CS 7633 Fall 2016 Written Case Study #2

Submit response on T-Square by Tue Nov 1st, 2016 3:00pm

The purpose of the written case studies is to assess each student's individual mastery of the HRI curriculum. Topics covered include relevant literature review, study design methodology and evaluation methodology across multiple domains. Each written response will be graded by the course instructor and the TA, with the ultimate grade reported as a ✓+, ✓ or ✓- (equivalent to 100%, 80%, 60%). Students receiving a ✓ or ✓- may resubmit (by email to the instructor) up to one updated response for reevaluation within 7 days of the original deadline.

Note that each of the case studies previously appeared on the Robotics PhD Qualifer Exam, for which CS7633 serves as a core course. Thus, for PhD students in the course the case studies serve as valuable practice for the written portion of the quals. I'm happy to arrange a time to meet outside of class for any PhD student interested in practicing the additional oral component.

The submissions system will close at 3pm on the date that the assignment is due. Late assignments will not be accepted except for pre-arranged absences or special considerations because the content of the case studies will be discussed in class on the date of submission.

You are part of a team proposal to a Department of Homeland Security's new Research Division. You and your colleagues are proposing to develop and test robot guides that can be deployed in crowded indoor venues during evacuation and other emergency situations to help with crowd control and to facilitate a smooth evacuation.

You are applying for their small 2-year grant which has a budget sufficient to support your development team to modify and build five prototype robots and to run a test with around 300 participants in the university aquatic center.

As part of this proposal your colleagues are tasked with writing the following sections:

- Introduction and motivation
- Budget justification
- Description of baseline robot capabilities
- Risk analysis and mitigation
- Commercialization plan to transition the technology to private industry

and **<u>you have been tasked with writing the remaining sections</u>** of:

- Relevant literature synthesis & key insights that you will bring to bear
    - This section should describe the key insights from the relevant literature that your research and development team will be using. The emphasis should be on synthesis of the relevant literature to support the 3-5 key insights you plan to leverage.

    - It should indicate any ways in which you feel your proposal is unique among your competitors who are primarily made up of teams with Mechatronics, Autonomy & Controls experts.
- Design Approach – what modifications you intend to make to the baseline robots and why
    - This section should describe all of the major modifications you believe that you will make to the baseline robots. If multiple modification options are under consideration then describe those as well.
    - Will all of the robots be equally kitted out? Or will they have different roles with different modifications?
    - Link your choices back to the relevant literature or key insights.
- Preliminary Evaluation – evaluation of the robotic designs prior to Concept Validation
    - This section should describe any and all evaluations of the robotic designs prior to actual full scale field testing.
    - Make sure to give a high level overview of the evaluations that will be conducted, the variables which will be tested and the metrics that will be evaluated. Also make sure to include descriptions about the participants involved and the tasks or part tasks that are used during the evaluation.
    - Sketch out some basic statistical methods that will be used to analyze the data and why those methods are appropriate.
- Concept Validation – a full scale field test in the aquatic center
    - Describe the concept of operations that will be evaluated including the number and role robots, the evacuation scenario.
    - Describe any independent variables which you intend to evaluate and what metrics you intend to collect.
    - Describe how you intend to evaluate your metrics and if statistical analysis is appropriate then what methods you intend to use and why.

As of now, the only section which is written is a draft description of the baseline robot capabilities:

For this project we will make use of the Willow Garage PR2 platform. The baseline capabilities include navigation and obstacle avoidance; the robot has a map of the building to be evacuated and can orient itself with respect to this map. The robot can track people in the environment with the Kinect senor, and can do some basic manipulation skills on known objects (pick-up/put-down, operating door handles, etc.) The robot uses the Google Speech API for automatic speech recognition, and has a speaker and text-to-speech capabilities for speech generation.