

6.5 Analog input

In general, controllers are equipped with [Analog to Digital Converters](#) or short [ADC](#). This internal device converts voltage potential into numeric value which can be further used by written program. This is also the case in Arduino UNO converter by the function `analogRead(pin_number)`. In this case the voltage range $[0.0\text{ V}.. + 5.0\text{ V}]$ is converted into range of numbers $[0..1024]$.

6.5.1 Tasks:

1. Unmount robot's bumper and all connections to the switch.
2. Equip the robot with distance sensor according to [video](#) and scheme (see [fig. 1](#)).

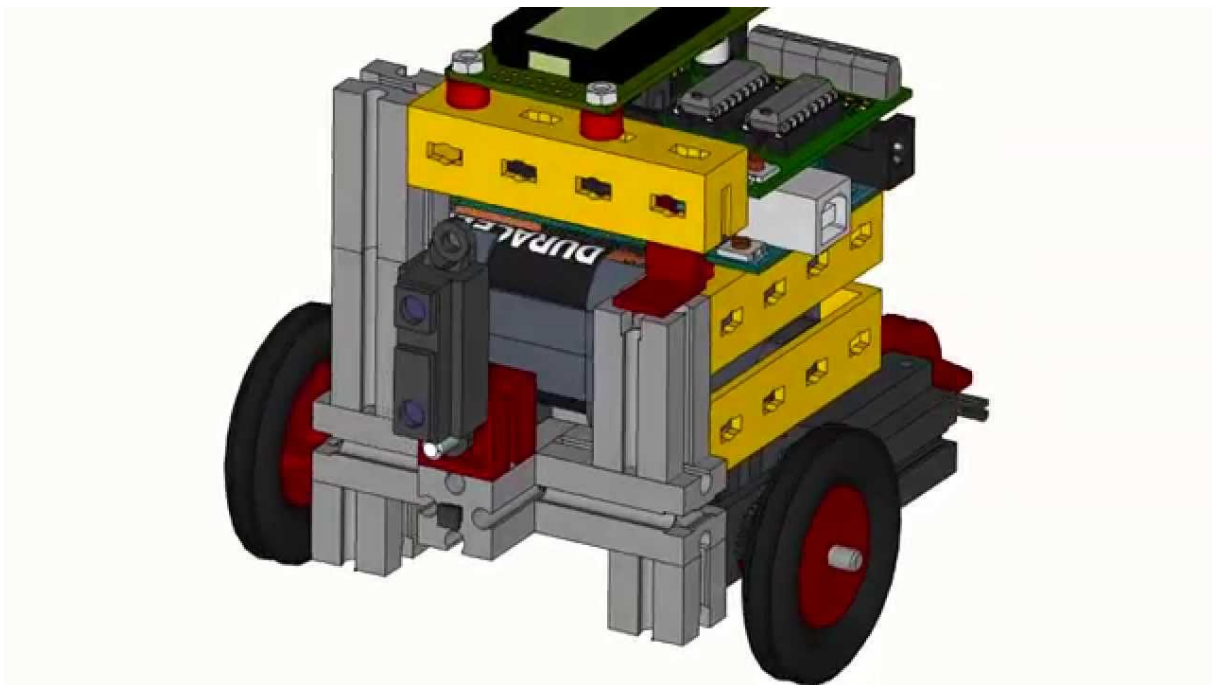


Figure 1: Mounting position of analog distance sensor.

3. Try next prog. [1](#) and check the output of distance sensor in Serial monitor.

Program 1: Analog Input.

```

1  const int DIST_SEN_PIN = A0;
2  void setup()
3  {
4      pinMode(DIST_SEN_PIN, INPUT);
5      Serial.begin(9600);
6  }
7
8  void loop()
9  {
10     int adc_value = analogRead(DIST_SEN_PIN);
11     Serial.println(adc_value);
12     delay(1000);
13 }

```

4. Convert the `analog_sensor_value` into `input_voltage` and measure the input voltage potential with volt-meter. The formula for conversion can be programmed as:

```

1  float input_voltage = 5.0/1024 * adc_value;

```

5. From the [datasheet](#) for the distance sensor try to code the function for measuring the distance in cm. According to documentation there is almost linear trend between output voltage and $distance^{-1}$. Thus we can get good result with eq. 1.

$$distance^{-1}[cm] = 0.045V_{out} \quad (1)$$

Next example can be your guide to code the function.

```

1  float getDistance_cm()
2  {
3      int adc_value = analogRead(DIST_SEN_PIN);
4      float input_voltage = 5.0/1024 * adc_value;
5      float distance = 1/(0.045 * input_voltage);
6      return distance;
7  }

```

6.5.2 Questions:

1. What kind of values do you getting from the reading of the distance sensor with the function `analogRead(A0)`?
2. Find the reasonable value where you should stop the robot.
3. Measure the voltage potential of the sensor's output.

6.5.3 Summary:

6.5.3.1 Analog to digital converter - ADC ADC is an electronic sistem that converts analog signal (voltage) to a digitalized values. In our particular case the range of an analog voltage from 0V to 5V is converted to range of numbers from 0 to 1024.

6.5.4 Issues:**6.5.4.1 <++> <++>**