How to make a line following Robot

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Definition of a robot

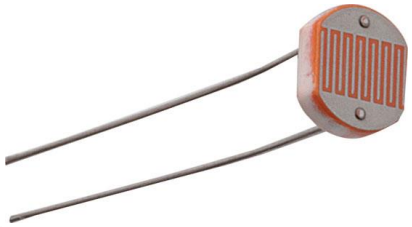
Why we use them

Introduction

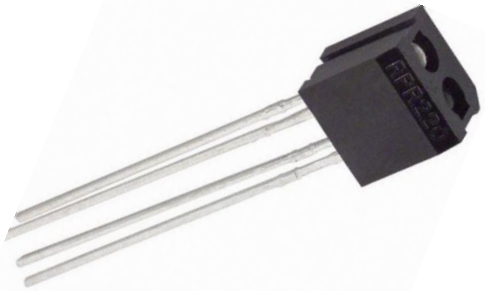
- What are the main building blocks in a Robot
  - Microcontroller (Act as the brain)
  - Sensors
  - Motors / Actuators (Driving Mechanism)
  - Battery (Power Source)

Sensors

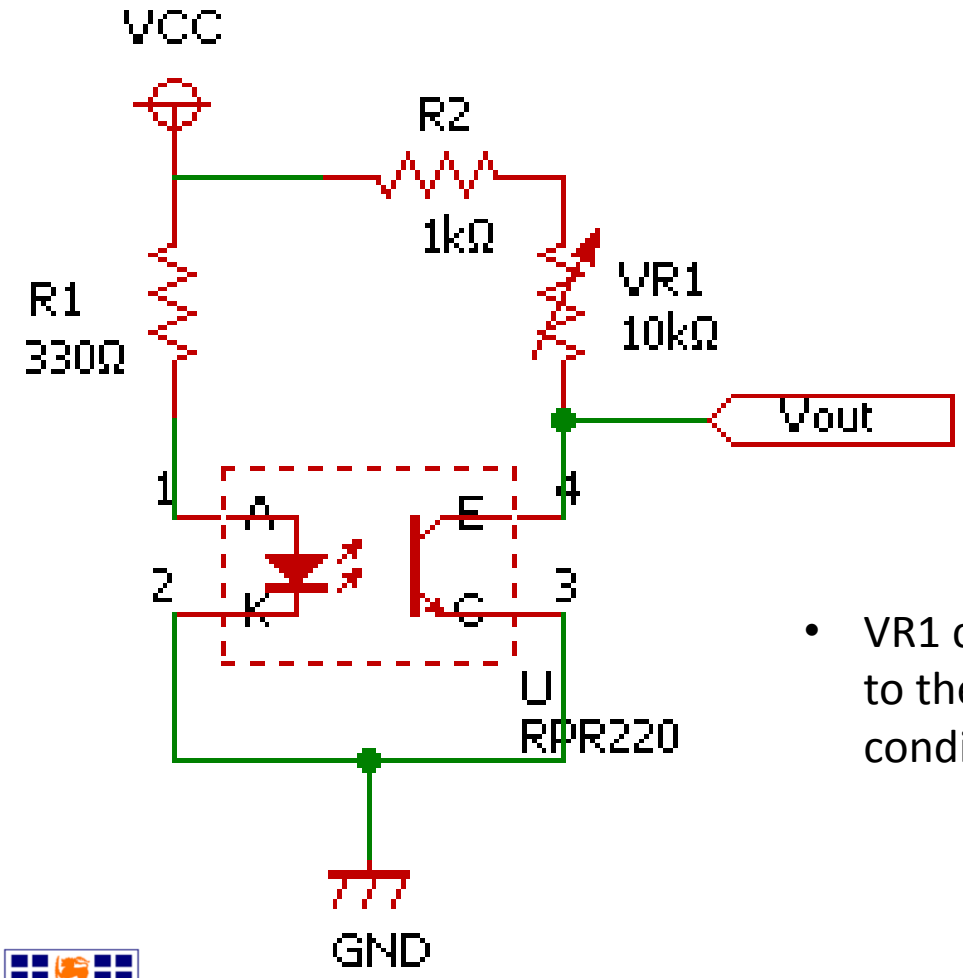
- What is a sensor
- Sensors used for line detection
  - LDR(Light dependent resistors)



  - IR Sensors (Inferred)



How to connect an IR sensor



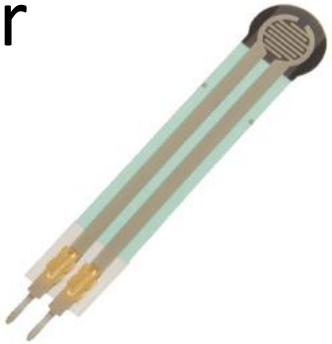
- VR1 can be used to adjust the sensor to the current ambient lighting conditions

Several other sensors used in robotics

- Ultrasonic sensor

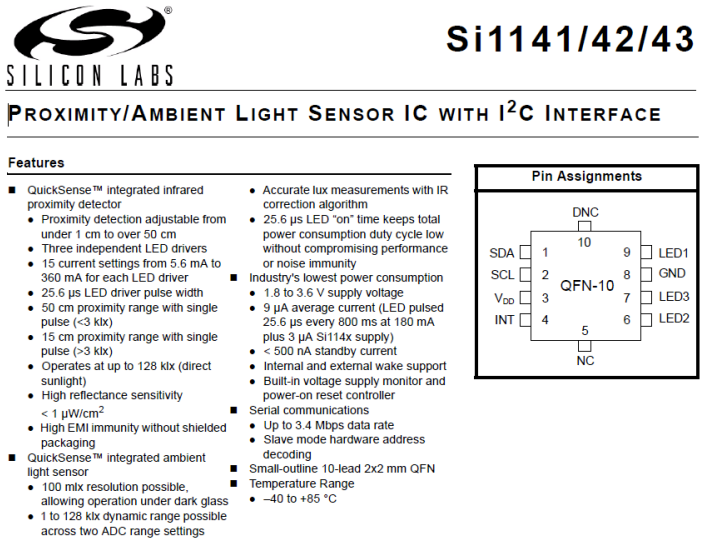
- Color detecting sensor

- Pressure Sensor



Data sheets

- What are data sheets
- Why do we need them



SILICON LABS

Si1141/42/43

PROXIMITY/AMBIENT LIGHT SENSOR IC WITH I²C INTERFACE

Features

- QuickSense™ integrated infrared proximity detector
  - Proximity detection adjustable from under 1 cm to over 50 cm
  - Three independent LED drivers
  - 15 current settings from 5.6 mA to 360 mA for each LED driver
  - 25.6 µs LED driver pulse width
  - 50 cm proximity range with single pulse (<3 klx)
  - 15 cm proximity range with single pulse (>3 klx)
  - Operates at up to 128 klx (direct sunlight)
  - High reflectance sensitivity < 1 µW/cm²
  - High EMI immunity without shielded packaging
- QuickSense™ integrated ambient light sensor
  - 100 mlx resolution possible, allowing operation under dark glass
  - 1 to 128 klx dynamic range possible across two ADC range settings
  - Accurate lux measurements with IR correction algorithm
  - 25.6 µs LED "on" time keeps total power consumption duty cycle low without compromising performance or noise immunity
- Industry's lowest power consumption
  - 1.8 to 3.6 V supply voltage
  - 9 µA average current (LED pulsed 25.6 µs every 800 ms at 180 mA plus 3 µA Si114x supply)
  - < 500 nA standby current
  - Internal and external wake support
  - Built-in voltage supply monitor and power-on reset controller
- Serial communications
  - Up to 3.4 Mbps data rate
  - Slave mode hardware address decoding
- Small-outline 10-lead 2x2 mm QFN
- Temperature Range
  - –40 to +85 °C

Pin Assignments

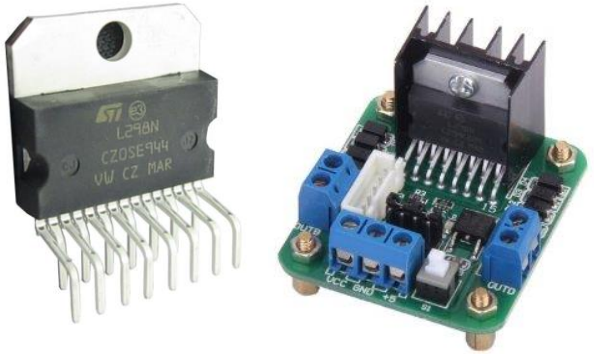
Motors

- Gear motors

- Servo Motors

Motor controllers

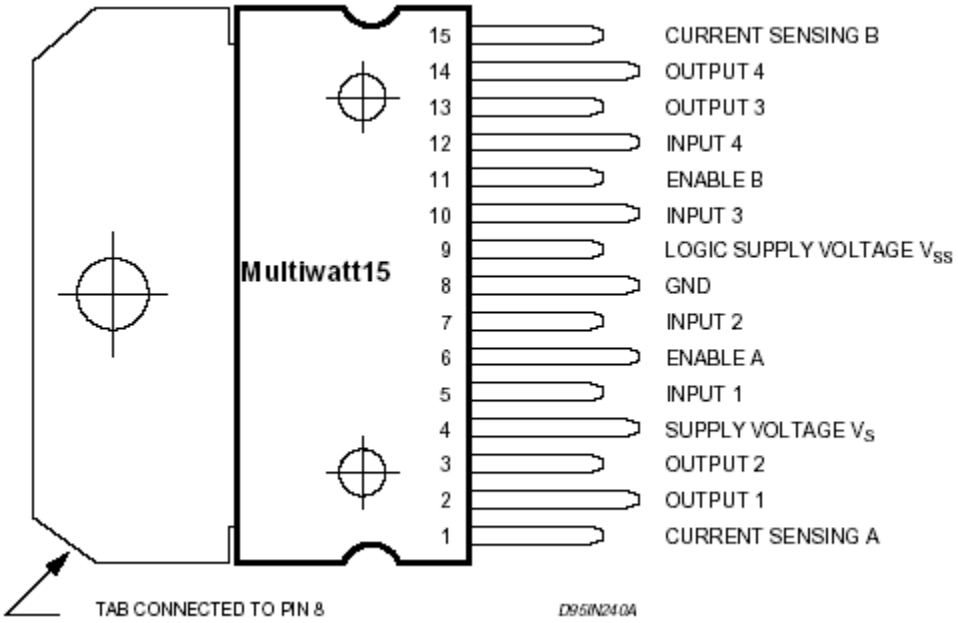
- Why motor controllers are used to drive motors
- Motor controller IC (L298 and L293D)

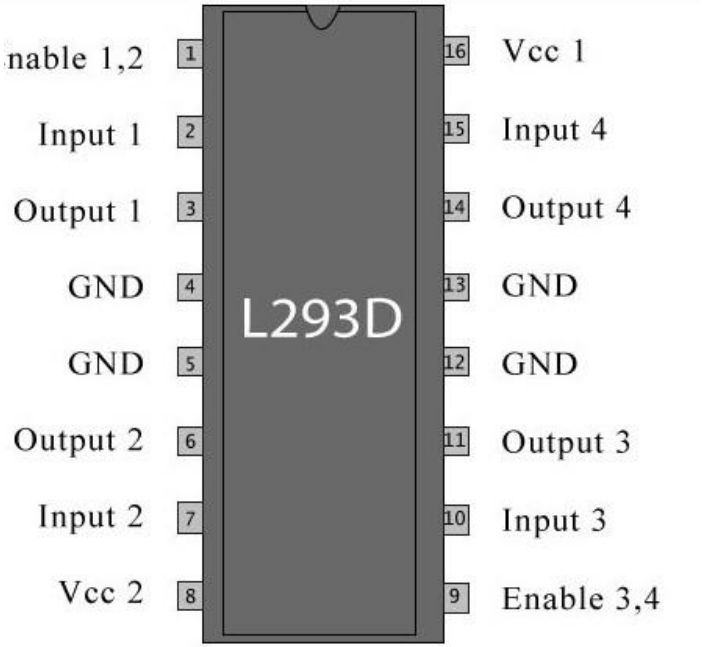


L298

L293D

How to connect the motor controller

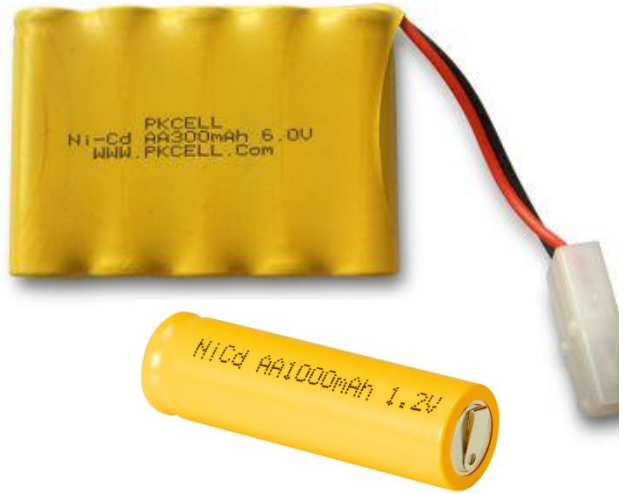




Power for the Robot

- Why use These type of batteries for the robot

Li-Po Battery

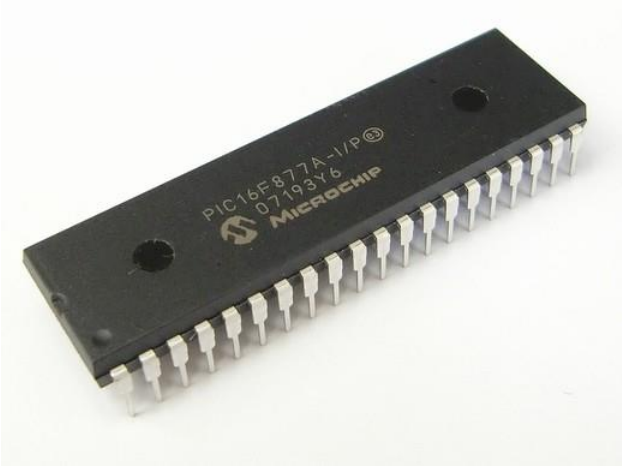


Ni-Cd Battery

- Need special charges to charge these batteries

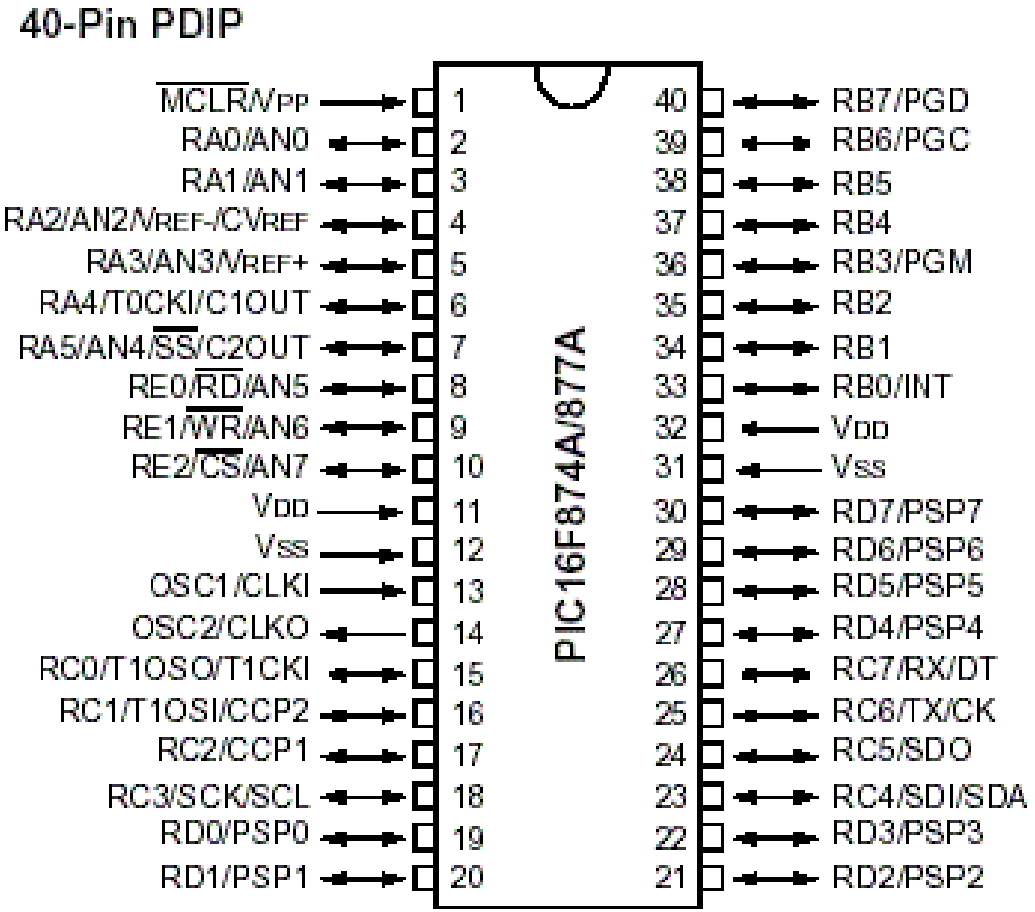
Microcontroller (Brain of the robot)

- What is a Microcontroller
- Types of Microcontrollers
  - PIC Microcontroller
  - Atmel Microcontroller
- Why use Microcontrollers in robots
- Architecture of the Microcontroller

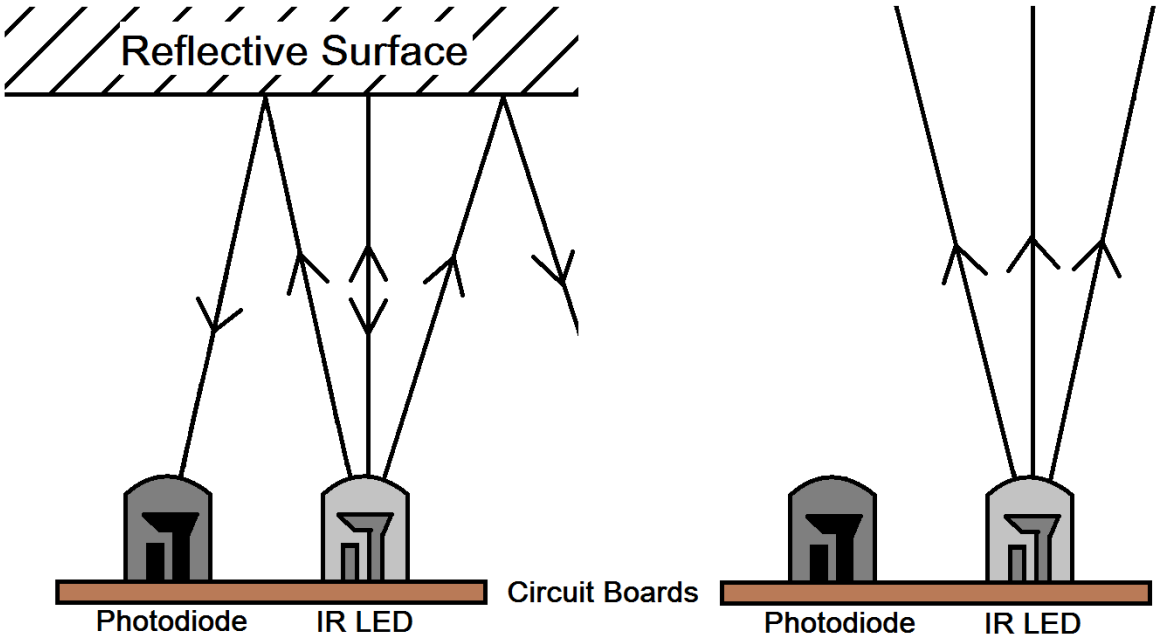


PIC 16F877A

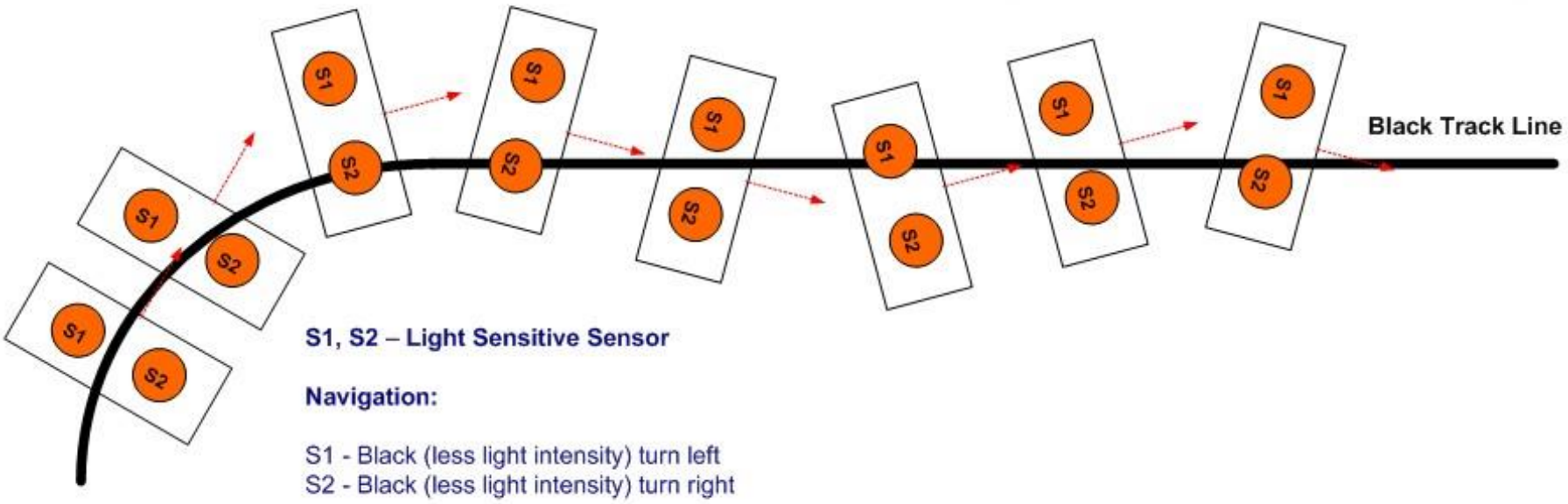
- Pin Diagram



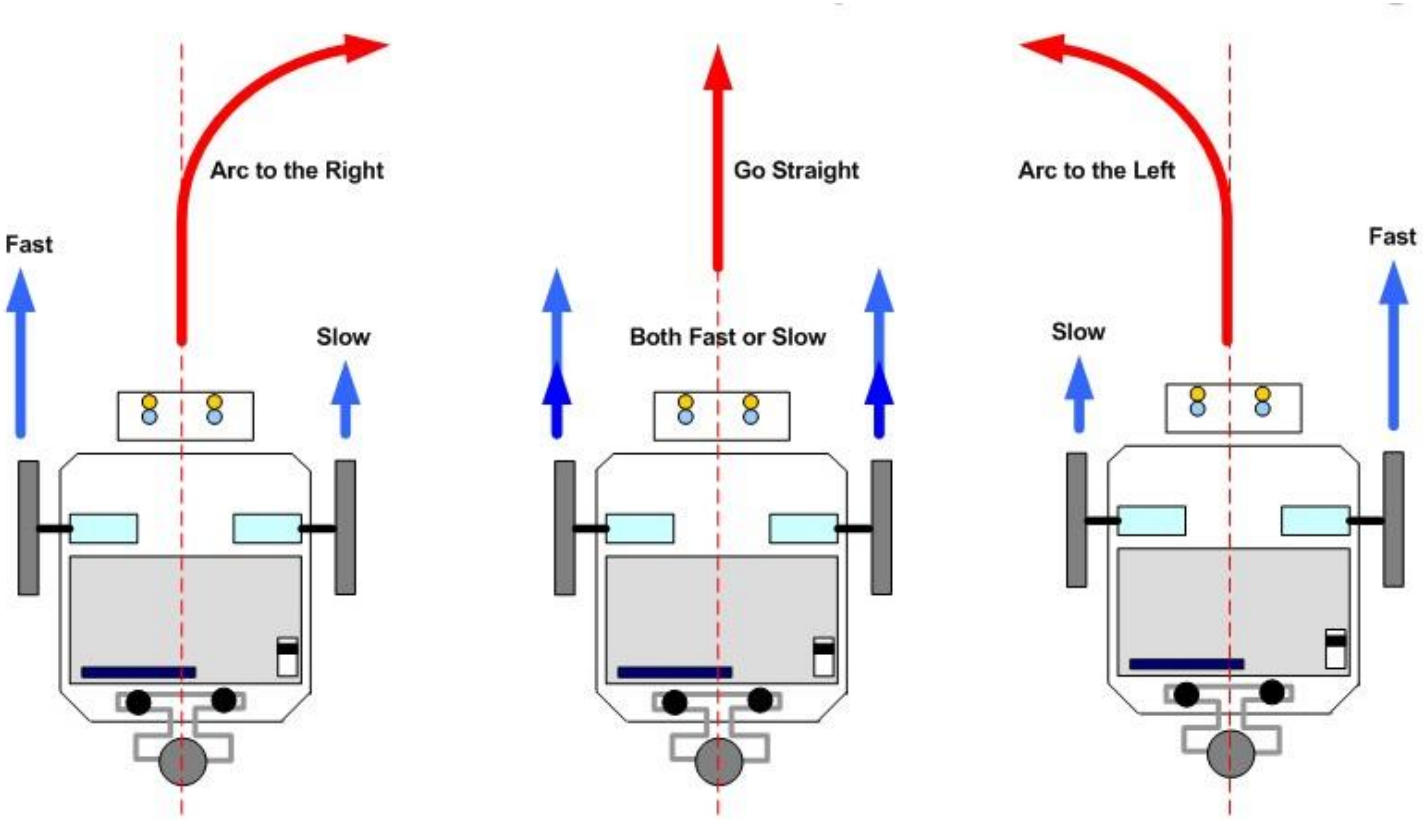
Line detecting using IR sensor



Line detection using two sensors



Steering the robot



Line Follower Robot Differential Drive Steering

Resources

- http://www.pololu.com
- http://www.sparkfun.com/

Data sheets

- http://microrato.ua.pt/main/Actividades/Estagios/docs/pic16f87x.pdf
- http://www.st.com/web/en/resource/technical/document/datasheet/CD00000240.pdf
- http://rohmfs.rohm.com/en/products/databook/datasheet/opto/optical_sensor/photosensor/rpr-220.pdf
- http://www.ti.com/lit/ds/symlink/l293.pdf

Any Questions...
Just Ask!

THANK YOU