Robotic Platform for Testing Autonomous Emergency Braking in Vehicles

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Location in the world
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New Car Assessment Program
PreScan Applications
AEB Pedestrian performance test

*Euro NCAP consumer testing*
Test Scenarios
Conventional Methods for Testing
The AVCASS
The **AVCASS** (Autonomous Vehicle for Certification of Active Safety Systems)
- an **ultra-low profile**, 
- **overrun safe**
- for Pedestrians or Balloon cars
- **autonomous control**

**Capabilities:**
- Provides motion to the target dummy
- Able to withstand multiple over-runs at realistic test speeds
- Autonomous control and feedback
- High run time allowing uninterrupted testing
- Causes no damage to the test vehicle
### AVCASS - Features

<table>
<thead>
<tr>
<th>AVCASS</th>
<th></th>
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<tbody>
<tr>
<td>Design</td>
<td>Tracked drivetrain with dual motor control and independent suspension linkages</td>
</tr>
<tr>
<td>Weight</td>
<td>21.5 kg</td>
</tr>
<tr>
<td><strong>Control System</strong></td>
<td></td>
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<tr>
<td>Control Modes</td>
<td>Remote Control / Autonomous</td>
</tr>
<tr>
<td>Autonomous</td>
<td>Robust and Real time Control using feedback from encoders, GPS and IMU</td>
</tr>
<tr>
<td>Control Unit</td>
<td>SBC of 1066MHz ARM9 Processor Electronic Speed Controllers for motor control GPS receiver and IMU placed inside black box</td>
</tr>
<tr>
<td>Velocity</td>
<td>Up to 20 Km/h</td>
</tr>
<tr>
<td>Positional Accuracy</td>
<td>± 10 cm</td>
</tr>
<tr>
<td>Communication</td>
<td>Wifi communication with operator control unit</td>
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</tbody>
</table>
Design and Simulation Process:

- CATIA modules for Kinematics and Modeling
- ADAMS for dynamic simulations
- Mathematical modeling of drive-train of AVCASS
- ANSYS has also been used for structural analysis
- Control system design to operate the AVCASS
Salient Features of the AVCASS

- Low profile design and suspension with sloped protective top shell
- High maneuverability due to twin rubber tracks for power and steering
- Front caster wheels (single or double) with centering and damping system
- Autonomous control with inertial navigation and Differential GPS guidance
- Significant mechanical load bearing capacity; AVCASS is designed to withstand 500 over-runs
- Robust drivetrain and suspension designed to bear test vehicle loads during over run
AVCASS - Communication

ACU (AVCASS Control Unit)

RCU (Remote control unit)

DGPS Base Station

Host Vehicle
AVCASS - Control System

- GPS
- IMU
- Wireless Communication Module
- Operator Control Unit
- Processor
- ESC
- Motors
- Encoders

- Single Board Computer
- GPS with cm accuracy
- Inertial Measurement Unit (IMU)
- Operator Control Unit
Testing of AVCASS in Simulation at Various Speeds

Car moving at 5 km/h hits AVCASS

Car moving at 10 km/h hits AVCASS

Car moving at 50 km/h hits AVCASS

Car moving at 80 km/h hits AVCASS
Roof-Top Tests

- 4.75 km/h
- 6.3 km/h
- 7.9 km/h
AVCASS testing in Simulation

AVCASS hitting the car front at 25%

AVCASS hitting the car front at 50%

AVCASS hitting the car front at 75%
Applications in Commercial Vehicles
How Users Test AEB?
Thanks

Questions

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