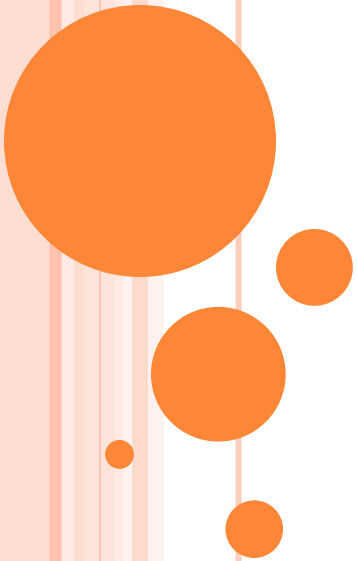


Arduino tutorial

Open-source Microcontroller Platform

Arduino mega 2560

- Board used in Robot
- Uses Atmega 2560 Microcontroller
- Used to control DC-Motors and Sonars on Robot
- Capable of Serial Communication with Computer

Contents

- Getting Started
- Hello World!!
- Motor Control
- Sensor Reading
- Serial Communication
- Circuit used in Beaglebot
- Obstacle Avoidance code in Beaglebot

Getting started

- Arduino Board being open-source has a lot of support
- Documentation on http://www.arduino.cc/
- Arduino Board has bootloader which is compatible with Arduino Software
- Instructions to setup Arduino Software provided on: - http://arduino.cc/en/Guide/HomePage
- Once Software is up and running, one can start coding

Getting started

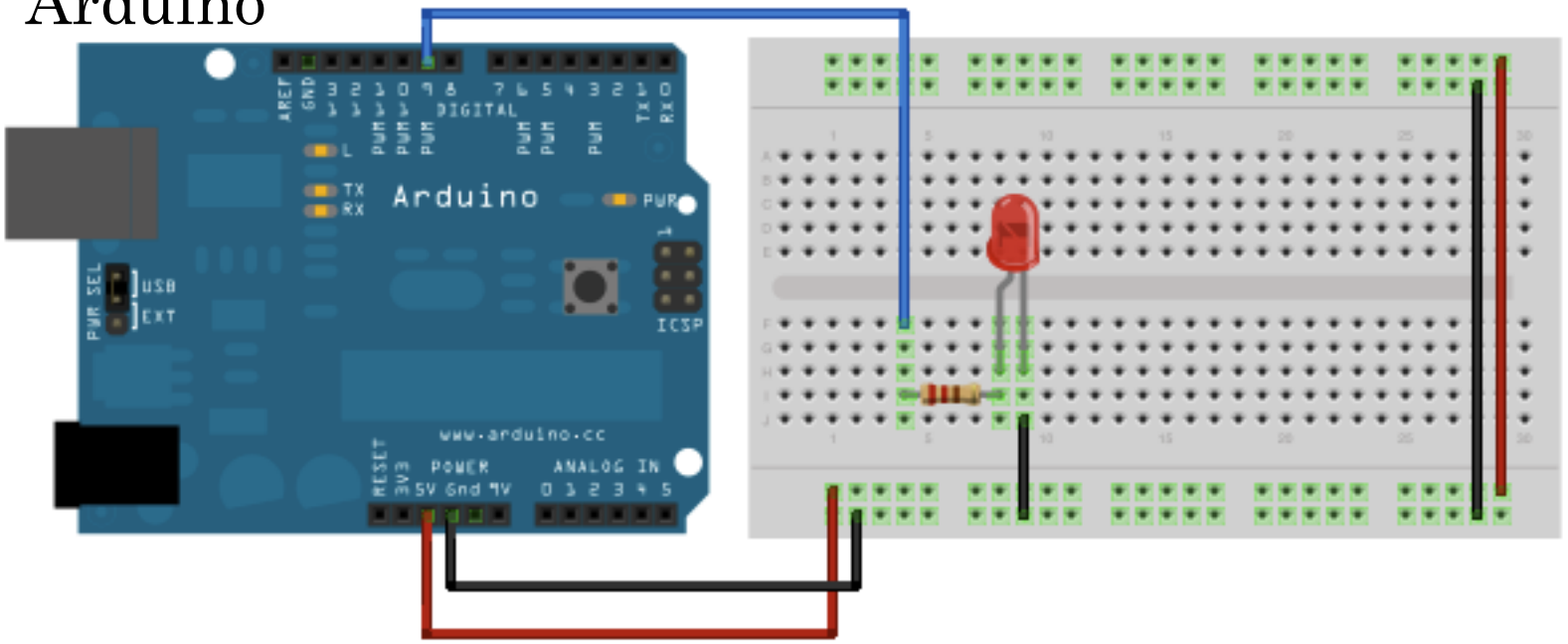
- Arduino Boards usually have wide range of GPIO Pins, PWM Pins and Analog Input Pins
- Boards also have serial ports for Serial Communication
- A wide range of devices can be controlled by the Arduino
- There are good references with example codes to run these devices on: - http://arduino.cc/en/Tutorial/HomePage

Getting started

- Real-time Microcontroller Programming is very difficult
- Arduino Software has many inbuilt functions which make the programming very easy
- Reference to these libraries can be found on: - http://arduino.cc/en/Reference/HomePage

Hello world!!

- Method of Glowing an LED
- Connections shown in Diagram
- Positive Terminal Connected to pin no. 9 of Arduino



Hello world!!

- Every code has two parts
- setup() function where the pins are setup and Serial Communication is setup
- loop() function which is equivalent to main() function in C Program
- Bare minimum code that can be run in Arduino

```
void setup() {
  // put your setup code here, to run once}
void loop() {
  // put your main code here, to run repeatedly}
```

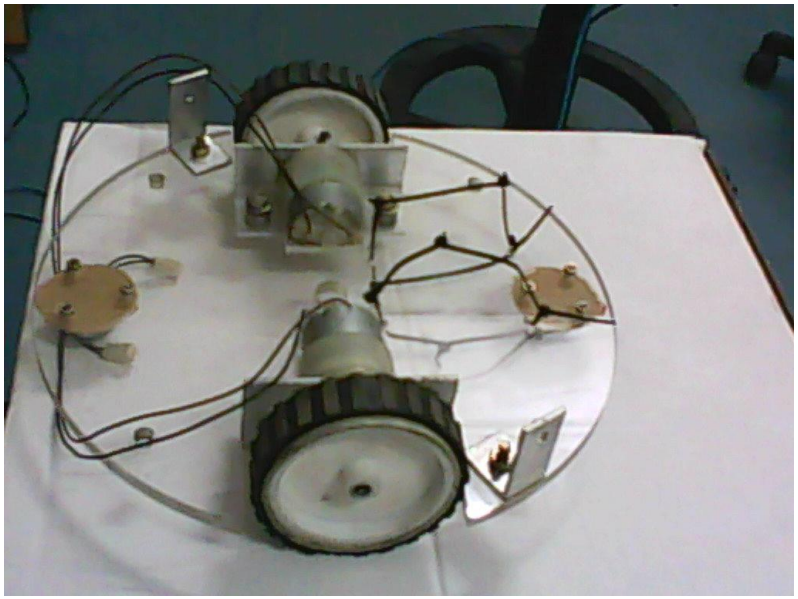
Hello world!!

- Code used to blink LED

```
void setup() {
  // initialize the digital pin 9 as an output.
  pinMode(9, OUTPUT);
}
void loop() {
  digitalWrite(9, HIGH);   // set the LED on
  delay(1000);             // wait for a second
  digitalWrite(9, LOW);    // set the LED off
  delay(1000);             // wait for a second
}
```

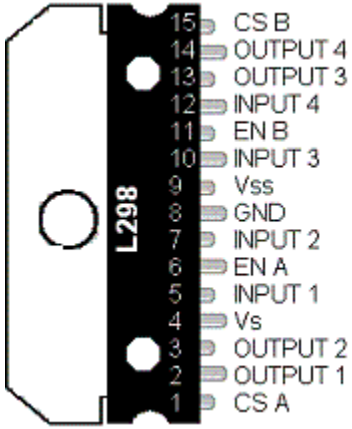
Motor control

- Beaglebot uses DC Motors for Motion
- It adopts Differential Drive System
- 100 rpm DC Motors used in the Robot



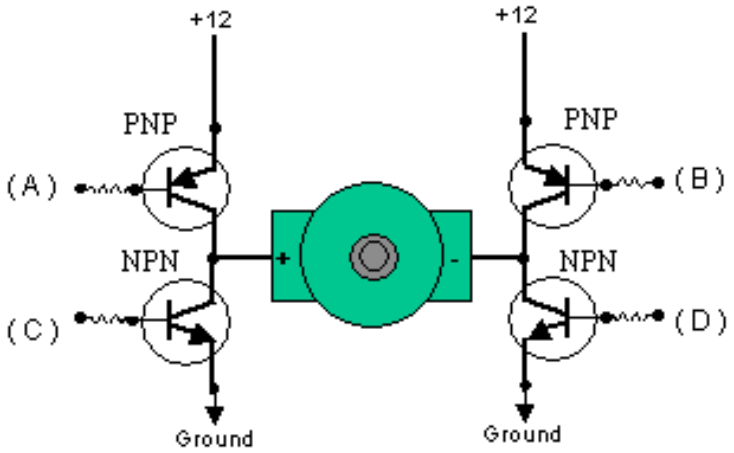
Motor control

- DC Motor with speed of 150 rpm used
- Arduino gives 5V signals and motor runs on 9-12V
- For the necessary voltage conversion we use a motor driver {l293d, l298}
- Each IC can control 2 motors



Motor control

- The Motor Driver Adopts a H-Bridge Circuit
- This requires 2 logic pins from Arduino for each motor
- Logic Supply provided by Arduino and Motor Supply by Battery



A	B	C	D	Function
1	0	0	1	Forward
0	1	1	0	Reverse
1	1	0	0	Brake
0	0	1	1	Brake

Motor control

- Code for control of a single motor

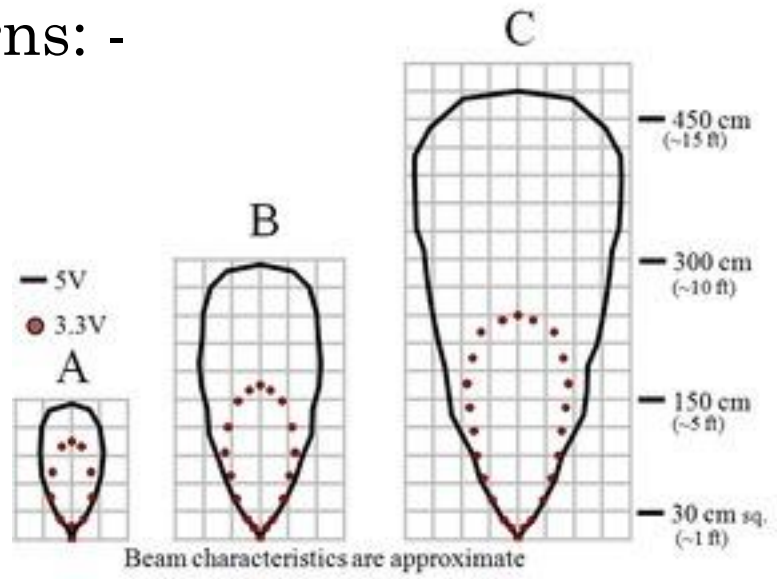
```
//Code to control single motor using motor driver l298
void setup() {
  // input pins connected to motor driver are 9,10.
  pinMode(9, OUTPUT);
  pinMode(10, OUTPUT);
}
void loop() {
  digitalWrite(9, LOW);      //Both states are in LOW
  digitalWrite(10, LOW);     //motor in rest
  delay(1000);               // wait for a second
  digitalWrite(9, LOW);      // Motor in Clockwise rotation
  digitalWrite(10, HIGH);
  delay(1000);               // wait for a second
  digitalWrite(9, HIGH);     // Motor in counterclockwise rotation
  digitalWrite(10, LOW);
  delay(1000);               // wait for a second
}
```

Motor control

- To control both motors, we write own function
- Two functions implemented
- Refer to Arduino Code *motorfunction.pde*
- rot(int motor, int status)
- mot(int stat)

Sensor reading

- Beaglebot uses sonars for obstacle detection
- Maxbotix Sonars used for the purpose
- Range of Detection – 6-245 inches with step of 1 inch
- Ideal for detecting long range and small obstacles
- Beam Patterns: -



Sensor reading

- Output given in Analog, Pulse Width and Serial formats
- The Robot takes input in Analog format
- AN pin of Maxbotix Sonar connected to Analog Pin of Arduino

Sensor reading

- Code for taking an Analog Input
- Let Sonar be connected to pin A0

```
//code to read from a Sonar
 void setup(){//to set the pin mode as input
pinMode(A0, INPUT);
}
 void loop(){//to read from sonar at intervals
analogRead(A0);
//use sonar reading
 delay(1000);
}
```

Serial communication