CISCOR

CENTER FOR INTELLIGENT SYSTEMS, CONTROL, AND ROBOTICS

Team 10

GOLIATH Autonomous ATV

Group Members:

Michael Brazeau, Marc Akbar, Jeremy Hammond, Omesh Dalchand, Lester Kendrick, Merrick Salisbury, Nahush Kulkarni

Advisors:

Dr. Chiang Shih, Dr. Kamal Amin, Dr. Michael Frank, Dr. Oscar Chuy, Dr. Emmanuel Collins

Instructor:

Dr. Kamal Amin

Background/Needs

- CISCOR focuses on mobile robotic path-planning
- Requires a more robust autonomous off-road platform
- Previous work included remote control
- Actuators installed

Objectives

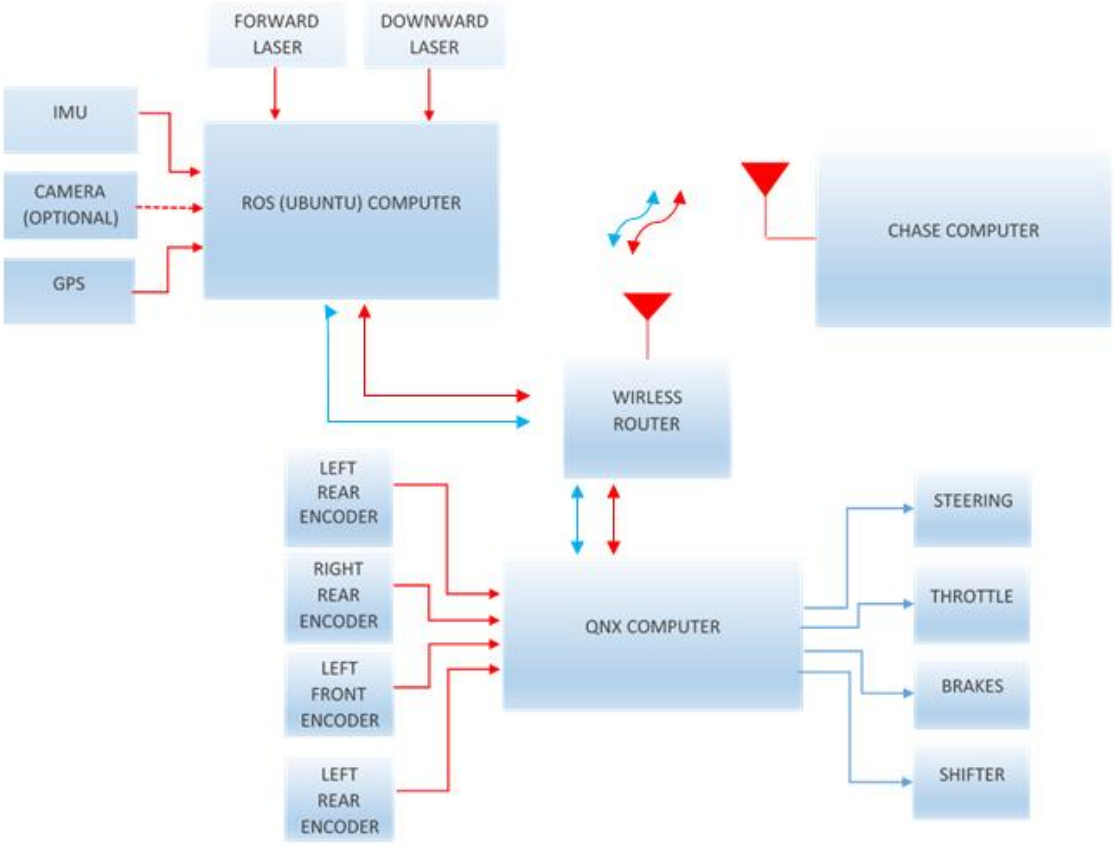
- To integrate a sensory system that will scan the surrounding environment
- Use data to compute a trajectory to perform waypoint navigation and road following autonomously
- Will be used as a future research platform for CISCOR

Fall Semester Accomplishments

- Design and analyze the sensor mounts

Fall Semester Accomplishments

- Created system for communications



Fall Semester Accomplishments

- All operating systems are installed and functioning
- Received data from the lasers/GPS in windows
- Started development of autonomous algorithm for waypoint and road following

Recent Accomplishments

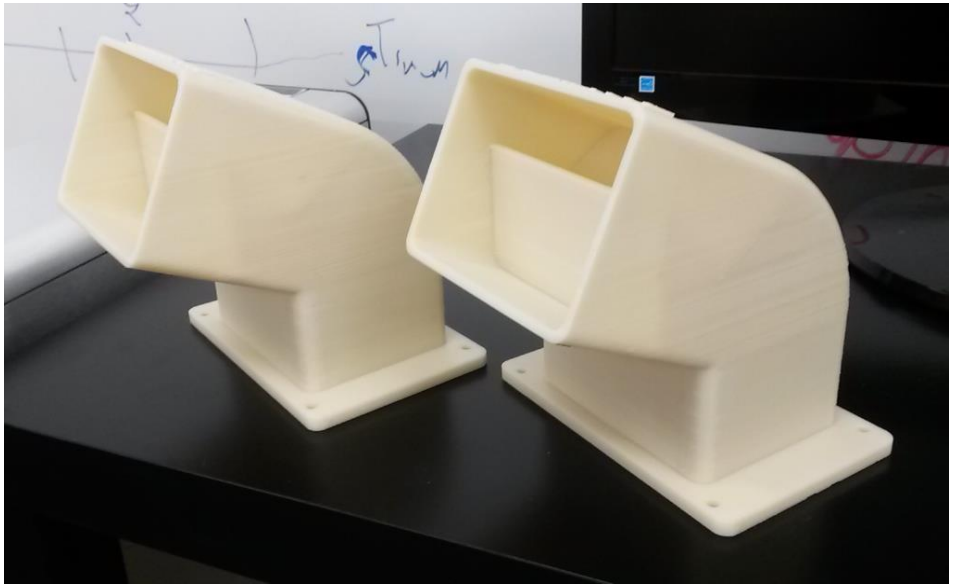
- GPS driver created for Ubuntu
- Laser data
  - SICK tool box package
  - Becoming the standard (easily shared)
- ROS package
  - Subscriber receive data from nodes
  - Publisher publish data to nodes

Final Design Concepts

- Most sensors and equipment installed in rear ATV trunk
  - IMU mount integrated with GPS mount for simplicity
- Laser and encoder mounts ready for waterjet
- Fabrication of snorkels to dissipate extra heat from rear trunk

Final Design Concepts

- Air intake snorkels
  - 3D printed
  - Porous material needs sealant



Final Design Concepts

- Encoders
  - Different sizes for front and rear CV axles
  - Pulley machining
    - Machining error

Potential Challenges

- Part fitting
  - Curved trunk surface for snorkels
  - Plastic trim interference with laser mounts
- Communication between electrical components and sensors
- Debugging code

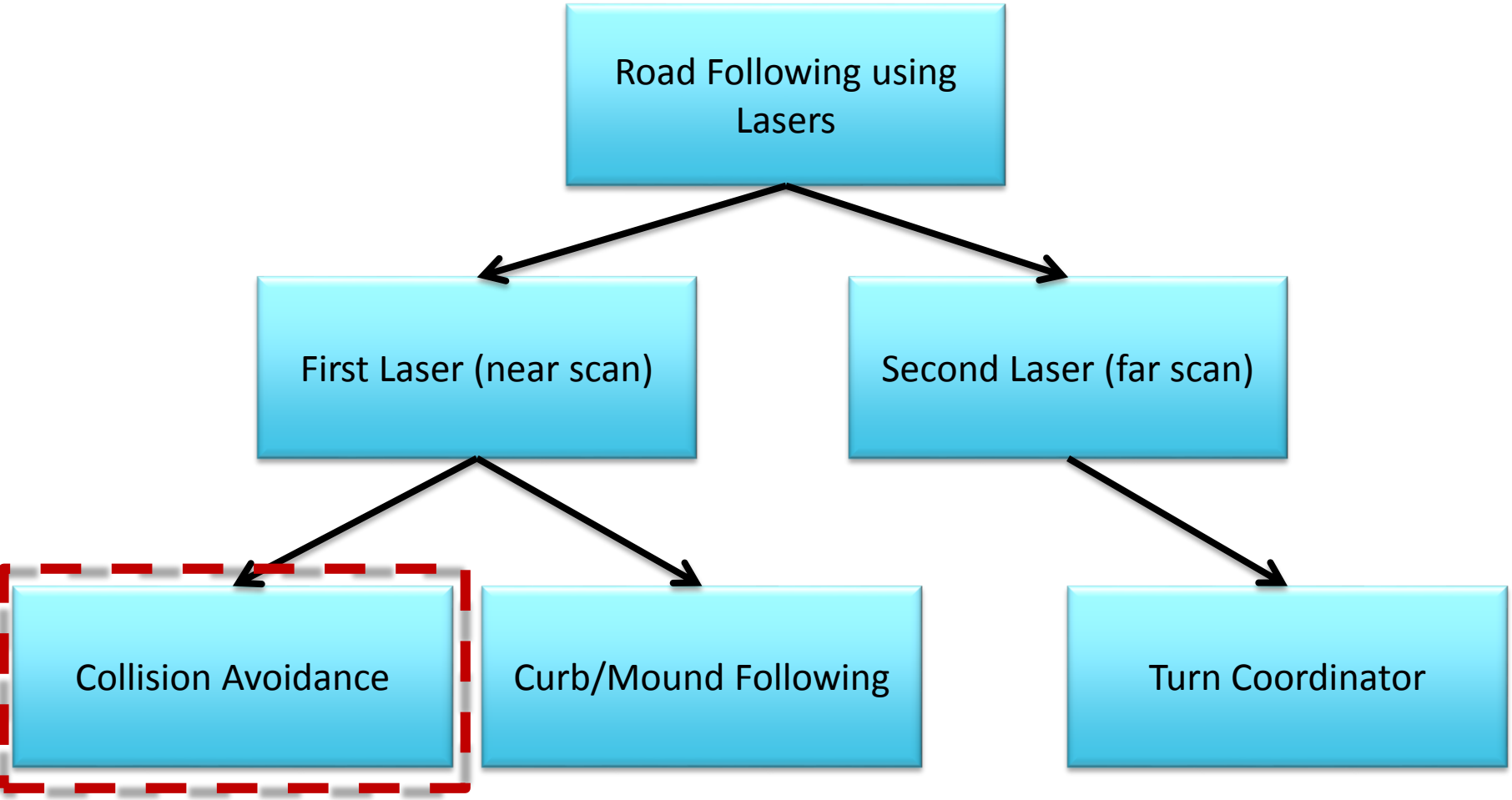
Procurement Status

- Fans, raw materials, and battery have been received
- Fasteners and extra parts need to be ordered
- Communication cables bought locally
- Power wires supplied by CISCOR sponsor

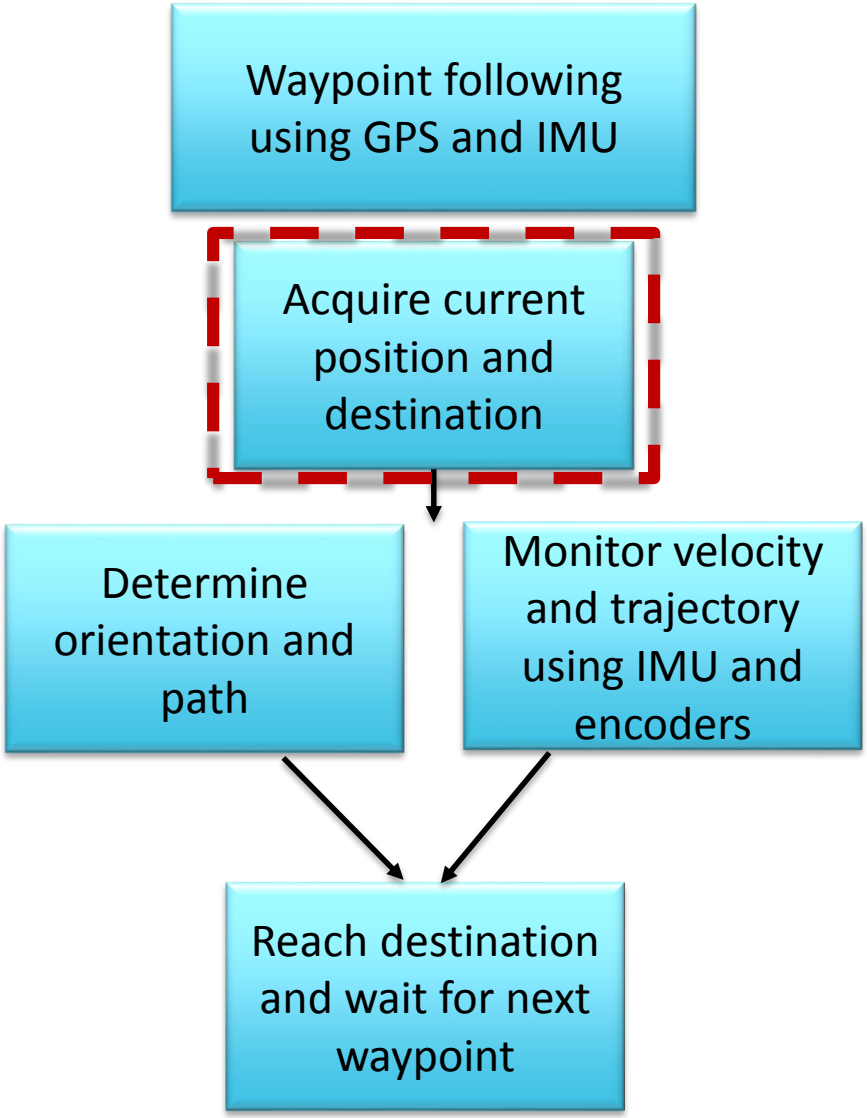
Future Work

- Waterjet encoder/laser/GPS/IMU mounts
  - Initial installation and testing
- Finalize steering motor mount
  - Machining part
  - Installation and testing
- Mount fans and snorkels
  - Gaskets
  - Adapter plate

Future Work


Road Following using Lasers
First Laser (near scan)
Second Laser (far scan)
Collision Avoidance
Curb/Mound Following
Turn Coordinator

Future Work


Waypoint following using GPS and IMU
Acquire current position and destination
Determine orientation and path
Monitor velocity and trajectory using IMU and encoders
Reach destination and wait for next waypoint

Conclusions

- On track for mechanical testing
  - Most mechanical designs finalized for machining
  - Some parts already fabricated
- Part procurement almost complete
- Coding for sensor drivers still in progress
  - Laser testing
  - GPS testing

Spring Schedule/ Gantt Chart

Team 10 Autonomous ATV (GOLIATH)

ACTIVITY	Start date	End date	Percent complete
Part Ordering			0%
Updated Plan/Specs			0%
Finalize Mechanical Designs			0%
GPS Communication/Testing			0%
Laser Communication/Testing			0%
Webpage Update			0%
Part Manufacturing			0%
Initial Installation			0%
Initial Part Testing			0%
IMU communication/Testing			0%
ROS/QNX Communication			0%
Midterm 1			0%
Midterm 1 Presentation			0%
Finalize Part Installation			0%
Final Part Testing			0%
Autonomous Code			0%
Autonomous Code Testing			0%
Midterm 2			0%
Midterm 2 Presentation			0%
Operational Manual			0%
Finalize Algorithms			0%
Final Testing			0%
Manu/Reliab Report			0%
Walkthrough			0%
Open House			0%

Fin

Questions?

Comments?