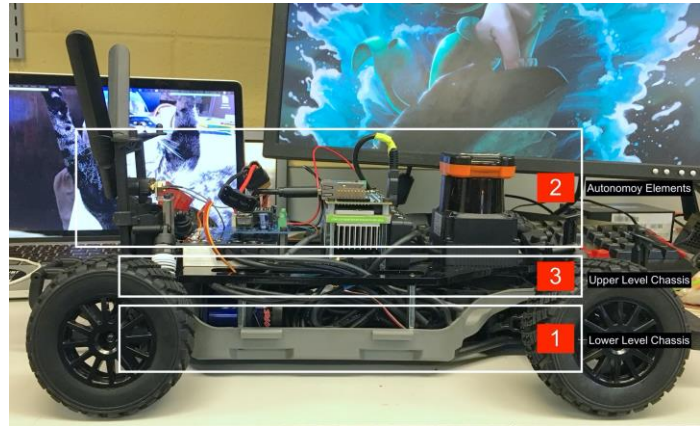


F1TENTH Autonomous Car

The goal is to build an F1tenth autonomous car and develop the software/algorithms needed for autonomous operation.



Hardware

Detailed instructions for building the hardware are available at <https://f1tenth.org>, which will allow the team to rapidly focus their work on the development of algorithms for autonomous driving.

We will not require the use of official F1tenth plans and some exploration of alternative hardware solutions is possible. However, to keep the project focus we strongly encourage:

1. Staying roughly within the 1/10th scale, which in practice limits the power of the motor and battery size
2. Using an off-the-shelf chassis (rather than building it) so that algorithm development can start early in the year

Algorithms

The goal is to study, adapt, and integrate the algorithms needed to perform a non-trivial *task*. <https://f1tenth.org> is focused on racing, but we definitely do not want to restrict this capstone project to it. In fact, the first weeks of the project should be devoted to defining the task to be accomplished by the car, which can include:

- Racing on a track (<https://f1tenth.org/race.html>); as a first goal just racing against the clock, without other cars in the track and, as a stretch goal, against a human driven RC-car.
- Finding the way out of a building (with a known or unknown map for the building).
- Video surveillance of a building/area (this will require additional hardware, as the basic hardware in <https://f1tenth.org> does not include a video camera and the capability to stream live video). As a first goal the car could just stream live video as it goes over a pre-determined path and, as a stretch goal, follow moving objects.
- ... your imagination is the limit...

All tasks described above are much more challenging that you can imagine (which is why we don't see many autonomous cars in the streets today), so a big portion of the effort need to be devoted to:

1. *learning the state of the art in vehicle autonomy*
2. *exploring existing algorithms and their hardware/software requirements*
3. *adapt and integrate algorithms into the hardware prototype*

A good place to start learning is <https://f1tenth.org/learn.html>

Classes in robotics (say the ECE179 series) and control (say the ECE147 series) will be very helpful.

Questions? hspanha@ece.ucsb.edu