Requirements on the Midterm Course Project Proposal

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In the semester each team needs to submit a Project Proposal for their course project after the project is approved by the instructor. In the proposal, you need to clearly describe the project target, technical specifications your team plan to achieve in the project, any preliminary design you have, hardware/ devices (motor, sensors, …) you plan to use and the justifications of the use, and the sub-tasks each team member will work. Please carefully and thoroughly read the follows for the detailed requirements on the format and contents of the proposal. The grade of your proposal will be determined by its *completeness, clarification, technical soundness, and professionalism* of the proposal.

Please submit the proposal ONLY via the Blackboard. For the instructor to assign a grade to everyone, every member in a team needs to submit a copy of the proposal on the Blackboard!

- **Format of the Proposal:**

The proposal should be **at least 3 pages (letter size) EXCLUDING** cover page and references, with **single spaced lines**. The font of the main text body should **NOT be larger than 12pt**. Any font size of 30+pt can **NOT** be used for any other content (including title, cover page, section titles, …). The page margin should not be more than 1.25"*1.25". If a figure, picture or table is used, it should not be larger than a half page. Do NOT separate each section on different pages. All the pages except the cover page need to be numbered.

Absolutely include any **reference** you use for the project (including **webpages, youtube videos,** books or articles, etc.). **Table of contents** is not required. Include your team name (if applicable) and all team members' names on the cover page.

Note: In the main body of the proposal, do **NOT** use separate page for different sections.

- **Contents of the Proposal:**

The proposal should at least have a **cover page**, a title, clear statements and description of **the main target** your team plan to achieve in the project. Besides these, you also need to include:
1. A clear, well-defined **title** that precisely reflects the main task, feature or functionality of you project.

2. In the main body of the proposal, expand the title and clearly describe and explain the task your system will achieve.

In another word, you need to technically clarify what your project will do by detailed descriptions. For example, for an obstacle avoiding robot project, you need to clearly explain what task the robot will do: whether the robot moves from a starting location to a designated destination location while successfully avoiding all the obstacles along its path? Or it just randomly moves around in the field for several times while avoiding all the obstacles in the field? Another example: for a tape-track following mobile robot project, you need to clarify the colors of the tape and the floor, and the shape of the tape-track (circle or arbitrary shape?). In a word, please be technically specific as much as possible!

In addition, if necessary, clearly specify any relevant <u>technical measure</u>, not just verbal description, which is applicable to the task of your project. For example, for an elevator project, if you state that the task is to control the elevator car to move up/down and stop on a floor *precisely*, then you need to **technically specify** the word "*precisel*y". How *precisely* you want it to be: the elevator car will not be more than 2cm off from a floor when it stops, or <u>1ft off</u>? Some other examples: a flying robot can reach <u>200ft</u> in height as the maximum; an obstacle-avoiding robot can avoid all obstacles by keeping a spacing at least <u>0.5foot</u> away from the object; an tape-track following robot will not be off the tape for more than <u>5cm</u> during its movement. In short: provide certain technical specifications of your project whenever possible.

Note that the underscored numbers in the above are only examples of technical measures of project. You can certainly define your own specifications for your project.

3. Clearly describe and state the **project setup and initial conditions** under which your system will function.

For example, for an obstacle-avoiding robot project or a tape-track following robot project, you need to clearly explain the setup of the field where the robot will run, the robot's starting position, and the shape and size of the tape-track. During the final demonstration, an enclosed area with a maximum size of 8*8fts may be set up for you robots to demonstrate.

4. Clearly describe and state any **assumption**, and/or **necessary conditions** for your system.

For example, for an obstacle-avoiding robot: the location of the obstacles is unknown or known? for a tape-track following robot: what is the light or color condition of the environment you may need for a successful demonstration?

5. A **Preliminary System Design** is <u>**ABSOLUTELY**</u> required: Include a preliminary design of the three components (mechanical, electrical and software) of your system.

For example: which type of motion mechanism you will use for your mobile robot, tricycle/different drive? how many wheels and how many motors you will use? Are you going to use a dedicated steering wheel for the robot? What are the layout of wheels/motors, or do you have any AutoCAD design of the robot body? which type(s) sensor you will use, how many, and why? Any preliminary circuit schematic for the motor and the sensor you have? Which kind of functions you plan to write in the final Arduino sketch? Clearly describe any design you have so far.

Use block diagram or plot here to help explain your preliminary design.
Note: You can always upgrade your preliminary design later.

6. **Task division among team members**:

   Break down the entire projects into as many sub-tasks as possible, and assign them to each team member. Clearly state each member's assignments.

   Here are some sub-tasks you can refer to: *Search & order the motors, test the motors, mechanical component design, mechanical component assembly, electrical circuit design/soldering/assembly, search & order the other parts (e.g., H-Bridge, blah blah sensors, Bluetooth, blah blah shields, …), test/programming H-Bridge, sensor testing/programming, Bluetooth testing/programming, motor circuit design/assembly/testing, programming the motor, sensor circuit design/assembly/programming/test, system integrated testing/ upgrading,* and so on.

   Include a list in the proposal to explicitly show the sub-task division among members. For example, in a proposal, it writes:

   Person A's subtasks: search and order the motors, test the motors, mechanical component design, mechanical component assembly, electrical circuit design, H-bridge programming …

   Person B's subtasks: Search and order the other parts (including sensors and blah blah shields), motor circuit design/assembly/test, sensor circuit design/assembly/ coding/test, ….

   Note: This job division will help your team split and clarify the tasks and responsibility for each team member. It surely can be changed later on the condition of your team agreement.

7. **Project Timeline:**

   Plan a timeline for your project, starting from the first day of the class, finishing on the last day of the class which will be also the final project demonstration day. Use a software (e.g., ProjectLibre or Microsoft Project) to draw a Gantt chart to indicate the timeline and corresponding subtasks along the timeline. Include the subtask description and Gantt chart in the proposal.

   See course website for more details on Gantt chart.

Due date: See the announcement on the Blackboard.