AHSANULLAH UNIVERSITY
OF
SCIENCE AND TECHNOLOGY

PROJECT REPORT

GROUP NAME: ***DALEK***

PROJECT NAME: ***INVENTORY MANAGEMENT SYSTEM***

SUBMITTED BY:

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INTRODUCTION:

Inventory is the total amount of goods and/or materials contained in a store or factory at any given time. Factory managers need to know the precise number of items on their shelves and storage areas in order to supply parts to the assembly line in a particular time.

Regarding IMS, automation can be introduced by using robots which could sense objects, follow a particular way points and can be programmed based on its action timing for delivering the spare parts on the desired station in time. Moreover it could perform regarding the position of the product through the assembly line.

As we know there may be several stations in a factory in which the assembly line goes through and a product gradually gain its final look with the progression of passing the assembly line. An automation system can be introduced to serve two stations at a time to avoid complexity and to sustain a smooth flow in the assembly arena.

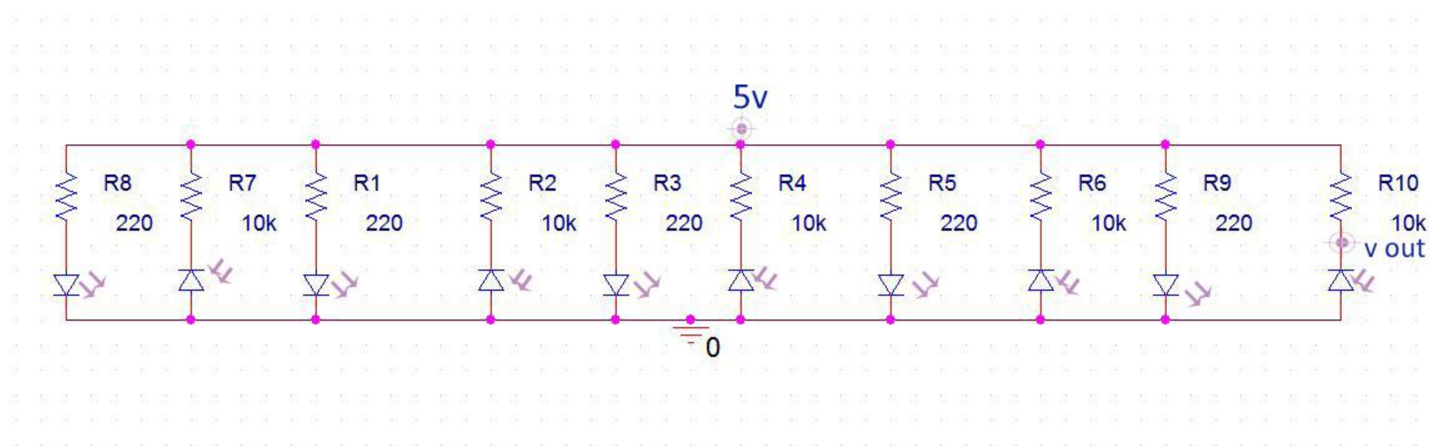
EQUIPMENTS:

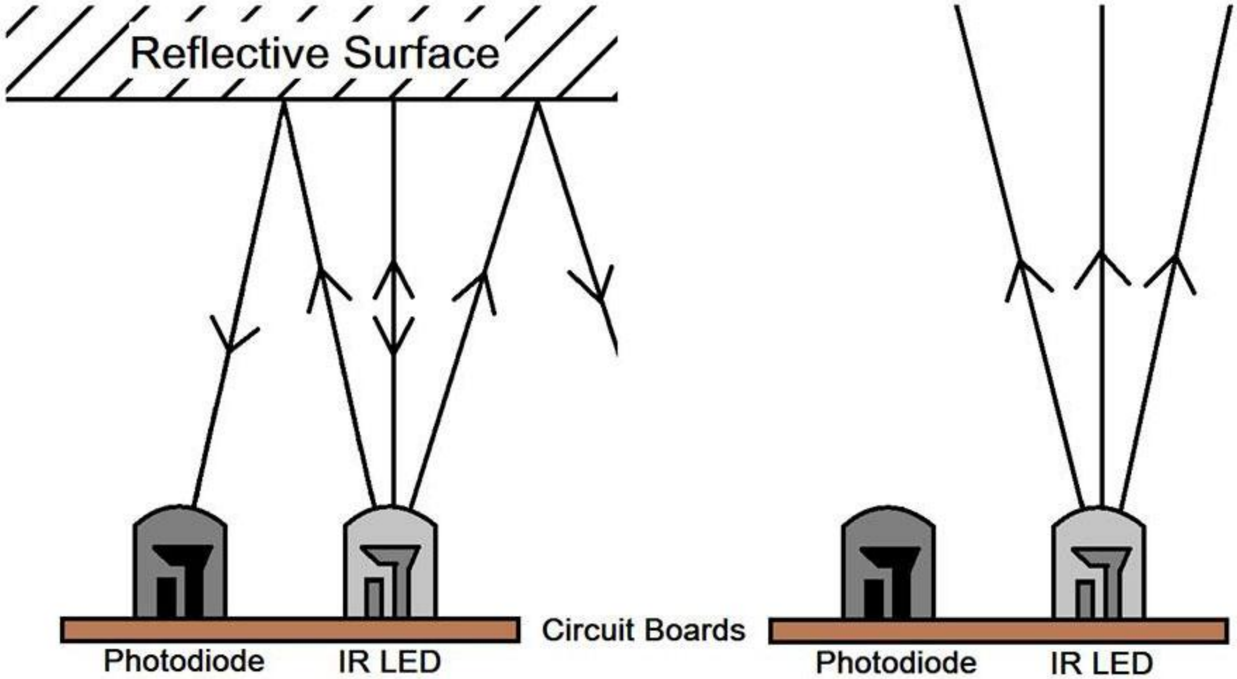
- Arduino Mega 2560
- Ping HC-SR04x2
- Micro DC Geared Motor(6V,180rpm) with Back Shaft x2
- Jumper Wires(Male to male & Male to female)
- Breadboard
- DC Power Supply(7.00v and 8.00v)
- Smart Robot Car Chasis
- Ball Caster x1
- 9.Resistances
  10k x5
  220 x5
- IR Led and Photo Diode-5 pairs

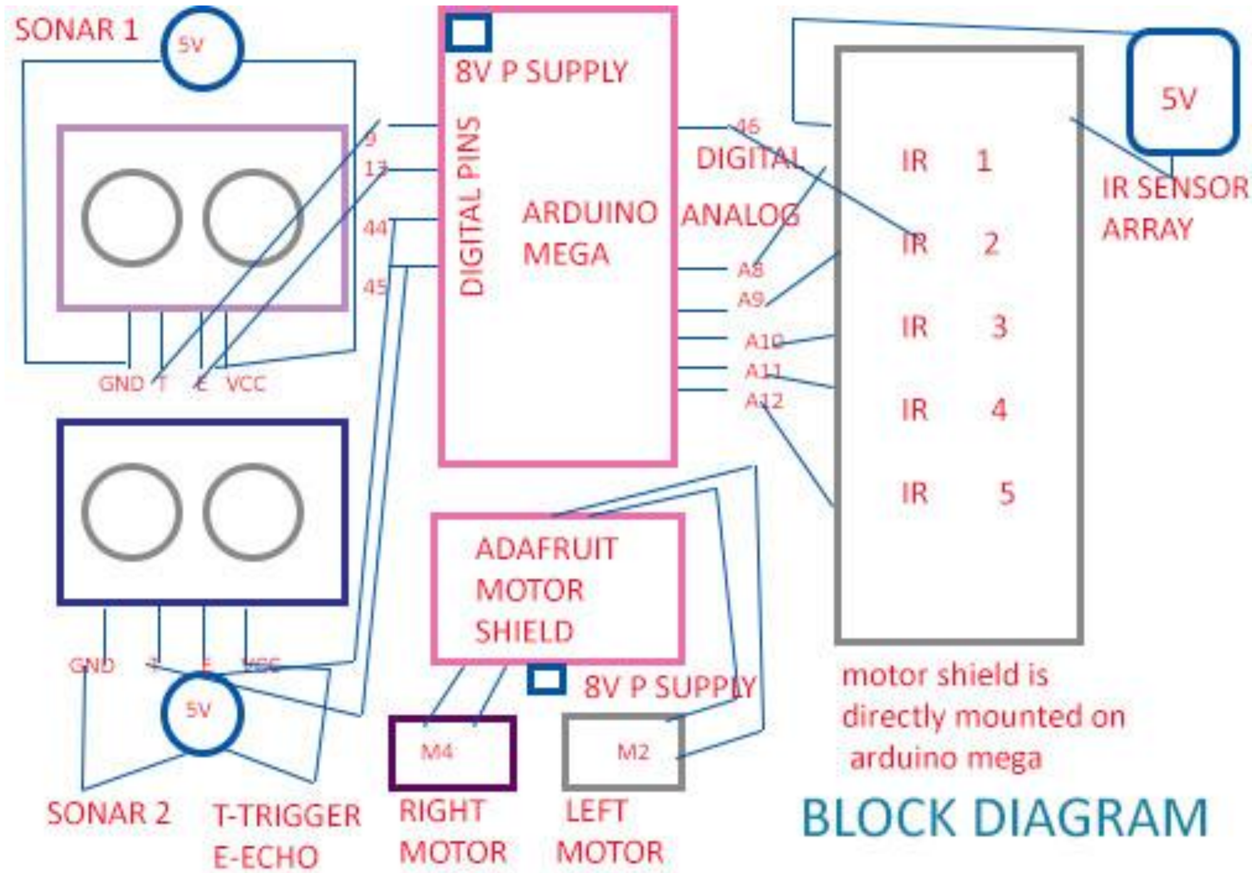
- **Adafruit Motor Shield v 1.2**

CIRCUIT DIAGRAM:

FOR SENSOR ARRAY:




Reflective Surface
Circuit Boards
Photodiode
IR LED
Photodiode
IR LED



WORKING PRINCIPLE OF SONAR:

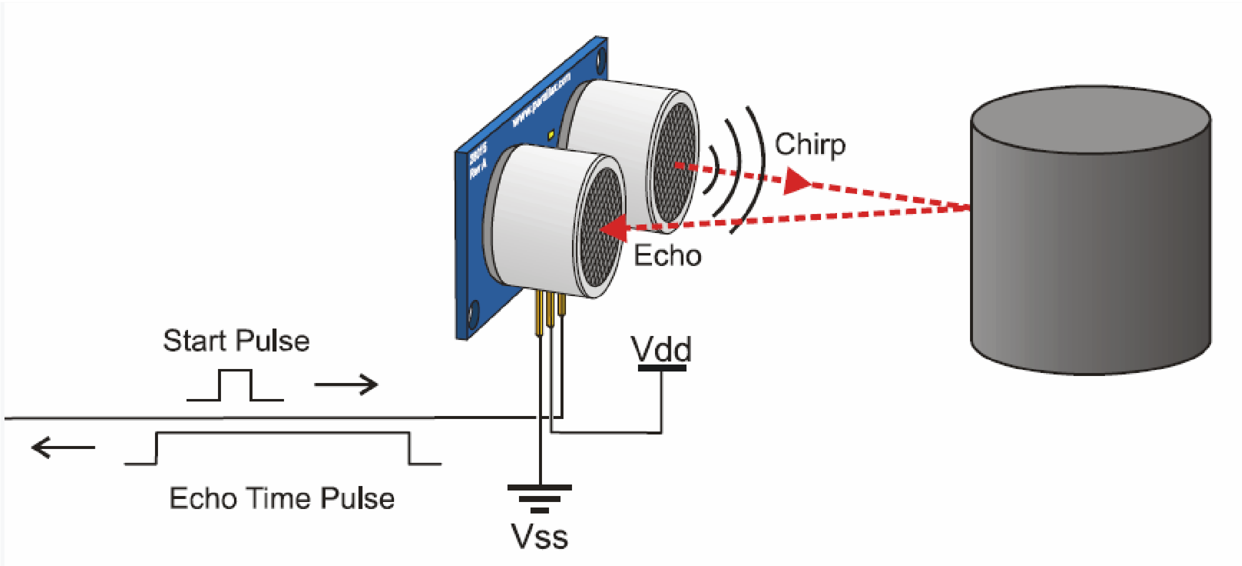
Ultrasonic transducers are transducers that convert ultrasound waves to electrical signals or vice versa. Those that both transmit and receive may also be called ultrasound transceivers; many ultrasound sensors besides being sensors are indeed transceivers because they can both sense and transmit. These devices work on a principle similar to that of transducers used in radar and sonar systems, which evaluate attributes of a target by interpreting the echoes from radio or sound waves, respectively. Active ultrasonic sensors generate high frequency sound waves and evaluate the echo which is received back by the sensor, measuring the time interval between sending the signal and receiving the echo to determine the distance to an object. Passive ultrasonic sensors are basically microphones that detect ultrasonic

noise that is present under certain conditions, convert it to an electrical signal, and report it to a computer.

Ultrasonic sensors emit short, high-frequency sound pulses at regular intervals. These propagate in the air at the velocity of sound. If they strike an object, then they are reflected back as echo signals to the sensor, which itself computes the distance to the target based on the time-span between emitting the signal and receiving the echo.

As the distance to an object is determined by measuring the time of flight and not by the intensity of the sound, ultrasonic sensors are excellent at suppressing background interference. Virtually all materials which reflect sound can be detected, regardless of their color. Even transparent materials or thin foils represent no problem for an ultrasonic sensor.

microsonic ultrasonic sensors are suitable for target distances from 20 mm to 10 m and as they measure the time of flight they can ascertain a measurement with pinpoint accuracy. Some of our sensors can even resolve the signal to an accuracy of 0.025 mm. Ultrasonic sensors can see through dust-laden air and ink mists. Even thin deposits on the sensor membrane do not impair its function. Sensors with a blind zone of only 20 mm and an extremely thin beam spread are making entirely new applications possible today: Fill level measurement in wells of microtiter plates and test tubes, as well as the detection of small bottles in the packaging industry, can be implemented with ease. Even thin wires are reliably detected.



WORKING PRINCIPLE OF IR SENSOR ARRAY:

This Sensor module works on the principle of Reflection of Infrared Rays from the incident surface. A continuous beam of IR rays is emitted by the IR LED. Whenever a reflecting surface (white/obstacle) comes in front of the Receiver (photo diode), these rays are reflected back and captured. Whenever an absorbing surface (Black/No Obstacle) comes in front of the Receiver, these rays are absorbed by the surface and thus unable to be captured.

Applications:

1.Line Follower sensor

2.Obstacle Avoidance Robot

3.Edge avoiding robot

4.Anti-falling robot

5.Light/Fire sensing

IR LED:

IR LED is used in this circuit to transmit infrared light. An Infrared light-emitting diode (IR LED) is a type of electronic device that emits infrared light not visible to the naked eye. The wavelength and colour of the light produced depend on the material used in the diode. Infrared LEDs use material that produces light in the infrared part of the spectrum, that is, just below what the human eye can see. Different infrared LEDs may produce infrared light of differing wavelengths, just like different LEDs produce light of different colours. Since the human eye cannot see the infrared radiations, it is not possible for a person to identify whether the IR LED is working or not, unlike a common LED. To overcome this problem, the camera on a cell phone can be used. The camera can show us the IR rays being emanated from the IR LED in a circuit.

Photo-diode:

Photodiode Here Photo diode is used to capture reflected light of IR LED. A semiconductor diode that, when exposed to light, generates a potential difference or changes its electrical resistance. A Photo diode is a reverse biased silicon or germanium pn junction in which reverse current increases when the junction is exposed to light. When no light is incident on the pn junction of photo diode, the reverse current is extremely small. This is called DARK CURRENT. When light is incident on the pn junction of the photo diode there is a transfer of energy from the incident light (photons) to the atoms in the junction .this will create more free electrons (and more holes) these additional free electrons will increase the reverse current.This electrical energy can be recorded as voltage drop fluctuations by using a series resistor in the outer circuit and taking voltage readings across it.

CODING:

```
#include <AFMotor.h>
// Motor Library add
```

```
#define lights_green 46

#include <NewPing.h>

#define TRIGGER_PIN_F  44//BROWN
#define ECHO_PIN_F     45//ORANGE
#define MAX_DISTANCE_F 200


#define TRIGGER_PIN_R  9//BROWN
#define ECHO_PIN_R     13//BLACK
#define MAX_DISTANCE_R 50
NewPing sonar_R(TRIGGER_PIN_R, ECHO_PIN_R, MAX_DISTANCE_R);

AF_DCMotor motor(2,MOTOR12_64KHZ); //Left MOTOR-reset button of motor
driver as a reference
AF_DCMotor motor2(4,MOTOR12_64KHZ); //Right MOTOR

int left_brown = 8; //Start from left sense pin
int blue = 9;
int yellow = 10;
int grey = 11;
int right_white = 12;
int value_brown, value_blue,value_yellow, value_grey, value_white;
int convalue1, convalue2,convalue3, convalue4,convalue5;
int leftOffset,rightOffset,xright,xleft,centre;
int distance_R;
int stop=0;


void calibrate() {
for (int x=0; x<10; x++) { // run this 10 times to obtain average
digitalWrite(lights_green, HIGH); // lights on
```

```
value_brown = analogRead(left_brown);//Name of color indicates the colors of the
wires
value_blue = analogRead(blue);
value_yellow = analogRead(yellow);
value_grey = analogRead(grey);
value_white = analogRead(right_white);
leftOffset = leftOffset + value_brown;// add value of left sensor to total
xleft=xleft+value_blue;
centre = centre + value_yellow;// add value of centre sensor to total
xright=xright+value_grey;
rightOffset = rightOffset + value_white; // add value of right sensor to total
digitalWrite(lights_green, LOW); // lights off

}
// obtain average for each sensor
leftOffset = leftOffset / 10;
xleft=xleft/10;
centre = centre /10;
xright=xright/10;
rightOffset = rightOffset / 10;
}
int stop_2=2;
void setup()
{
  Serial.begin(9600);
  pinMode(value_brown, INPUT);
  pinMode(value_blue, INPUT);
  pinMode(value_yellow, INPUT);
  pinMode(value_grey, INPUT);
  pinMode(value_white, INPUT);
  pinMode(lights_green, OUTPUT);
  calibrate();
  digitalWrite(lights_green, HIGH); // lights on
```

```
  motor.run(RELEASE);
  motor2.run(RELEASE);
}
void loop()
{
  delay(500);// Wait 50ms between pings (about 20 pings/sec). 29ms should be
the shortest delay between pings.
  unsigned int uS = sonar_R.ping(); // Send ping, get ping time in microseconds
(uS).
  Serial.print("Ping R: ");
  distance_R = uS / US_ROUNDTRIP_CM;
  // Convert ping time to distance in cm and print result (0 = outside set distance
range)
  Serial.print(distance_R);
  Serial.println("cm");

value_brown = analogRead(left_brown);
value_blue = analogRead(blue);
value_yellow = analogRead(yellow);
value_grey = analogRead(grey);
value_white = analogRead(right_white);
Serial.print("value_brown");
Serial.println(analogRead(value_brown));
Serial.print("value_blue");
Serial.println(analogRead(value_blue));
Serial.print("value_yellow");
Serial.println(analogRead(value_yellow));
Serial.print("value_grey");
Serial.println(analogRead(value_grey));
Serial.print("value_white");
Serial.println(analogRead(value_white));
{
{if ( value_brown >=490 && value_brown <= 1022 )
```

```
convalue1 = 0 ; //Black

else if ( value_brown >= 15 && value_brown <= 620)
value1 = 1 ;
} //; //White
{if ( value_blue >= 620 && value_blue <= 1022)
value2 = 0 ;  //Black
else if ( value_blue >=15 && value_blue <= 620)
value2 = 1 ;
} //White
{if ( value_yellow >= 620 && value_yellow <= 1022)
value3 = 0 ;  //Black
else if ( value_yellow >= 15 && value_yellow <= 620)
value3 = 1 ;
} //White
{if ( value_grey >= 620 && value_grey <= 1022)
value4 = 0 ;  //Black
else if ( value_grey >= 15 && value_grey <=620 )
value4 = 1 ;} //White
{if ( value_white >= 620 &&value_white <= 1022)
value5 = 0 ;  //Black
else if (value_white >= 15 && value_white <= 620)
value5 = 1 ;} //White
}

if(value1== 1 && value2== 1 && value3== 1 && value4== 1 && value5== 1)
{
  stop = 1;
  motor.run(BACKWARD);
  motor2.run(BACKWARD);
  delay(500);
  motor2.run(RELEASE);
  motor.run(RELEASE);
```

```
}
else
{
  motor.setSpeed(200);
  motor2.setSpeed(200);
  motor.run(FORWARD);
  motor2.run(FORWARD);
  stop =0;
}



if((distance_R==20||distance_R==21||distance_R==22||distance_R==23||distance_R==
24||distance_R==25||distance_R==26||distance_R==27||distance_R==28||distance_R=
=29) && stop == 0)
{
  Serial.print("GO TO STATION-1");
  motor.setSpeed(200);
  motor2.setSpeed(200);
  motor.run(FORWARD);
  motor2.run(FORWARD);
 }
else{
  motor.run(RELEASE);
  motor2.run(RELEASE);
}



}
```

WORKING PRINCIPLE:

Please refer to power point slide, for better illustration.

ADVANTAGES OF IMS:

- To save time.
- To supply parts to the assembly line in a more reliable way.
- To avoid mistakes on the eve of crucial parts delivery.
- To supply parts to a proper station in a proper time.
- To boost production capacity.
- To maintain a harmony with the assembly line regarding the gradual progression for making a finished product.

DISADVANTAGES:

- Remote sensor is not wireless.So problem of extra wire.
- It may cause delay to reach at next station so it will cause complexity in delivery .
- As there is no built in grabber,it will need extra equipment.
- It is designed for 2 stations where 1 robot will serve.Its not cost effective.
- It will face complexity while taking instruments from inventory as there is no identity clarification.

FUTURE SOLUTIONS:

- Wireless sensor will be used.
- Timer will be fitted to both station and robot.And a system will be designed through which robot will be capable to count exact timing.
- A system will be designed where 1 robot will serve 3 stations to reduce cost.It will need more complex constructions.

- **RFID tag will be used to get separate identities of parts of inventory.**

REFERENCES:

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