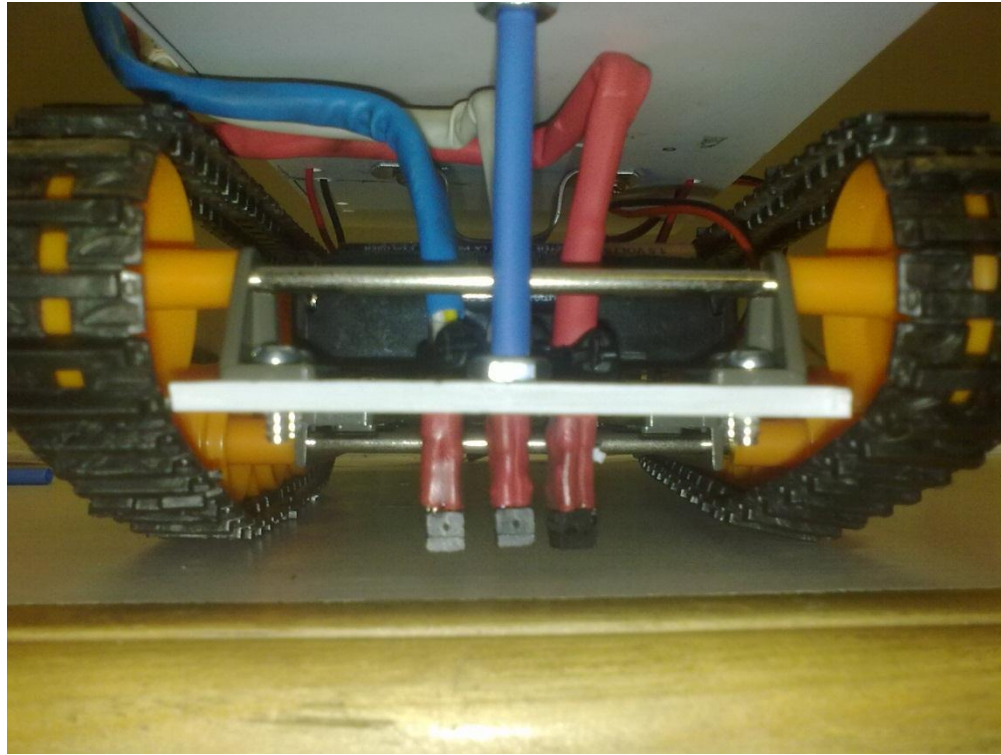 turns 180 degrees and moves

  opposite direction

SENSOR PLACEMENT (CONTINUED)

Dual Sensor:

- **Each sensor controls one motor**
  - Left sensor controls right motor and vice versa
- **Advantages**
  - Smooth motion on straight line
- **Disadvantages**
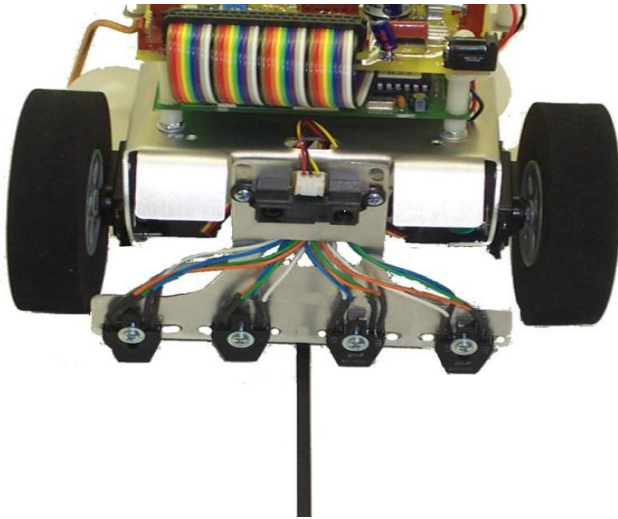 - Two sensors
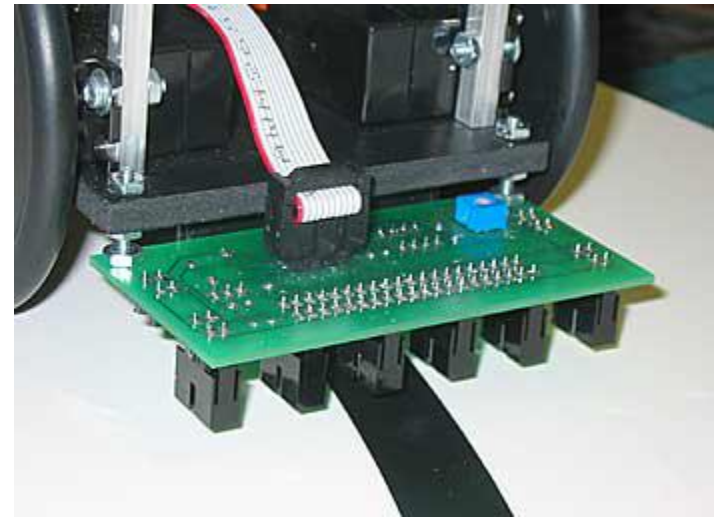 - Motors should be synchronized
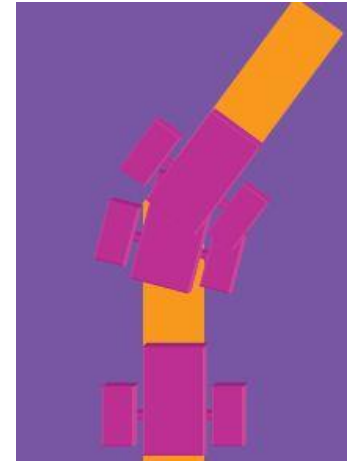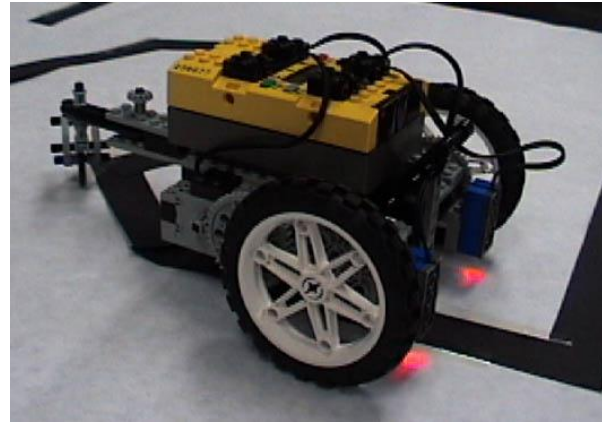
SENSOR PLACEMENT (CONTINUED)
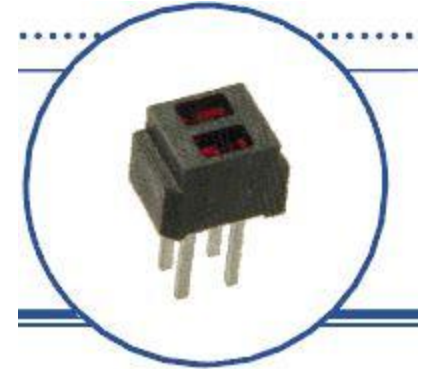
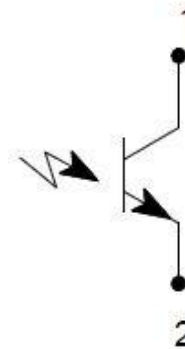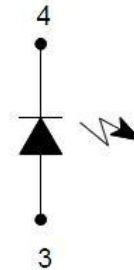# SENSOR PLACEMENT (CONTINUED)

Four sensors

Six sensors

REFLECTIVE OBJECT SENSOR

Contains:

- **LED**
  - To produce InfraRed light

- **Phototransistor**
  - Made of high resistance semiconductors
  - To detect intensity of absorbed photons by the semi conductor and convert it to appropriate voltage

THE MOTORS

Tamiya Double Gearbox:

- **6 Volts**

- **Variable speeds and torques**
 - Depending on how you install them, you get one of four different gear ratios
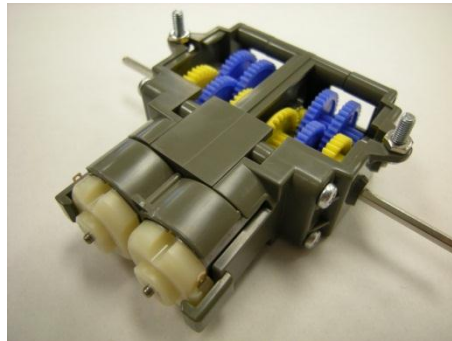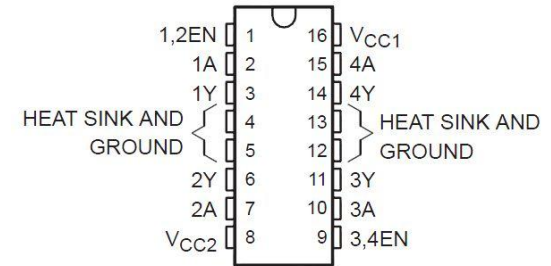
H-BRIDGE

An H-bridge is an electronic circuit that enables a voltage to be applied across a load in either direction.

Quadruple Half-H driver:

- **1-A Output-Current Capability Per Driver**
- **Wide Supply-Voltage Range of 4.5 V to 36 V**
- **Minimized Power Dissipation**
- **Improved Functional Replacement for the SGS L293**
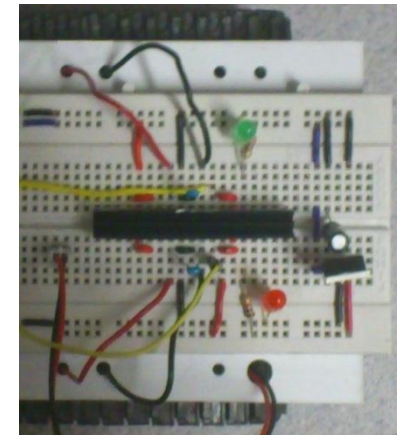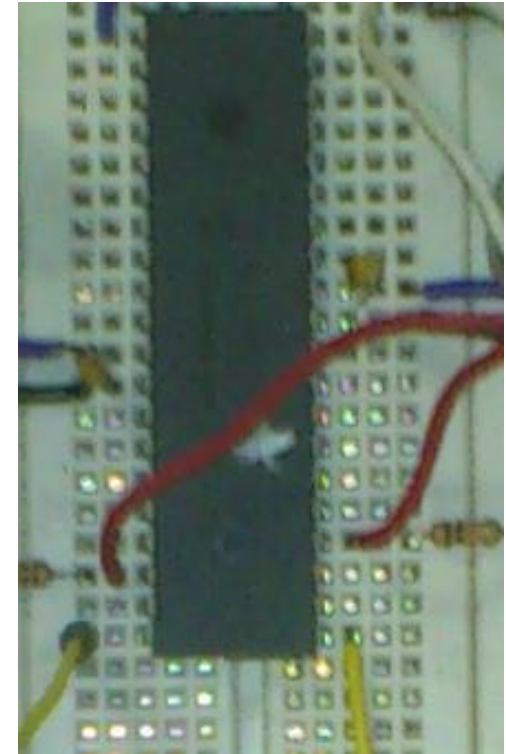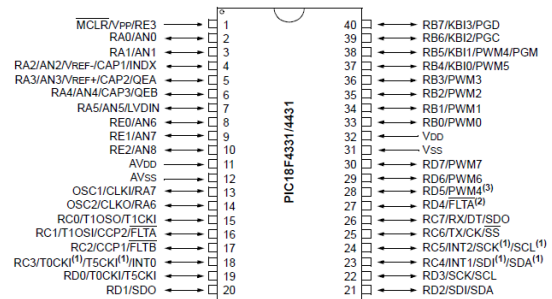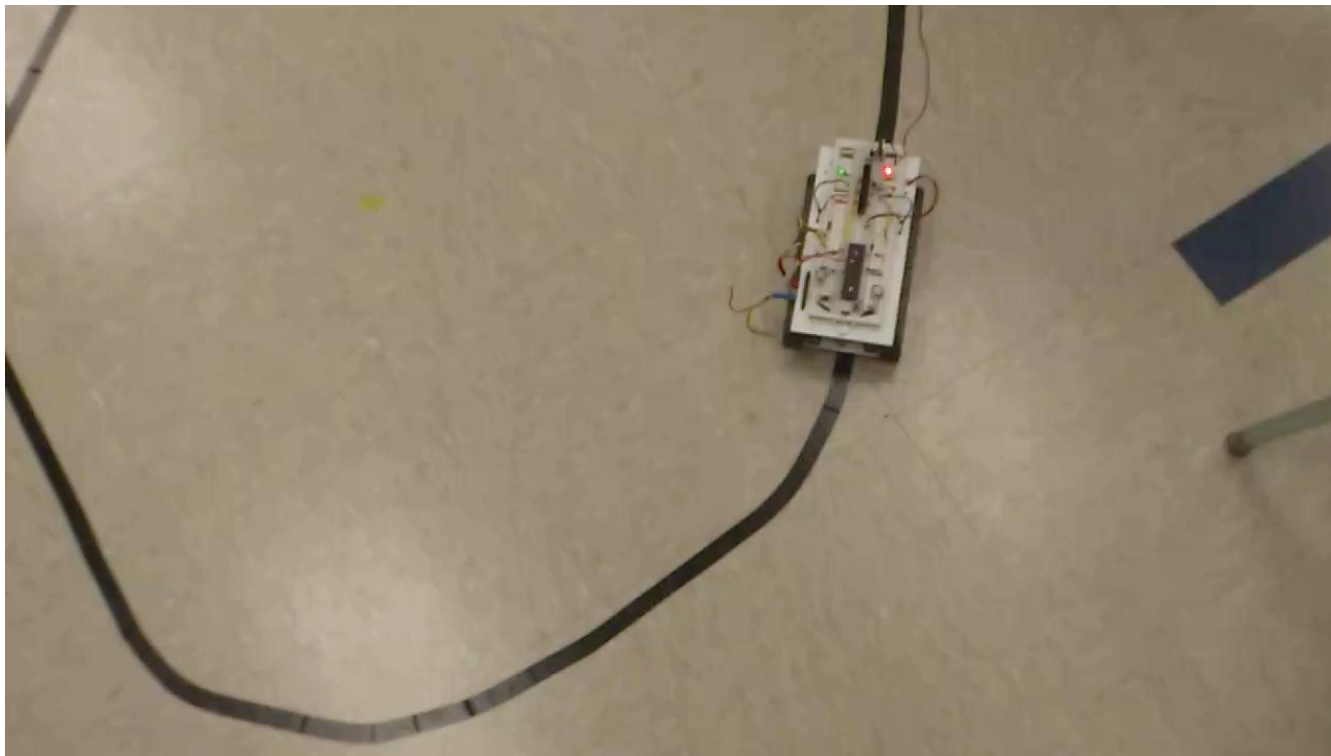
MICROCONTROLLER

Pins

Sensors:

- **Pin18/INT0**
- **Pin23/INT1**
- **Pin24/INT2**

Motor Control:

- **Pin20: Left Motor**
- **Pin21: Right Motor**

LINE FOLLOWING ROBOT OPERATION

QUESTIONS?

ACKNOWLEDGEMENTS

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