6.5 Analog input

In general, controllers are equipped with `Analog to Digital Converters` or short `ADC`. This internal devices converts voltage potencial 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 $[0.0\ V.. + 5.0\ V]$ is converted in to 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).

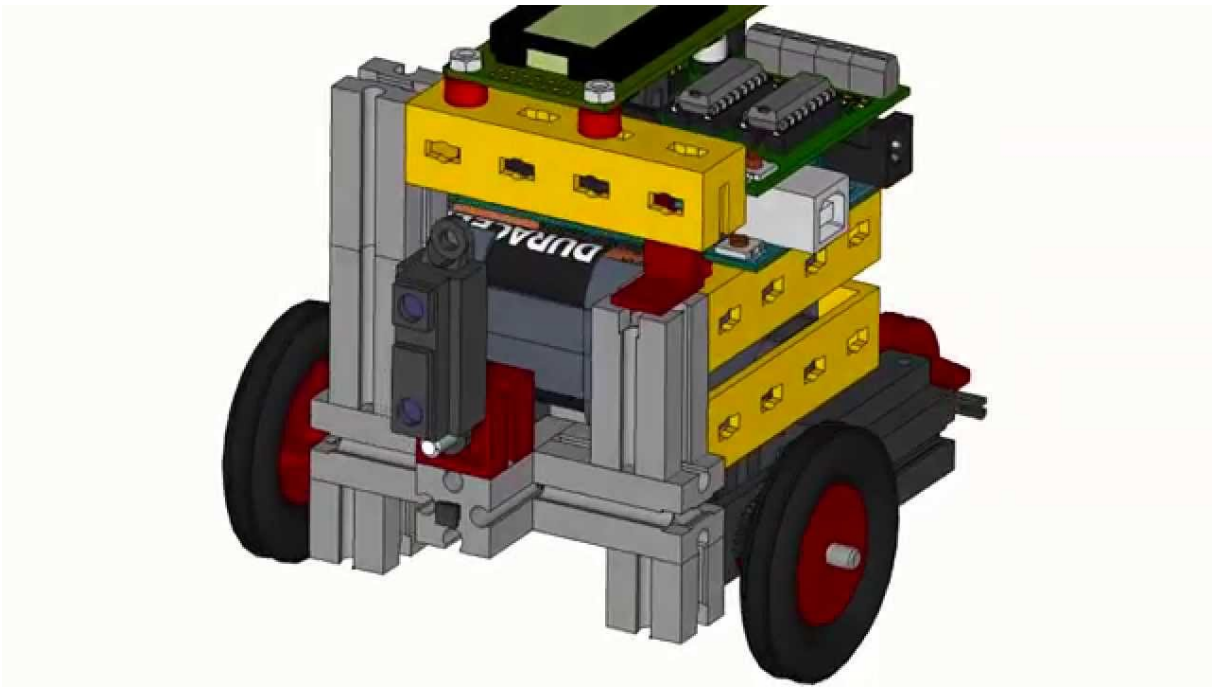

Figure 1: Mounting possition of analog distance sensor.

3. Try next prog. 1 and check the output of distance sensor in Serial monitor.

Program 1: Analog Input.

```
const int DIST_SEN_PIN = A0;
void setup()
{
  pinMode(DIST_SEN_PIN, INPUT);
 Serial.begin(9600);
}

void loop()
{
  int adc_value = analogRead(DIST_SEN_PIN);
 Serial.println(adc_value);
 delay(1000);
}
```

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

```
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.

$$distance^{-1}[cm] = 0.045 V_{out} \tag{1}$$

Next example can be your guide to code the function.

```
float getDistance_cm()
{
  int adc_value = analogRead(DIST_SEN_PIN);
  float input_voltage = 5.0/1024 * adc_value;
  float distance = 1/(0.045 * input_voltage);
  return distance;
}
```

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 potencial 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 <++> <++>