

CALIFORNIA INSTITUTE OF TECHNOLOGY  
Control and Dynamical Systems

**CS/EE/ME 75a**

R. M. Murray  
Fall 2006

**Homework Set #1**

Issued: 2 Oct 06  
Due: 9 Oct 06

Complete the problems below, trying to spend no more than the estimated time listed.

1. Read the DARPA Grand Challenge Rules, available at

<http://www.darpa.mil/grandchallenge>

Answer the following questions to the best of your ability (not all of them have complete answers):

- (a) What is the maximum length of time that the vehicle will have to be able to operate without intervention by the team members?
- (b) What vehicle subsystems must be shut off during a disable E-Stop signal? What other actions must be undertaken, if any?
- (c) What is the maximum distance between two waypoints and what is the minimum and maximum size of roads in which the vehicle must operate?
- (d) What is the format of the NQE test? How long will it last, what type of situations will be encountered, what type of obstacles are expected?

Every student should read through the grand challenge rules; don't just ask your teammates for the answer or search for the spot that answers the specific question above. It's OK to cut and paste from the web site, as long as it is appropriately indicated in your homework. (Estimated time: 30 minutes)

2. Read the information contacted on the internal Team Caltech web site

<http://gc.caltech.edu/wiki>

The username and password will be given during class (ask a teammate if you missed class). Use the information provided there to answer the following questions:

- (a) How much electrical power is available in Alice?
- (b) How many cameras were mounted on Alice in the 2005 race? How many LADARs?
- (c) What devices are used to estimate the current position, orientation of and pose of Alice? (Hint: the algorithm that performs this function is 'astate'.)

(Estimated time: 30 minutes.)