Georgia Tech

NAVX:

PATH PLANNING FOR A TACTICAL UNMANNED GROUND VEHICLE

ALVIN O'GARRO
JACOB JEONG
ANTONY SAMUEL
KARTIK SASTRY

CREATING THE NEXT®

INTRODUCTION

Objective:

- High-level path-planning for an existing mobile robot, the Tactical Unmanned Ground Vehicle (TUGV)
  - Input: High-resolution LIDAR point-cloud data with point classification
  - Output: A set of “waypoints” that the TUGV can navigate
  - Current Strategy: Graph-based

Motivation:

- Mission Planning
- Intelligence, Surveillance, and Reconnaissance (ISR)
- Area Scanning
- Emergency Situation Response
- Warehousing/Material Handling

Background:

- Two major Components:
  - Mapping/Representation (discrete vs. continuous)
  - Planning Algorithms (coupled with representation)

PROJECT DESCRIPTION AND GOALS

Qualitative Goals:

- Construct a graph model of a geographic area and assign edge weights per information extracted from LIDAR data and fundamental vehicle limitations.
- Compute the single-source, least-cost path to a specified destination.
- Translate the result of the graph search into a sequence of waypoints; Transmit the waypoints to the TUGV.

Specifications:

Base Station Parameter	Minimum Requirements
Clock Speed	2.0 GHz
RAM	8 GB
Disk/Flash Memory	256 GB
I/O	802.11n Wi-Fi USB Serial Interface

DESIGN APPROACH DETAILS

Design Approach

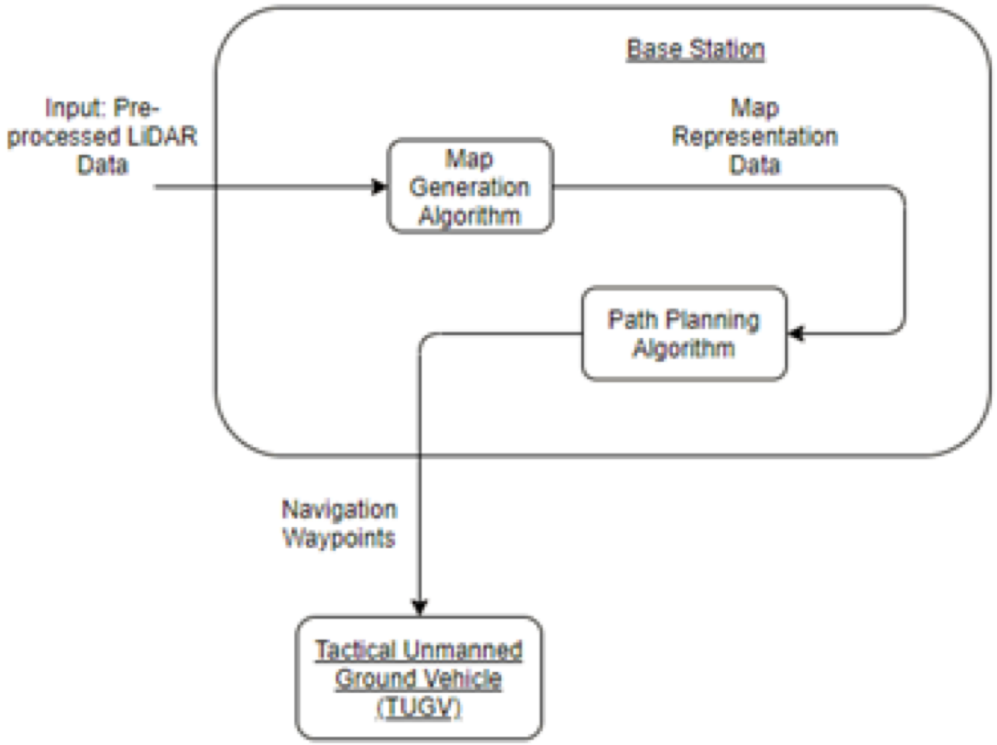
- Global Path planning on base station
- Discrete map representation
- Graph-based search algorithm
- Waypoints to TUGV

Codes and Standards

- LAS, Serial, Wifi

Constraints, Alternatives, Tradeoffs

- Preprocessed vs raw LiDAR
- Base Station Computation Limits
- Data Resolution



SCHEDULE/MILESTONES

- Documentation/Website maintenance
- 3 main tasks:
  - Data Acquisition, Preprocessing
  - Developing Representation
  - Implementing Path Planning Algorithm

SCHEDULE/MILESTONES

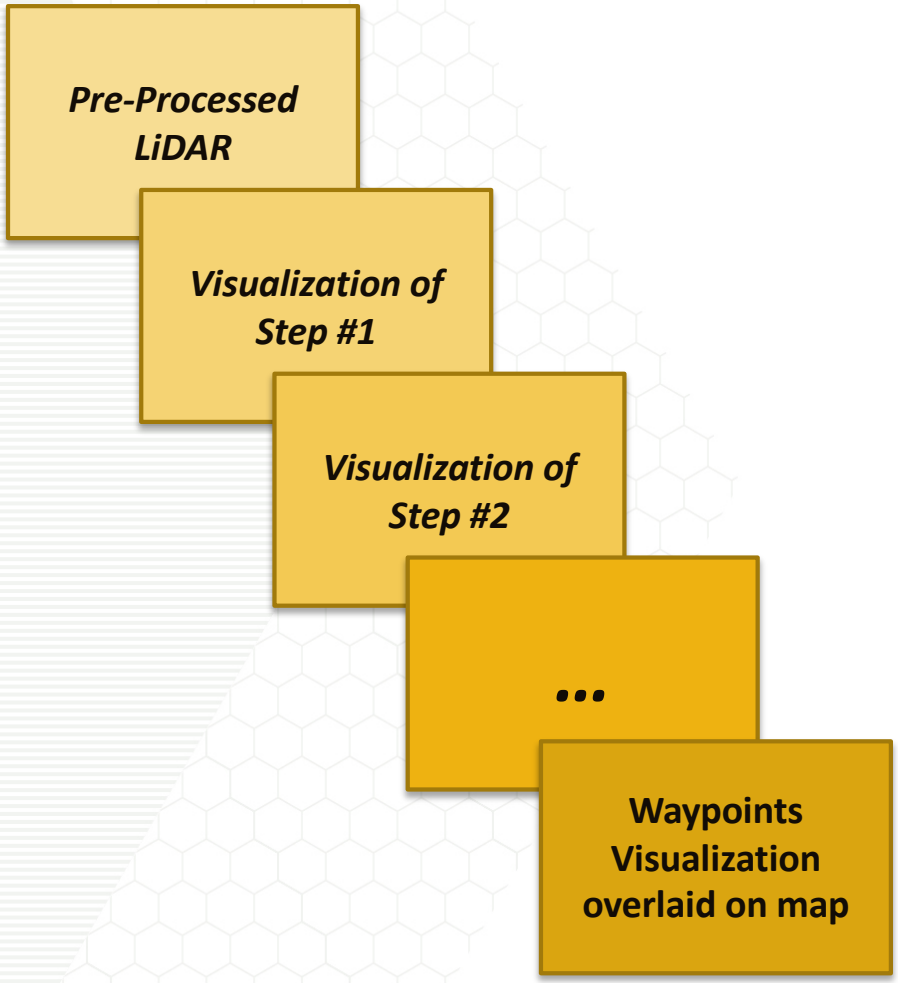
- Week 2-5: Data acquisition, preprocessing (Jacob, Antony)
- Week 2-7: Develop code for data representation (Kartik)
- Week 2-9: Implementing path planning algorithm (Alvin)

- Week 2-4: Integrating with Team B
- Week 10-11: Output generation

- Design reviews
  - Critical design review: Week 8
  - Technical readiness review: Week 12
- Week 14-15: Testing + Expo prep

PROJECT DEMONSTRATION

- **Data Input**
- **Processing Checkpoints**
- **Waypoints Output**
- **Final Verification**



MARKETING ANALYSIS

- **Harris Corporation is an American Technology Company, Defense Contractor, and IT services group**
- **With a single customers, our product captures its intended market by following requirements requested by the direct customer**
- **Working with Mr. McGonagle to establish and read all technical specifications**

COST ANALYSIS

- **Deliverables are all software-related and don't have any hardware-related costs**
- **Cost is solely a function of software salary**

COST	AMOUNT (USD)
Alvin O'Garro Salary	$6587.20
Jacob Jeong Salary	$6587.20
Antony Samuel Salary	$6587.20
Kartik Sastry Salary	$6587.20
TOTAL	**$26,348.80**

NEXT STEPS

- **Coordinating GIS requirements with Mr. McGonagle**
- **Experimentation/Discussion of mapping and path planning options**
- **Detailed, system level block diagram for software**