Integrated Autonomous Vehicle (IAV)
Two Main Goals:

- Design and build a fully automated vehicle capable of transporting an individual to improve accessibility on campus.
- Design and build fully integrated and self-powered infrastructure to assist the vehicle in navigating the Carleton Campus.

Main development areas

- Developing machine learning navigational and visual recognition systems
- Integrating control systems based on input from navigational and visual systems
- Designing and implementing systems for assisted entry and safety
- Developing beacon systems to assist with navigation
- Developing energy harvesting system to power the beacons
Integrated Autonomous Vehicle (IAV)

Vehicle Sensors
- Stereo Cameras
- LIDAR
- Radar
- Ultrasonic ranging
- GPS
- Bluetooth
Machine Learning and Neural Networks

2020-2021 Areas of work

- Camera vision
- Vehicle localization and mapping
- Dynamic route planning
- Lane detection
- Vehicle dynamics simulation
- Test vehicle prototyping

Real time object detection using YOLO (You Only Look Once)

Vehicle route planning

Environmental Mapping using SLAM (Simultaneous localization and mapping)

Lane line detection
Integrated Autonomous Vehicle (IAV)

Integrated Beacon System Design

- a) Autonomous Vehicle
- b) Energy Harvesting Unit
- c) Integrated Beacon Network (currently Bluetooth)
- d) Example of Beacon Implementation (virtual stop line)
Currently designed systems

- Arduino based system utilizing Bluetooth Low Energy
- Energy harvesting system utilizing piezoelectrics
Beacon System

Future Work

- Continued development of communication systems. Both beacon to beacon, and beacon to vehicle.
- Continued testing of beacon range under various conditions
- Development of information processing systems
- Local network integration

Arduino based system utilizing Bluetooth Low Energy
Piezoelectric Energy Harvester

Future Work

- Further design and manufacture of future units
- In-service testing
- Continued development of FEA simulation model
- Optimization of power conditioning circuits
- Integration with Beacon System
Vehicle System Integration

- Designed control systems will need to be integrated into the vehicle (i.e. steering, braking, etc.)
- Accessibility features will need to designed and implemented
- New and/or existing safety features will need to be integrated
- Non-Contact charging

Current FSAE vehicle available for modification
Team Composition

Looking for students with background or interest in:

- Machine Learning
- Control systems and mechatronics
- Communication systems
- Electronics
- Mechanical design
- Structural analysis
- And more

If you have any questions, feel free to send an email to any of the following emails:

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