

CALIFORNIA INSTITUTE OF TECHNOLOGY
Control and Dynamical Systems

CS/EE/ME 75a
Homework Set #1

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Issued: 11 Oct 04
Due: 18 Oct 04

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 corridor in which the vehicle must operate?
- (d) What is the format of the NQE test? How long will it last, what type of terrain 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. 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://grandchallenge.caltech.edu>

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 Bob?
- (b) How many cameras were mounted on Bob in the 2004 race? How many were used?
- (c) What does a goodness value of 60 mean for a voter communicating with the arbiter?
- (d) What devices are used to estimate the current position, orientation of and pose of Bob? (Hint: the algorithm that performs this function is 'vstate'.)

(Estimated time: 30 minutes.)