ME-GY 6933 Advanced Mechatronics

PROJECT-1

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OBJECTIVE

■ Our aim for the term project will be to deploy a **swarm of two robots** in an **unknown environment** and generate its **map** using various sensors and techniques as we progress and learn our concepts over three stages of the project.

PROPOSAL

- **Arduino stage:** [2D Environment Mapping]

  A differential drive robot will be deployed in an environment to generate a 2D map of the environment.

- **Propeller stage:** [Swarm Robotics]

  The aim of this stage is to model and develop a system of two robots that localize themselves in an unknown environment while they cover different regions in the environment, i.e., no overlap in the regions covered. The robot will have a specific task assigned in its own region.

- **Raspberry Pi stage:** [3D Environment Mapping]

  At this stage we use a collection of sensors or a camera mounted on a robot to generate a 3Dmap of an unknown environment.

- **Term Project:** [Swarm Robots for Environment Mapping]

  For the term project we will integrate all the work done and data collected from at each stage and develop a swarm of two robots to map an unknown environment.

APPLICATIONS

- Mapping of unknown environment and locating land mines during military operations.

- Surveillance in dangerous and inaccessible places.

- Rescue search operations during disaster management.

- Sensor specific applications such as using the system to sense the levels of toxic gases, etc.

System Block Diagram
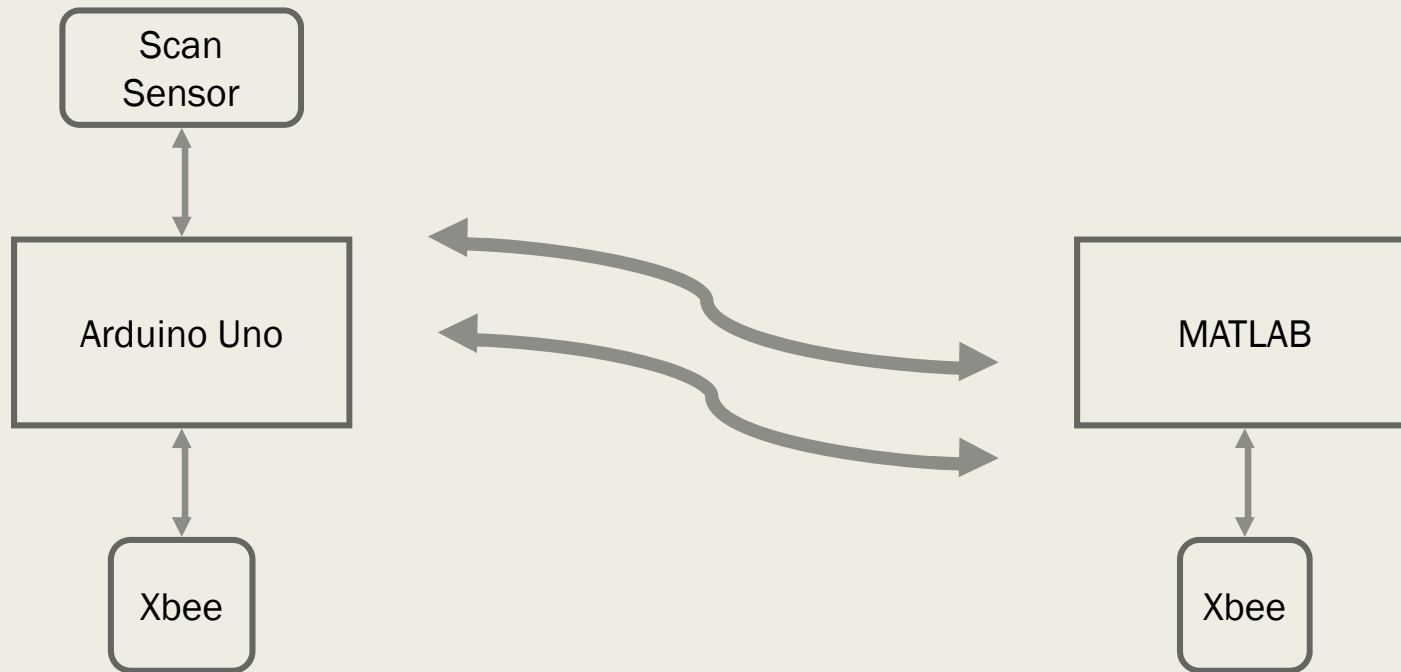
WHAT WE ACHIEVED
(Arduino Stage)

- ■ MOTION:
- – *Wall tracking*

- ■ COMMUNICATIONS:
- – *Wireless communication between Arduino and Xbee (XCTU)*
- – *Serial communication between Xbee(on Arduino) and MATLAB*

- ■ 2D MAPS:
- – *MATLAB creates a map using data points sent by Arduino.*

LIMITATIONS
(for developed prototype)

- Sensor:
- *range is limited to 10-80 cm*

- Mapping techniques:
- *Limited accuracy*

- Arduino:
- *Need of multiple power sources due to limited current capabilities*

FUTURE SCOPE

- Sensor:
- *Use of better/more sensors e.g.: LIDAR, for better accuracy*

- Mapping techniques:
- *Implementing a more robust algorithm and add robot localization*
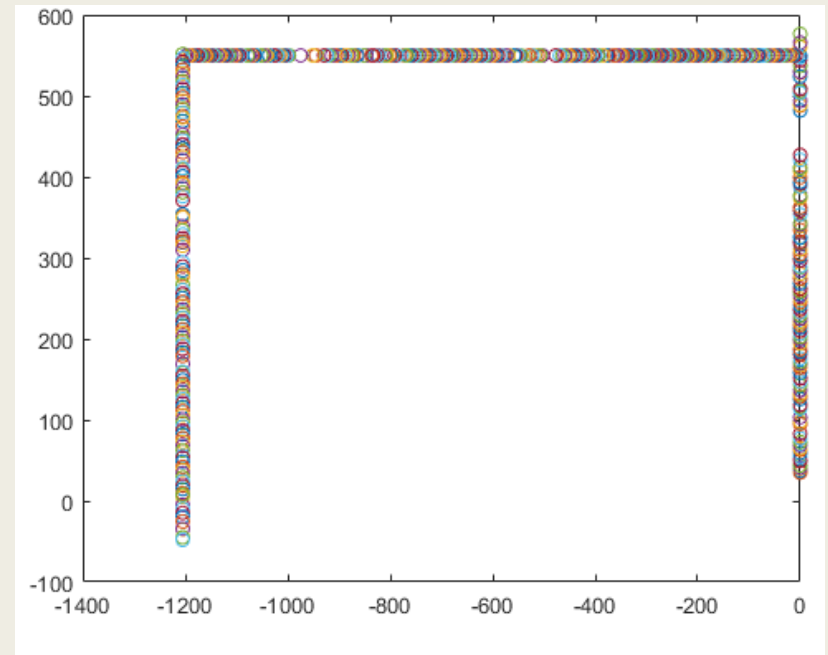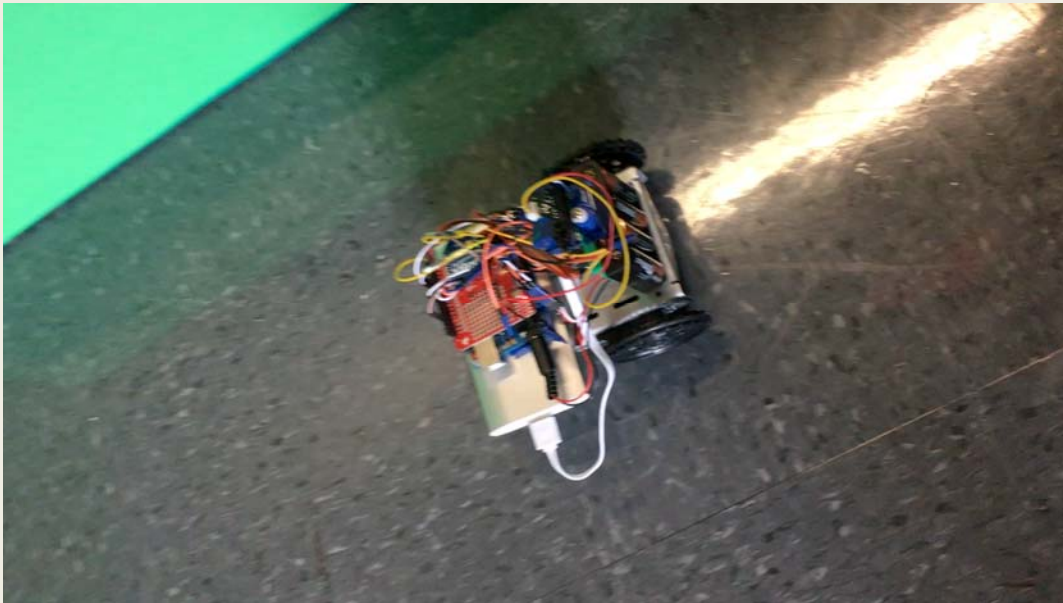
VIDEO - I

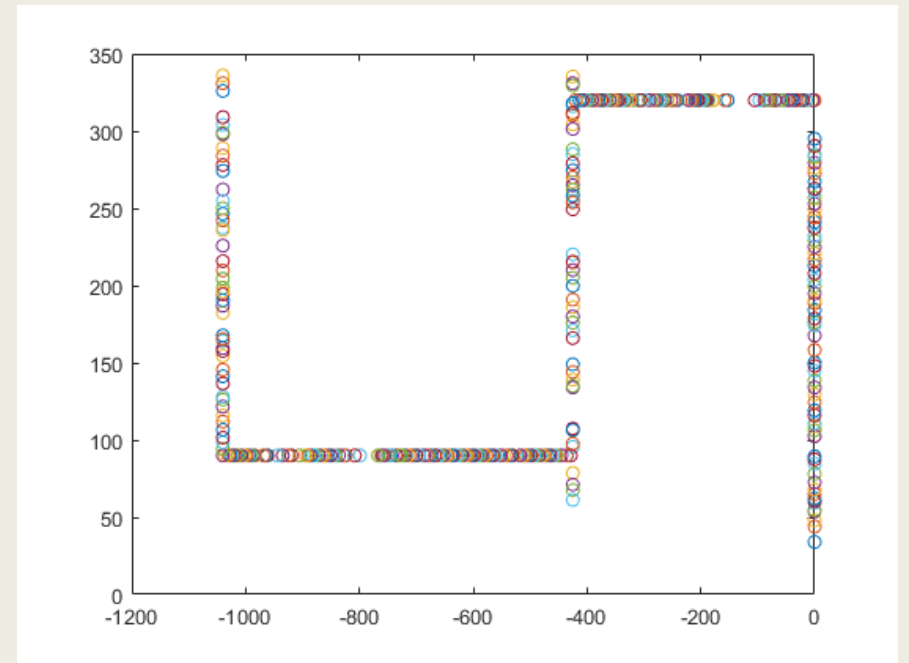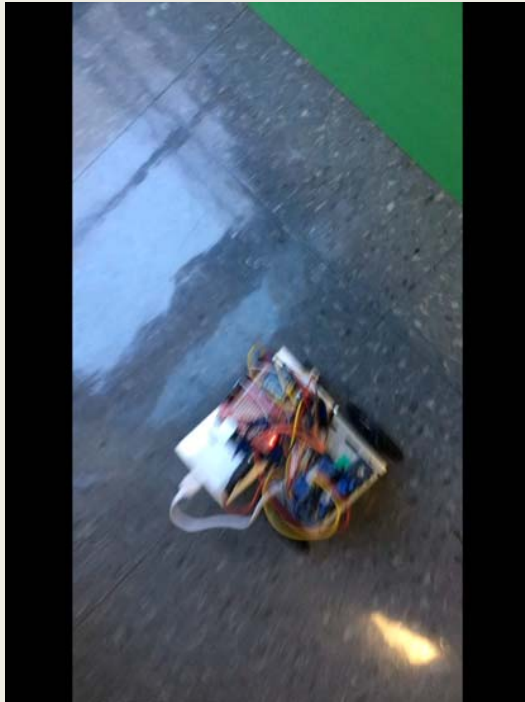### Milestone 1:
Wall-follower

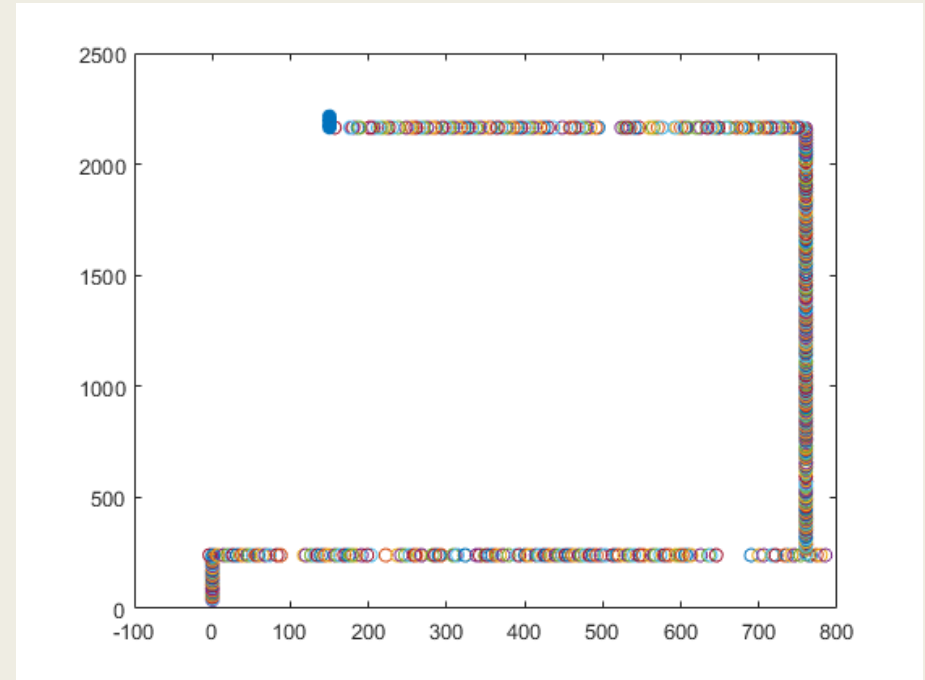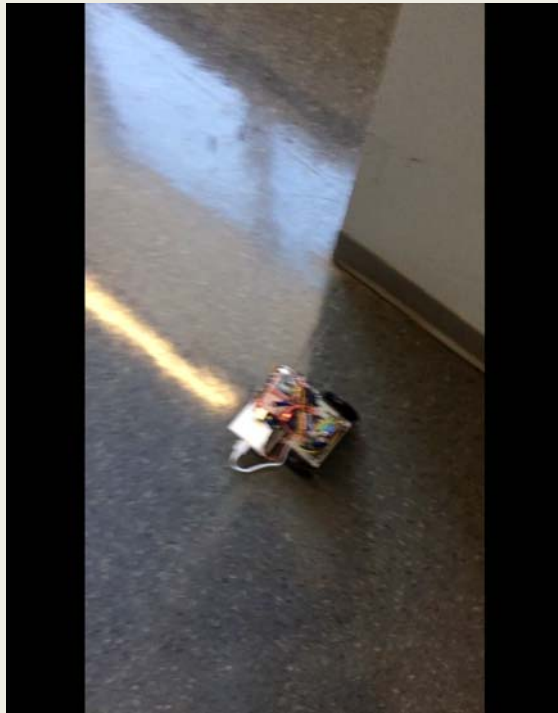### Milestone 2:
Get Scan Sensor data
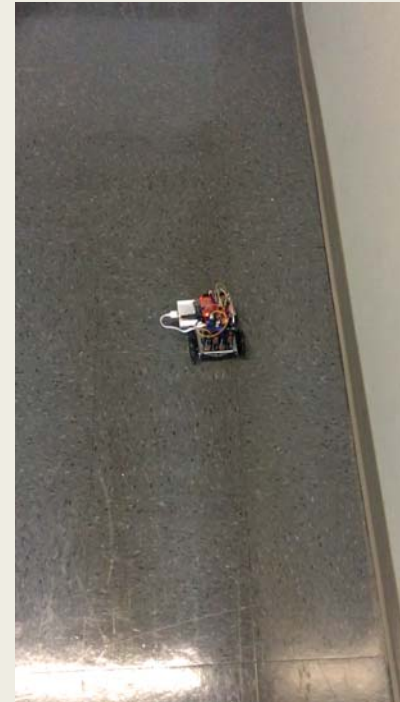
VIDEO - II

Milestone 3: Generate Map using obtained data

VIDEO - III

VIDEO - IV

THANK YOU

NYU Tandon School of Engineering (Fall 2016)