CENG 5437-4391 Mobile Robots HW6 First Project Report

Project Report Spring 2022 **Due March 22, 2022**. T. L. Harman: 281 283-3774

1. **For some ideas: Please scan the references on the course website or in Blackboard Course Content. You should apply or describe the ideas we have covered in the course when appropriate for your robot – physics, control, sensors, navigation, etc.**
2. **Read the Requirements below for your report.**

The project will consist of a technical description and/or design with documentation for a **mobile robot** serving some useful purpose. The presentation will consist of a brief lecture and report on the project at the end of the semester. The robot can be a commercially available unit. If so, get as much technical information about it as possible – remember journal articles or patents if they apply!

1st Brief Report - I expect only a few pages here. Keep it SHORT and to the point!

Write a short report on your project to turn in and discuss with the class in two weeks. This should follow the general form of the final report described below. **Use your own words! REMEMBER TO include information about things we have discussed in class – sensors, navigation, etc.**

1. **Start with a description of the robot project and describe a detailed plan of action for the rest of the semester. This should include a "Time Line"**

2. **Include Chapter 1 described below -Literature Search- Summary of previous work in the area including references with comments on the references.**

The report should give an outline of your project and what you intend to include for the final report. Describe the application in detail and give the specifications of the robot in terms of the inputs and outputs and user interface.

Give as much detail as you can. Obviously, you may not know all of the technical details but do your best. An example for a robotics project is shown below.

The final report should include the engineering and computer properties of the system you are studying. Include a description of the software including the basic architecture of the software in block diagram form. I expect a discussion of the sensors needed, the algorithms, and the control needed.

NOTE1: List all references - the web URL, books, etc. Give a brief summary of the references.
NOTE2: This report could be the start of a Capstone project or a Master's Thesis.

SUMMARY OF DOCUMENTATION for Project
PROJECT REPORTS - OUTLINE AND REQUIREMENTS
To hand in during the semester:
Brief Write-up and Discussion of the project –

1. **Preliminary report on project – Description of the Requirements and operation of the system. Maybe a second report to describe your progress.**
2. **Final Presentation to class, and Final Report (Due Night of Final)**

(Reports to be typed and spellchecked)

Outline of Report: Please Limit Report to 10 pages.
Cover page – Title, Course, date, and your name
Table of Contents
Abstract (10 Points) – Brief summary of project and main results in your OWN words!
Introduction (10 Points) – Brief summary of the chapters or sections of the report (50 Points)
Chapter 1 -Literature Search- Summary of previous work in the area including references (If applicable).
Chapter 2 – Define the Requirements including the USER Interface. How autonomous will the robot be in accomplishing its tasks?
Chapter 3 – Functional Design – Block Diagrams and description of Modules including sensors, processing, and control outputs.
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Chapter 4 to N-1 Include details to describe how the system meets the requirements. This is the Detailed Design!
Chapter N – Conclusions and results (Final Report) In your OWN words!

Appendix – Code or Circuit Diagrams and similar details of the software or hardware if you have such details. Put miscellaneous stuff in the Appendix. Please don't describe all the pins on the microcomputer in the report!

Glossary (10 Points) – Definition of special terms and all acronyms.

References (10 Points) –List of all sources for the report and briefly describe their content – These may be tied to reference numbers in the report. If you copy material from the WEB, etc. Give the Reference! Give a brief description of the reference in a sentence or two.

Index – Listing and page number of major items in the report. (Optional for formal reports)

To be included in final project report (if applicable):
Cost Analysis
Trade offs analysis – Alternative ways of accomplishing the result – and the reasons for choosing your method.
Safety and Certifications - Description and references for safety requirements and any standards that may apply – i.e. UL listing may be necessary.
Grading: 90% Final Report format and readability following this Outline.

10% Originality and interest of topic to the class and the instructor.

EXAMPLE SUMMARY OF DOCUMENTATION for Robotics Project

General Requirements

Describe the general specifications of the operation of the robot. These specifications should define the characteristics of the robot as experienced by the **end user**. First, describe what the robot is intended to do in some detail. Is it used for factory automation, medical applications, delivery, disinfecting or other mobile operation, etc.? Details might include such topics as sensors, lifting capacity, speed, and type of end effectors or actuators. How is it programmed and controlled by the user? What are the safety considerations? Numerical values should be assigned to a requirement whenever possible.

Detailed Requirements

1. Description of purpose and general operation including a physical description. Describe the sensors required – vision, collision avoidance sensors, sensors for position, velocity, etc.
2. In normal operation for input and output
    What can the user specify? For example, the path, speed, etc. of the robot.
    For outputs, what will the user see (or hear)? How does the user control the robot-teaching by moving the robot, programming, touch screen, visual model, etc.

3. Details of the User interface with the robot. Is the operation automatic or does it require user inputs as the robots completes its task?
4. Other conditions
    Safety and Alarm conditions (if necessary)
5. Special Requirements
    Power and environmental considerations

Functional Specifications

1. Block diagram and description of software (SW) and hardware (HW) modules used to meet the Detailed Requirements
2. Description of the interfaces between modules – type of data exchanged, data rates, error conditions, etc.

Detailed Design (Hardware and Software)

1. Flow charts, circuit diagrams, etc. that describe the various parts of the robot **if you are actually building a robot**. (With the Covid situation this may not be possible.) You could develop a preliminary design for a robot you might build for the Capstone project or the Master's Thesis if you wish.