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Sensor Report

Sensors

The robot is equipped with four sensors:
1. IR Sensor for avoiding the robot from falling it off the table as it moves on the table.
2. A limit switch for limiting the hammer rotation
3. Phototransistor to detect the ball before the arm will actuate to throw the ball
4. A flex sensor, which senses if the ball is hit back on the robot and turns the buzzer ON.

All the above sensors are run by the Atmega 323 microcontroller.

IR Sensors

The Near Infrared Proximity sensors are sensitive in the range just below the visible light, often around 880 nm wavelengths. The IR sensors consist of two GP2D12 sharp sensors, one on each side of the robot to detect the end of the table.

The Fig. 1 gives the graph of the decimal value of the corresponding Analog Output Voltage Vs Distance to Reflective object. It can be seen from the graph that for a distance of about 10 to 12 inches the Analog Output Voltage is around 1 Volt (decimal value 51) whereas for a distance above 36 CMS the output

voltage is less then 0.4 volts (decimal value 15). This difference in the output voltage is used to detect the end of the table. When the Robot reaches one end of the table the direction of the motors is reversed.

Distance in INCHES	Decimal Values	Binary Output
4	119	1110111
5	99	1100011
6	85	1010101
7	73	1001001
8	63	111111
9	56	111000
10	51	110011
36	15	1111
48	1	1

Analog values Vs Distance

Analog values vs Distance (Inches), Decimal Values
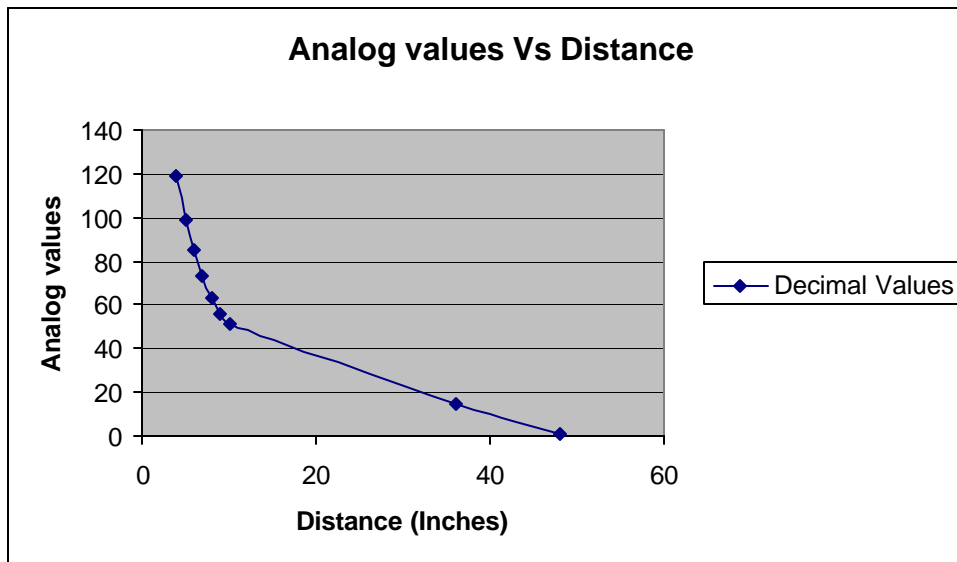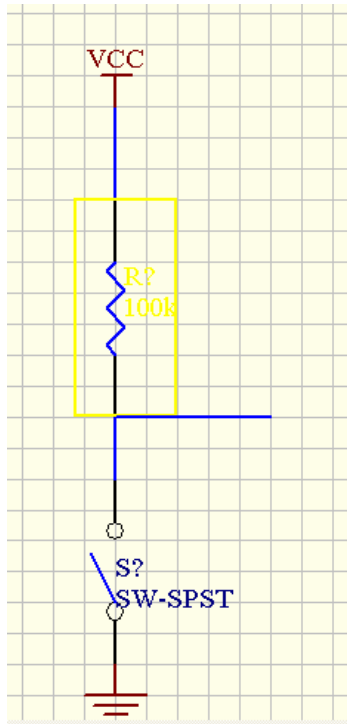
Limit Switch

The fig. Below shows the ckt. for the limit switch. A resistance of 100k is added in series. As shown the signal is normally high. Only after the limit switch is triggered the signal reaches Low.

Phototransistors

The QRB1133 consists of an Infrared emitting diode and an NPN silicon Phototransistor mounted side by side. The Phototransistor responds to radiation from the emitting diode only when a reflective object passes within its field of view. I am using this sensor to determine whether the ping-pong ball is in right position for the arm to lift.
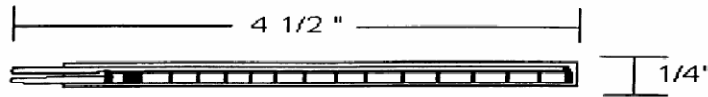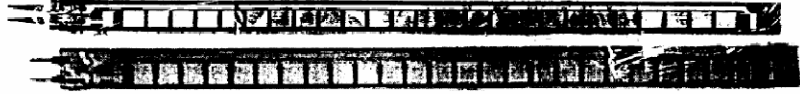
The circuit below is used from MarkIII robot kit for the phototransistor
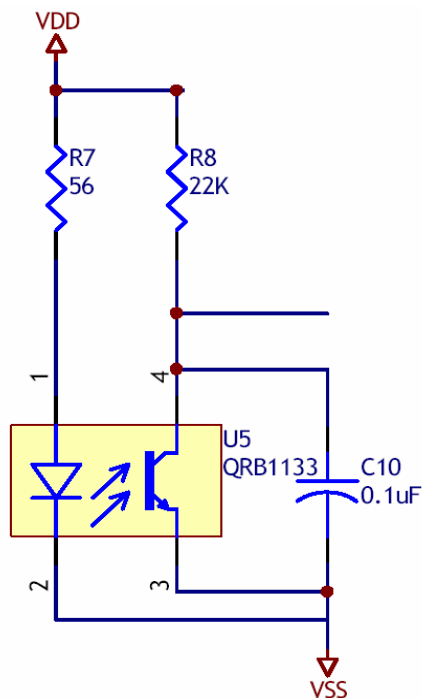
Flex Sensor

Jameco Part number 150551

Flex Sensor

4 1/2 "

1/4"

Nominal Resistance
Flex 0 Degrees: 10 K

Flex 90 Degrees
30-40 K

Proportional increase in resistance as sensor is bent or flexed. Maximum resistance 30K - 40K ohms.

The resistance of the sensor increases, as it is bend on one side. The resistance varies from 10k to 40k.

The Fig. Below shows the ckt. For the flex sensor. A resistance of 10k is used in series with the sensor.
It can be seen that the analog value changes from 255 to 130 as the sensor is bent from 0 to 90 degrees.

10k

R?
Flex

VCC

Analog value Vs Angle of Bend

Analog

300
250
200
150
100
50
0

1   10   100

Angle

♦ Analog value