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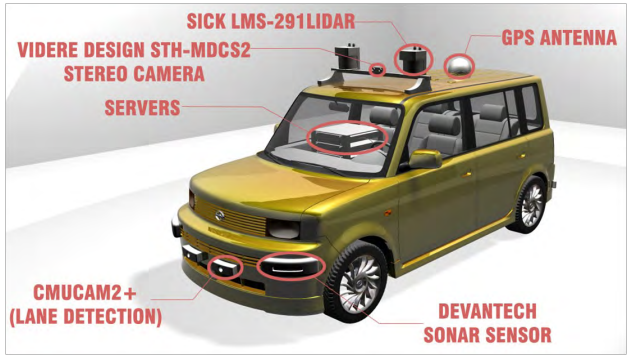

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MISSION STATEMENT: The Los Altos Academy of Engineering is a student-run program that offers high school students opportunities to explore career paths through education, training in vocational and business skills, hand-on experience, and exposure to engineering and technology.

LOS ALTOS ACADEMY OF ENGINEERING

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LOS ALTOS ACADEMY OF ENGINEERING

HISTORY OF DARPA GRAND/URBAN

The DARPA Grand Challenge is a prize competition for driverless cars that is sponsored by the Defense Advanced Research Projects Agency (DARPA), the central research organization of the United States Department of Defense. Congress has authorized DARPA to award cash prizes to sponsor revolutionary, high-payoff research that bridges the gap between fundamental discoveries and their use for national security. The third event, the DARPA Urban Challenge, that had taken place on November 3, 2007, further advances vehicle requirements to include autonomous operation in an urban environment.

LAAE'S AUTONOMOUS VEHICLE

The Los Altos Academy of Engineering is dedicated to making an autonomous vehicle similar to those run in the DARPA Urban Challenge. Our strategy to successfully creating an autonomous vehicle is to take baby steps. We have designed a mule (a test vehicle) that has the same dimensions as a commercial vehicle. Our initial plan is to run the vehicle on remote control. We will gradually integrate more and more sensors into the vehicle. After all the modifications are complete, the vehicle should be fully autonomous with the remaining task to turn it on and start it. It should run without any human interference. The DARPA Urban Challenge is no longer competing.

SOFTWARE

The software of the vehicle is the most complicated and challenging part of the project. Members of the software team develop most of their code in C, targeting the Linux operating system. The software will be used for controlling the actuators, receiving data from the sensors, and planning the route that the vehicle might take. The goal is to use as much available software as possible and only develop software that we cannot obtain through normal means.

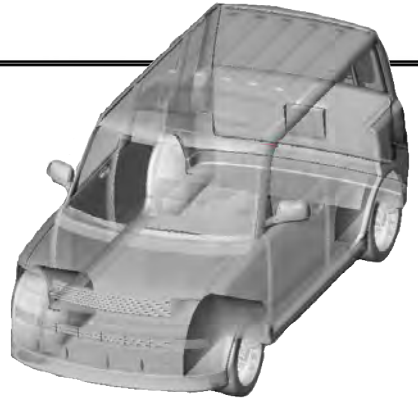
MECHANICAL/COMPOSITE STRUCTURES

All of the sensors and actuators need mechanical and composite structures to support their mounting. Some of these structures have been developed and fabricated. Some are pending design. Structures for mounting the steering actuation motor to the steering column are designed and fabricated by the students.

ACTUATORS

The vehicle will be driven by the existing engine. Team LAAE will add a few actuators to manipulate the heading and speed of the vehicle. These motors are mounted to the appropriate places in the vehicle, such as the steering column, the gas pedal, the brake pedal, and the shift gear. The motors will have feedback to measure precisely where the motor positions are.

DESIGN



The original design called for modifying an existing commercial vehicle. Due to budget constraints, the team started with the skeleton of a LAAE solar vehicle. A frame was added to mimic the appearance and dimensions of the commercial vehicle. The plan is to develop components that can be migrated to the commercial vehicle when it becomes available. The vehicle is controlled by three computers, each responsible for one of the three functions:

SENSOR

The vehicle is run on numerous sensors. It relies on a GPS (Global Positioning System) receiver for absolute positioning and an IMU (Inertial Movement Unit) for relative positioning. An integrated device combining both sensors is in our inventory. The vehicle will also employ two to four LIDARs (Light Detection and Ranging) for forward- and rear-looking medium-range obstacle detection and ranging. A group of four SONARs (Sound Navigation and Ranging) augments the LIDARs in close-range obstacle detection. For long-range obstacle detection, two stereo-imaging cameras will be used.