How to use Sanyo 2Y0A21

The Sanyo 2Y0A21 is a low-cost infrared based distance sensor. It has an effective range of 10 to 80cm. The output signal voltage ranges from 3.1v to 0.3v

What you need:

- Sanyo 2Y0A21 IR Distance Sensor
- 1x 1M Ohm resistor
- 1x 2M Ohm resistor
- platform to connect to (ie. breadboard)

Wiring up to BeagleBone Black

The Beagle Bone Black board has seven ADC pins that could be used to interface with the distance sensor, but it requires the signal voltage to be limited to 1.8v or below. Before it can be connected, we must first construct a voltage divider.

A voltage divider is a signal voltage pull down hardware setup that allows higher voltage sources to be interfaced with another voltage source. To get the desired output voltage, you need calculate the desired voltage using the equation:

\[ V_{out} = V_{in} \cdot \frac{R_2}{R_1 + R_2} \]

*Image sourced from Sparkfun*

Your choice of resistance to generate the desired ratio is important, the high the resistance of the resistor pair, the less undesired voltage drop will occur under load.

For this instruction, we will be using 1M and 2M Ohm resistor. With R2 being 2M Ohm and R1 as 1M Ohm, the output would be ~2.067v, but after factoring the voltage drop under load, it should be around 1.786v.
To wire the circuit:

To connect the new voltage to BBB, you need to first select a pin to connect to, the options available are AIN0, AIN2, AIN6, AIN4, AIN5, AIN3, AIN1.

If you are using the ZenCape, please note that AIN0 is already occupied by the potentiometer.

**Configuring Beagle Bone Black**

To setup the Beagle Bone Black, you configure the pins for ADC. For our example, we are using AIN0.

SSH into BBB:
To Enable the ADC pins on the BBB:
#echo BB_ADC > /sys/devices/bone_capemgr.9/slots

To read the voltage:

#cat /sys/bus/iio/devices/iio:device0/in_voltage0_raw

**Parsing the input**

To parse the input we need to translate the signal characteristic:

![Image from Sanyo Datasheet](image_url)

The curve fit formula for the sensor (sourced from elinux.org page):

\[ cm = 41.543 \times (\text{Voltage} + 0.30221)^{-1.5281} \]

With the input voltage being 1.786v with a resolution of 4095 (BBB’s ADC resolution), voltage becomes:

\[ \text{voltage} = 1.786 \times \left( \frac{\text{adc\_read}}{4095} \right) / \left( \frac{3.1}{1.786} \right) \]

The combined final formula becomes:

\[ cm = 41.543 \times \left( (1.786^2 \times \frac{\text{adc\_read}}{4095}) + 0.30221 \right)^{-1.5281} \]
Sources/References:

Sanyo GP2Y0A21TYK Datasheet:
http://www.sharpsma.com/webfm_send/1208

Formula for IR Sensor:
http://elinux.org/ECE597_Project_Robot_Control

BBB Pinout diagram: