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QTR-1A Reflectance Sensor Reading with Arduino



Introduction

The QTR-1A reflectance sensor carries a single infrared LED and phototransistor pair. The phototransistor is connected to a pull-up resistor to form a voltage divider that produces an analog voltage output between 0 V and VIN (which is typically 5 V) as a function of the reflected IR. Lower output voltage is an indication of greater reflection.

The LED current-limiting resistor is set to deliver approximately 17 mA to the LED when VIN is 5 V. The current requirement can be met by some microcontroller I/O lines, allowing the sensor to be powered up and down through an I/O line to conserve power.

This sensor was designed to be used with the board parallel to the surface being sensed. Because of its small size, multiple units can easily be arranged to fit various applications such as line sensing and proximity/edge detection. The reflectance measurement is output as an analog voltage.

Specifications

- Dimensions: 0.3" x 0.5" x 0.1" (without header pins installed)
- Operating voltage: 5.0 V
- Supply current: 25 mA
- Output format: analog voltage
- Output voltage range: 0 to supplied voltage
- Optimal sensing distance: 0.125" (3 mm)
- Maximum recommended sensing distance: 0.25" (6 mm)
- Weight without header pins: 0.008 oz (0.23 g)



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Objective

The sensor will display the data in Serial Monitor tab.

Conponents Needed

- Arduino UNO (Nano and Mega)
- QTR-1A Reflectance Sensor
- Jumper Wires

Procedures

1. Connect the QTR-1A Reflectance Sensor with Arduino UNO based on picture and table provided below.

Arduino UNO	QTR-1A
A2	OUT
5V	VIN
GND	GND





2. Open Arduino IDE and instal QTRSensors Library by clicking on *Sketch > Include Library > Manage Libraries....*. The Library Manager popup will appear, search for QTRSensors and click install.

💿 QTRAExample Arduino 1.8.5					
File Edit Sketch Jools Help					
	0	Verify/Compile	Ctrl+R		
	_	Upload	Ctrl+U		
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40		Export compiled Binary	Ctrl+Alt+S	^	
41 42	voi {	Show Sketch Folder	Ctrl+K		
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44	p	Add File		Manage Libraries	
45 46	d. fo	or (int i = 0; i < 400	; i++) //	Add .ZIP Library	

Dibrary Manager
Type All Topic All qtr
GobbitLineCommand by Jason Talley Basic to advanced line following, intersection detection, basic motor control, battery monitoring, gripper control, and basic collision detection with the Gobbit robot. The built in functions range from simple out of the box single command line following and gripper actuation to deep fine tuning of PID motor control functions which include battery monitoring for variable manipulation, pin selections for custom L298 or similar style motor drivers, sonar range sensor and collision control, presets for the Sparkfun Ardumoto motor driver, and presets for the Adafruit v 2.3 motor shields. For line following, the Pololu QTR-BRC infrared line sensor is required. The Adafruit Motor Shield V2 and the QTRSensors libraries are required. This version has temp local copies of QTRSensors and Adafruit Motorshield v2.3. ScoutBotics Examples added. More info
QTRSensors by Polou Arduino library for the volou QTR Reflectance Sensors This is a library for an Arduino-compatible controller that interfaces with the Polou QTR reflectance sensors. More info Version 3 Version 3.1.0 Version 3.0.0
Close



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3. Still in Arduino IDE copy the following given program code into Arduino IDE.

#include <QTRSensors.h>

// This example is designed for use with six QTR-1A sensors or the first six sensors of a // QTR-8A module. These reflectance sensors should be connected to analog inputs 0 to 5. // The QTR-8A's emitter control pin (LEDON) can optionally be connected to digital pin 2, // or you can leave it disconnected and change the EMITTER_PIN #define below from 2 to // QTR NO EMITTER PIN. // The main loop of the example reads the calibrated sensor values and uses them to // estimate the position of a line. You can test this by taping a piece of 3/4" black // electrical tape to a piece of white paper and sliding the sensor across it. It // prints the sensor values to the serial monitor as numbers from 0 (maximum reflectance) // to 1000 (minimum reflectance) followed by the estimated location of the line as a number // from 0 to 5000. 1000 means the line is directly under sensor 1, 2000 means directly // under sensor 2, etc. 0 means the line is directly under sensor 0 or was last seen by // sensor 0 before being lost. 5000 means the line is directly under sensor 5 or was // last seen by sensor 5 before being lost. #define NUM SENSORS 1 // number of sensors used #define NUM_SAMPLES_PER_SENSOR 4 // average 4 analog samples per sensor reading #define EMITTER_PIN 2 // emitter is controlled by digital pin 2// sensors 0 through 5 are connected to analog inputs 0 through 5, respectively OTRSensorsAnalog gtra((unsigned char[]) {0, 1, 2, 3, 4, 5}. NUM SENSORS, NUM SAMPLES PER SENSOR, EMITTER PIN); unsigned int sensorValues[NUM_SENSORS]; void setup() delay(500); pinMode(13, OUTPUT); digitalWrite(13, HIGH); // turn on Arduino's LED to indicate we are in calibration mode for (int i = 0; i < 400; i++) // make the calibration take about 10 seconds { qtra.calibrate(); // reads all sensors 10 times at 2.5 ms per six sensors (i.e. ~25 ms per call) digitalWrite(13, LOW); // turn off Arduino's LED to indicate we are through with calibration // print the calibration minimum values measured when emitters were on Serial.begin(9600); for (int i = 0; $i < NUM_SENSORS$; i++) Serial.print(gtra.calibratedMinimumOn[i]); Serial.print(' '); Serial.println(); // print the calibration maximum values measured when emitters were on for (int i = 0; $i < NUM_SENSORS$; i++)



{ Serial print(atra calibratedMaximumOn[i]);
Serial print(('):
}
Serial.println():
Serial.println();
delay(1000):
}
void loop()
{
// read calibrated sensor values and obtain a measure of the line position from 0 to 5000
// To get raw sensor values, call:
<pre>// qtra.read(sensorValues); instead of unsigned int position = qtra.readLine(sensorValues);</pre>
unsigned int position = qtra.readLine(sensorValues);
// print the sensor values as numbers from 0 to 1000, where 0 means maximum reflectance and
// 1000 means minimum reflectance, followed by the line position
$10r (unsigned char 1 = 0; 1 < INOM_SEINSORS; 1++)$
{ Seriel print(conserValues[i]);
Serial print(\telsof v alues[1]),
/ //Serial println(): // uncomment this line if you are using raw values
Serial println(), // uncomment this line out if you are using raw values
Some princin (position), // common and the out it you are using faw values
delav(250):
}
,

4. Connect Arduino UNO to PC click on **Verify** and then click **Upload** to upload the program sketch to the Arduino.





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5. Done! Open **Serial Monitor** tab to see the QTR-1A Sensor reading.

💿 QTRAExample Arduino 1.8.5	
File Edit Sketch Tools Help	
	<u>@</u>
QTRAExample	
1 #include <qtrsensors.h></qtrsensors.h>	<u>^</u>

• When sensor placed on white paper

💿 СОМ4		
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Autoscr	oll	No line ending 🔹 9600 baud 🔹 Clear output

• When sensor placed on black tape

💿 COM4		
Ι		Send
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		•
Autoscr	oll	No line ending 👻 9600 baud 👻 Clear output