ONU SAE Baja
Data Acquisition System

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SAE Baja Data Acquisition System

Pediatric Algorithm
Background - SAE Baja

- First SAE Baja race held in 1976
- ONU is in its 14th year of Baja
  - Olivet Nazarene University’s Walker School of Engineering
Background - Data Acquisition

- Olivet has never had a data acquisition system
  - Maximize the reliability and minimize lap time
- Other Baja teams have used systems while at the competition
  - Research on Baja forums
- Worked with ONU’s Baja team
  - Highlighted main variables that need to be measured
Project Scope

- To design, implement, and test data acquisition system
  - Should have multiple sensors
  - Wired to logger
- Data that needs to be logged
  - Independent wheel speed
  - CVT pulley ratio
  - Engine RPM
  - GPS location
  - Accelerometer
- Work with the Baja team
  - Make adjustments as they see fit
Constraints

- Whole logger system waterproof/mud proof
- Handle moderate vibrations
  - Data System needs to be on Baja car
- Data needs log while car is in use at all times
  - Have visible confirmation
- Self powered
- Can be removed from the car if needed
  - Car may be redesigned each year
Design Alternatives

Distributed system

“Smart” sensors process data, central logger aggregates data.

Pros: flexible
Cons: complicated, cost

Centralized system

“Dumb” sensors, central logger processes and aggregates data.

Pros: simpler, cost
Cons: not as flexible
Final Design
Centralized system based on Raspberry Pi 3
Wheel Speed Sensors
Sensor Interface
GPS Receiver/Accelerometer
Wiring
Power Supply
User Interface
Overall System
**Logged Data**

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<th>Longitude</th>
<th>Speed</th>
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Work Completed

- System that collects and logs...
  - Position
  - Speed
  - Acceleration
  - Up to 8 readings from sensor interface
- Main waterproof enclosure that securely holds...
  - Logger
  - GPS/Accelerometer module
  - Sensor interface
  - Battery
- Mounting brackets with sensors for wheel speed
• Battery life and digital storage space far exceed requirements
• Interface for driver to operate system
• Preliminary work for CVT ratio and engine RPM
• Installation Guide
• Operation Instructions
• Sensor Diagram
Testing

- Enclosure durability
- Software verification and validation
- GPS accuracy
- Accelerometer accuracy
- Component Interoperability
Work Remaining

- CVT Ratio/Engine RPM
  - software adjustments
  - mount sensors
- Wheel speed
  - software adjustments
  - mount sensors
- Wiring
  - connect sensors to logger
  - fixed with hook and loop straps to car body
- Vibration/Durability testing
- Mount main enclosure
- Complete documentation
Possible Improvements

- Cooling technology
- Power consumption considerations
- Visualization software
- Wireless technology for logger on/off
- Additional metrics
Dr. Joseph Schroeder - Faculty Advisor
Dr. Bob Allen - ONU Baja Team Advisor
Jordan Houser - ONU Baja Team Leader
ONU Baja Team Members
Prof. Joe Makarewicz - Hardware/Software Advisor