# IGV: Intelligent Ground Vehicle

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## Team Introduction

Students that are a part of the UC Irvine Intelligent Ground Vehicle Team will design and test an autonomous ground vehicle that is able to navigate through an obstacle course. The technologies used in IGV encompass a wide range of applications in engineering including military mobility, intelligent transport systems, and manufacturing.

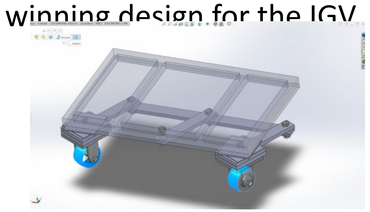
Students will be using technologies such as Arduino, SolidWorks, KiCAD, as well as various coding interfaces in order to develop modules within each subteam to ultimately develop a cohesive final product in the form of an automated ground vehicle.

## Project Objectives

- Use GPS, LiDAR, and Ultrasonic sensors to enable obstacle detection
- Create a Custom PCB with a plethora of sensors, on-board motor control, as well as Battery Charging and management.
- Develop a guidance system integrating the custom PCB with the preexisting controls system to streamline the navigation process.
- Integrate the new steering system with the controls module to allow for much tighter and more controlled steering.

## Mechanical

- The current IGV vehicle chassis is reinforced with plywood for higher durability.
- With an advanced steering system, this vehicle is designed to be compact and maneuverable.
- We believe this is will be a winning design for the IGV competition in 2022.



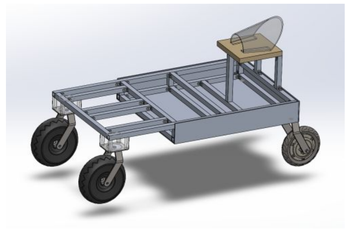
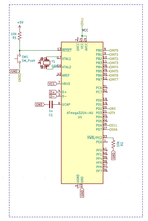
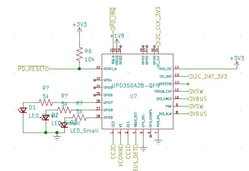


*Figure 1: The Final CAD Assembly*

## Electrical

- A custom PCB is being designed with multiple components such as:
  - Circuit protections
  - Motor controllers
  - Power delivery through USB-C
  - Sensors(gyroscope, accelerometer, GPS)
  - MCU to interface between sensors and Jetson N...





## Controls

We are writing custom firmware to power a custom PCB that the electrical team is making. This firmware will control a small chip that wcaill deal wit all of the sensor readings and motor control.

A Nvidia Jetson Nano is the brains of the vehicle. Using the OpenCV image and video processing modules we have written code in C++ to take camera input and find lanes as well as objects. We are developing custom algorithms to be able to quickly find a route through obstacles, stay between lanes, as well as find its way via GPS if there are no lanes.

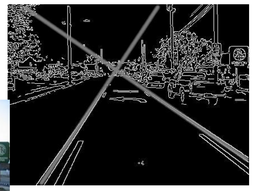


Figure 3 & 4: The black and white image is the processed output from the JetsoNano. The lines are drawn to match what the program output.

## Future Goals

**Future Design Tasks:**
-Motors/shaft
-Weather-proofing material
-Manufacturing with new materials

**Future Electrical Tasks:**
- Run simulations with mechanical components in mind
- Generate complete PCB with all submodules connected

**Future Controls Tasks:**
- Develop our lane detection algorithm to create a curve of motion.
- Finalize firmware