# Guided Target Control System

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**Timeline:** Sept 2016 – June 2017

Mechanical Engineering CAL POLY

DAIMLER Daimler Trucks North America

## Project Description

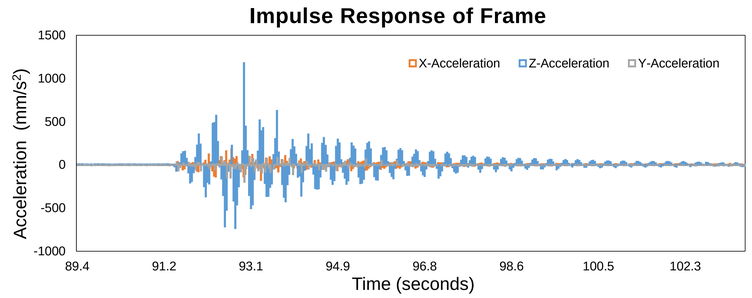
Daimler Trucks and other automotive manufactures have a need to test their life saving driver assistance technology such as automatic braking for collision avoidance.

Our goal is to design and build a guidance control and data acquisition system for a test vehicle frame that can be used to validate these driver assistance systems.

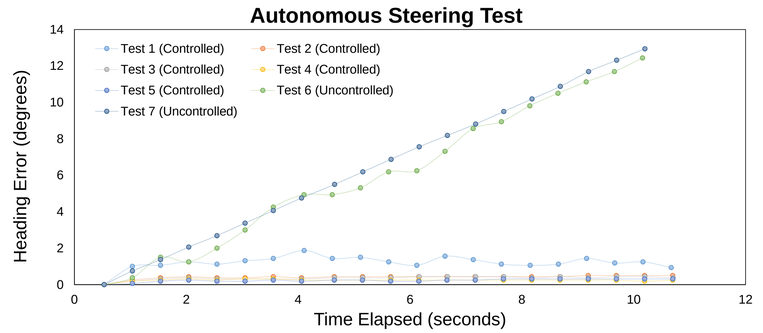
## Engineering Specifications

| Parameter Description | Requirement or Target | Results |
|---|---|---|
| Initial Setup Time | 30 min | Pass |
| Reset Time | 10 min | Pass |
| Primary System Size | 90% within 16in x 16 in x 5in | Pass |
| Power Independent Memory | Included | Pass |
| Emergency stop signal latency | 100 ms | Pass |
| Percentage of successful tests conducted without system faults | 94% | Fail |
| Cost of control system/data acquisition hardware | $1200 | Fail |

## Test Results




- Frame primary resonance is 2.8Hz
- Frame damping coefficient is 0.18

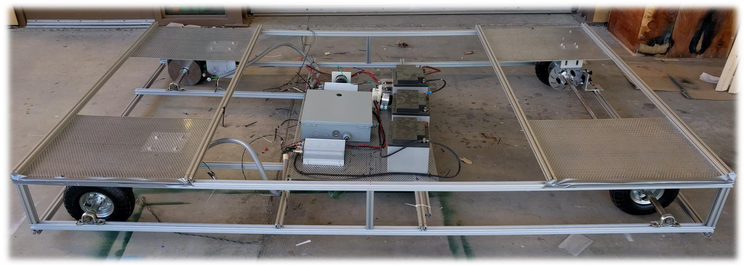



- Maximum heading error when controlled 1.5 degrees

## Final Design

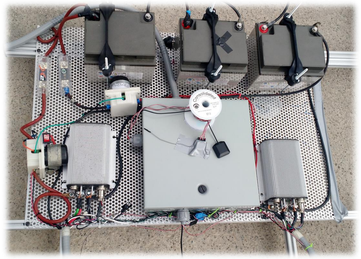
**Hardware**
- STM32 Nucleo Development Board
- Adafruit Ultimate GPS Module
- Adafruit BNO055 Inertial Measurement Unit
- Spectrum Radio Controller
- CUI Shaft Encoders
- Kelly Motor Controllers

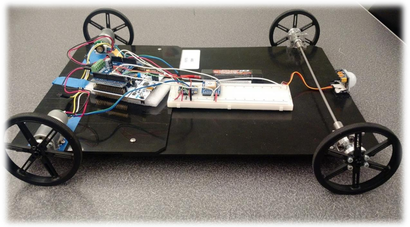
**Software**
- Autonomous operation capabilities
- Multiple fail safes and emergency stop
- Radio controlled manual driving mode
- User uploaded test maps
- GPS, IMU, and motor encoder data logging

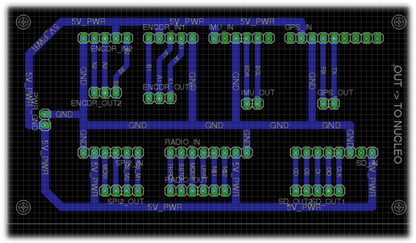


## Manufacturing

- Laser cut electrical mounting board
- Industrial control enclosure
- Multiple disconnects for easy maintenance
- Circuit protection for drive motor power
- Sensors tested on scale model before integration
- Custom printed circuit boards








## Future Improvements

- Further testing actuators and vehicle dynamics
- Implement autonomous software on full scale
- Integrate sensor fusion algorithms
- Develop a printed circuit board to reduce size of control hardware and simplify wiring
- Reduced enclosure size for smaller 2nd gen frame

## Special Thanks

- Dr. Charles Birdsong
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- Innovation Sandbox
- Mechanical Engineering Department