



# Goal

- Build a RC car that can be driven with no human intervention
- Research various algorithms, such as pathfinding, obstacle avoidance, and Simultaneous Localization and Mapping (SLAM) algorithms, to find the optimal combination of algorithms for autonomous driving
- Establish Vehicle to Vehicle (V2V) communication with other autonomous vehicles

# Timeline

Task	Start Date	<b>Completion Date</b>
Implement Vector Field Histogram (Obstacle Avoidance)	11/25/18	12/10/18
Merge every layer of algorithms into one general driving system	12/10/18	12/17/18
Test and improve efficiency and performance of algorithms	12/17/18	1/07/19
Implement UI for loading/switching algorithms	1/7/19	1/21/19
Refurbish old car and load new algorithms for V2V preparations	1/7/19	1/18/19
V2V Communication implementation	1/7/19	3/1/19

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# **Current Progress**



**SLAM** 

Fig. 1. Image showing the new car built

- 1) Record data of the environment via LIDAR and IMU
- 2) Data collected will be recorded in a .bag file
- 3) Configure software to match data collected
- The software would 4) then map out the environment based on the data given



Fig. 2. Generated map of the environment using Google Cartographer



Fig. 3. Visualization of the resulting path from the navigation algorithm

#### Path Finding

- 1) Begin at start cell
- 2) Iterate over nearby cells
- 3) Sort the neighboring cells using some algorithm
- 4) Pop out the first cell
- 5) Repeat until Goal is found



- 2014.

Rockwell

Fig. 4. Point based obstacle avoidance

#### **Obstacle Avoidance**

- 1) Treats the robot and other obstacles as circular objects
- 2) Find the maximum gap within the Lidar scan range
- 3) Calculate the gap center angle WRT the robot's orientation
- 4) Calculate the final heading angle towards the gap center
- Adjust the car towards 5) the gap center heading

# Future Works

### **Merging Algorithms**

• Alongside optimizing our algorithms, we also need to combine our algorithms to create a harmonious autonomous system that can react and adjust to its environment

### **Vehicle to Vehicle Communication**

• Work with PhD students to implement Vehicle to Vehicle communication Protocol to establish communication between the new car and the old car

## References

#### 1. http://fltenth.org

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