

UNC Charlotte–Advanced Embedded Systems-Midterm Exam 2 – 4/11/07

Name: _____ User ID _____

Question	1	2	3	Total
Score	/50	/50	/50	/150

You are permitted 75 minutes to take this test, no more. This is an open book/open notes test. You are allowed the following items for the test: computer, calculators, books, notes, homework, labs, pencils and erasers. You are not permitted to have any of the following on your desk during the test: cell phone. Failure to abide by this policy will result in a zero for the test and a visit to the UNC Charlotte honor board. Put your answers on paper supplied. Use only this paper. Turn in this paper at the end of the test.

Please read and sign this statement: I have not received from anyone nor assisted others while taking this test. I have also notified the test proctor of any of these violations noted above.

Signature: _____

Statement of work

Design an embedded system that will include:

- Four ultrasonic range finders – assume these have 10m range
- One 3-axis accelerometer
- Two DC motors
- One radio transceiver

Design an autonomous vehicle that can enter a room through a doorway, map the contents of the room in all three dimensions, transmit this information to a second identical robot just outside the room, and then leave the room. The vehicle should map all contents of the room, up to 8 feet high.

Capabilities

1. The vehicle may need to travel inside of to room to see items hidden behind larger items or to observe.
2. The vehicle will always be able to find its way out of the room.
3. The vehicle will be able to turn in place.
4. The vehicle is self powered (battery) with the aim of keeping the weight minimum.
5. You must mount the ultrasonic sensors on a pole 1.5 meters high.
6. You must include a watch dog timer function.
7. You must include an operating system.

Test Questions

1. Create a block diagram of the electronics of the proposed vehicle. Include enough detail on each components and number of wires between each subsystem.
2. Write the software architecture of your system.
3. Write the algorithm for the mapping subroutine.