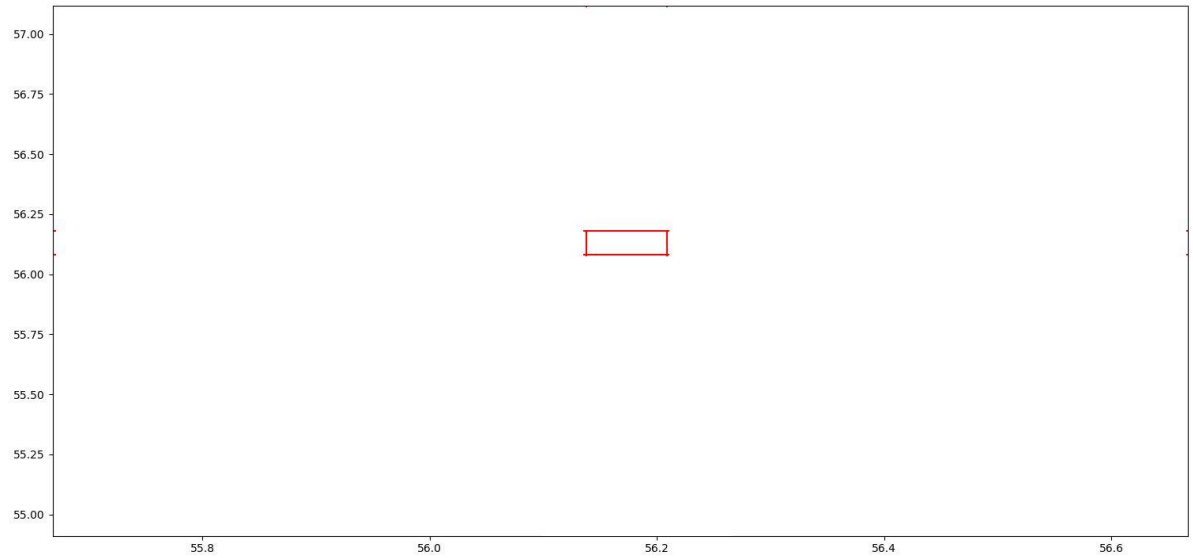

Lab #4

Student# 21060007

Task1: Subscriber for pub/sub

```
[INFO] [1645117310.784533]: /listener_2810_1645117310160I heard hello world!
[INFO] [1645117311.284981]: /listener_2810_1645117310160I heard hello world!
[INFO] [1645117311.784850]: /listener_2810_1645117310160I heard hello world!
[INFO] [1645117312.285142]: /listener_2810_1645117310160I heard hello world!
[INFO] [1645117312.783638]: /listener_2810_1645117310160I heard hello world!
[INFO] [1645117313.283469]: /listener_2810_1645117310160I heard hello world!
[INFO] [1645117313.785923]: /listener_2810_1645117310160I heard hello world!
[INFO] [1645117314.290662]: /listener_2810_1645117310160I heard hello world!
[INFO] [1645117314.787604]: /listener_2810_1645117310160I heard hello world!
[INFO] [1645117315.285226]: /listener_2810_1645117310160I heard hello world!
```

Task2: Connection with Arduino serial

```
alam@ubuntu:~$ rosrun rosserial_python serial_node.py /dev/ttyACM0
[INFO] [1645117284.227791]: ROS Serial Python Node
[INFO] [1645117284.246122]: Connecting to /dev/ttyACM0 at 57600 baud
[INFO] [1645117286.432743]: Requesting topics...
[INFO] [1645117286.759570]: Note: publish buffer size is 512 bytes
[INFO] [1645117286.764189]: Setup publisher on chatter [std_msgs/String]
[INFO] [1645117286.778907]: Note: subscribe buffer size is 512 bytes
[INFO] [1645117286.782907]: Setup subscriber on toggle_led [std_msgs/Empty]
```

Task3: Creating publisher to send Sonar data from Arduino to ROS

```
alam@ubuntu:~$ rosrun rosserial_python serial_node.py /dev/ttyACM0
[INFO] [1645119012.820038]: ROS Serial Python Node
[INFO] [1645119012.839532]: Connecting to /dev/ttyACM0 at 57600 baud
[INFO] [1645119015.180950]: Requesting topics...
[INFO] [1645119015.804733]: Note: publish buffer size is 512 bytes
[INFO] [1645119015.805815]: Setup publisher on /ultrasound [sensor_msgs/Range]
```

```
^Calam@ubuntu:~/catkin_ws$ rostopic echo /ultrasound
header:
  seq: 1
  stamp:
    secs: 0
    nsecs:         0
  frame_id: "/ultrasound"
radiation_type: 0
field_of_view: 15.0
min_range: 2.0
max_range: 400.0
range: 11.0
---
header:
  seq: 2
  stamp:
    secs: 0
    nsecs:         0
  frame_id: "/ultrasound"
radiation_type: 0
field_of_view: 15.0
min_range: 2.0
max_range: 400.0
range: 11.0
---
header:
  seq: 3
  stamp:
    secs: 0
    nsecs:         0
  frame_id: "/ultrasound"
radiation_type: 0
field_of_view: 15.0
min_range: 2.0
max_range: 400.0
range: 11.0
---
```

Task 5: Creating noise model for sonar data

```
[INFO] [1645119341.886196]: Mean is 11.000000 variance is 0.000000 Standard Deviation is : 0.000000
[INFO] [1645119392.147724]: Mean is 11.000000 variance is 0.000000 Standard Deviation is : 0.000000
[INFO] [1645119442.408335]: Mean is 11.000000 variance is 0.000000 Standard Deviation is : 0.000000
[INFO] [1645119493.018249]: Mean is 69.850000 variance is 170056.287500 Standard Deviation is : 412.378816
[INFO] [1645119543.259447]: Mean is 8.230000 variance is 3.397100 Standard Deviation is : 1.843122
```

Task 6: Getting data from IR sensor

```
34
33
34
34
33
33
32
33
```

Task7: Publisher data for IR sensor

```
  stamp:
    secs: 1645119833
    nsecs: 510904958
  frame_id: "/sonar_range"
radiation_type: 0
field_of_view: 0.10000000149
min_range: 0.0
max_range: 6.46999979019
range: 33.0
---
header:
  seq: 818
  stamp:
    secs: 1645119833
    nsecs: 520904958
  frame_id: "/sonar_range"
radiation_type: 0
field_of_view: 0.10000000149
min_range: 0.0
max_range: 6.46999979019
range: 33.0
---
header:
  seq: 819
  stamp:
    secs: 1645119833
    nsecs: 531904958
  frame_id: "/sonar_range"
radiation_type: 0
field_of_view: 0.10000000149
min_range: 0.0
max_range: 6.46999979019
range: 33.0
---
header:
  seq: 820
  stamp:
    secs: 1645119833
    nsecs: 541904958
  frame_id: "/sonar_range"
radiation_type: 0
field_of_view: 0.10000000149
min_range: 0.0
max_range: 6.46999979019
range: 33.0
---
```

Task 8: Noise model for IR sensor

```
[INFO] [1645119887.095638]: Mean is 36.080000 variance is 0.393600 Standard Deviation is : 0.627375
[INFO] [1645119888.161724]: Mean is 36.050000 variance is 0.207500 Standard Deviation is : 0.455522
[INFO] [1645119889.230337]: Mean is 36.100000 variance is 0.230000 Standard Deviation is : 0.479583
[INFO] [1645119890.299065]: Mean is 36.060000 variance is 0.456400 Standard Deviation is : 0.675574
[INFO] [1645119891.368020]: Mean is 36.220000 variance is 0.411600 Standard Deviation is : 0.641561
[INFO] [1645119892.433342]: Mean is 36.110000 variance is 0.417900 Standard Deviation is : 0.646452
[INFO] [1645119893.502289]: Mean is 36.160000 variance is 0.574400 Standard Deviation is : 0.757892
[INFO] [1645119894.571351]: Mean is 36.210000 variance is 0.445900 Standard Deviation is : 0.667757
[INFO] [1645119895.640312]: Mean is 36.200000 variance is 0.540000 Standard Deviation is : 0.734847
[INFO] [1645119896.705827]: Mean is 35.970000 variance is 0.189100 Standard Deviation is : 0.434856
[INFO] [1645119897.774749]: Mean is 33.980000 variance is 4.299600 Standard Deviation is : 2.073548
[INFO] [1645119898.844007]: Mean is 48.280000 variance is 2545.081600 Standard Deviation is : 50.448802
[INFO] [1645119899.913080]: Mean is 31.800000 variance is 0.340000 Standard Deviation is : 0.583095
[INFO] [1645119900.978259]: Mean is 31.860000 variance is 0.400400 Standard Deviation is : 0.632772
[INFO] [1645119902.047275]: Mean is 31.980000 variance is 0.199600 Standard Deviation is : 0.446766
[INFO] [1645119903.115984]: Mean is 32.090000 variance is 0.321900 Standard Deviation is : 0.567362
[INFO] [1645119904.185299]: Mean is 32.080000 variance is 0.313600 Standard Deviation is : 0.560000
[INFO] [1645119905.807155]: Mean is 31.980000 variance is 0.139600 Standard Deviation is : 0.373631
[INFO] [1645119906.876784]: Mean is 32.050000 variance is 0.087500 Standard Deviation is : 0.295804
[INFO] [1645119907.941594]: Mean is 39.820000 variance is 285.687600 Standard Deviation is : 16.902296
[INFO] [1645119909.010639]: Mean is 714.730000 variance is 44663.257100 Standard Deviation is : 211.336833
[INFO] [1645119910.079638]: Mean is 133.380000 variance is 79832.215600 Standard Deviation is : 282.545953
[INFO] [1645119911.157652]: Mean is 32.130000 variance is 1.073100 Standard Deviation is : 1.035905
[INFO] [1645119912.226584]: Mean is 32.740000 variance is 3.192400 Standard Deviation is : 1.786729
[INFO] [1645119913.295658]: Mean is 355.590000 variance is 160930.921900 Standard Deviation is : 401.161965
[INFO] [1645119914.360528]: Mean is 402.050000 variance is 164051.927500 Standard Deviation is : 405.033242
[INFO] [1645119915.429642]: Mean is 32.110000 variance is 0.217900 Standard Deviation is : 0.466798
[INFO] [1645119916.498543]: Mean is 255.890000 variance is 129511.737900 Standard Deviation is : 359.877393
[INFO] [1645119917.567944]: Mean is 350.670000 variance is 150881.761100 Standard Deviation is : 388.435015
[INFO] [1645119918.636007]: Mean is 32.200000 variance is 0.220000 Standard Deviation is : 0.469042
[INFO] [1645119919.702338]: Mean is 32.000000 variance is 0.000000 Standard Deviation is : 0.000000
[INFO] [1645119920.771074]: Mean is 32.010000 variance is 0.009900 Standard Deviation is : 0.099499
[INFO] [1645119921.840125]: Mean is 32.000000 variance is 0.040000 Standard Deviation is : 0.200000
[INFO] [1645119922.905090]: Mean is 32.070000 variance is 0.085100 Standard Deviation is : 0.291719
```

Task 9: Getting data from 4 sensors