# Adaptive Cruise Control (ACC)

CSE 470
Group: ACC

Fall 2001

## 1 Problem Description

Car collisions injure over 10 million people per year worldwide. One approach to collision avoidance is to measure the clear distance ahead of a car with radar, and apply brakes if the car will come within an unsafe distance of the lead vehicle. Typically, these systems are linked with the cruise control and automatic speed control systems in the car to hold the car at or below the minimum of the leading vehicle speed and the speed being commanded by the driver or cruise control.

There are two cases: In the first, the car is operating in the clear with the cruise control set. If a vehicle moves in front of the car at a distance considered unsafe, the car needs to decelerate with brakes until it is at least at the safe distance. Typically, the safe distance is measured in seconds of separation, for example, a two second space at 60 M.P.H. would represent 176 feet of separation. The car may also close on a slower moving lead vehicle. In this case, the car must decelerate before arriving at the unsafe distance.

In the second case, the cruise is not set and speed is controlled by the driver. In this case, the car must also not come closer than the unsafe distance from the lead vehicle either through use of brakes, reduction in speed commanded to the speed control, or both. When there is no lead vehicle, the car can assume whatever speed the driver is demanding.

## 2 Constraints

- The radar unit has a range of about 500 feet. The radar unit provides three data items:
  1. A "lead vehicle detected" signal when a vehicle is present. "Lead vehicle detected" is not present when no vehicle is within detection range.
  2. The distance to the lead vehicle.
  3. The closing speed between the car and the lead vehicle.
- The car shall never close closer to the lead vehicle than 2 seconds of separation.
- Brakes can be applied with deceleration of 0 to $12 ft/sec^2$ in increments of $1 ft/sec^2$.

- The engine control module will accept a digital speed message to hold the car at a given speed. A release signal resumes manual throttle control.
- The driver's accelerator can be overridden with the speed control.
- Either the cruising speed (if cruise is set) or the speed determined by the driver's accelerator must be resumed when possible.
- A signal is present when cruise is engaged.
- The system must not be active at or under 25 M.P.H.
- A driver's display must indicate when automatic braking is occurring and when speed is being limited to avoid the danger zone.

# 3 Assignment

Your group is to do the following tasks:

1. Schedule a meeting with your customer.
2. Prepare a detailed agenda for this meeting that addresses specific questions about the requirements for the project
3. Conduct the meeting and take specific minutes recording the issues raised and any resolution of those issues
4. Write a revised problem description statement that elaborates on the details of the problem to be solved
5. Write the requirements analysis document