ECE-218 EMBEDDED MICROCONTROLLER PROJECTS:
MILESTONE 1: PROBLEM DEFINITION

M1: DUE THURSDAY, FEBRUARY 21

Select a problem that addresses some sort of human need. The problem should require the use of a microcontroller and some of the sensors, displays and actuators that you have experience with and/or others that you believe are similar enough to be manageable. The system should be slightly (but not much) more complex than the ones you have completed so far.

Your team should meet in person to develop this problem definition. Here is a suggested process for coming up with a project idea, but no matter how you proceed, you must document at least 3 project ideas.

1. All team members come up with 3 ideas on their own. For each idea, specify the human need that is being met, how the system will meet the need, and the pros and cons of the idea.
2. Meet and discuss all of the ideas, suggesting improvements (but not shooting ideas down) so that each idea is as good as possible.
3. Each team member then ranks all of the ideas individually. Add up the rankings and the idea with the best ranking wins.

DELIVERABLE: PROJECT PROPOSAL

Submit the results of this milestone in the form of a project proposal. Write the proposal as a team using a shared google document. The proposal will have a cover sheet with team name, project title, designer names, and date. The body will have the following sections:

PROJECT DEFINITION

Specify the problem to be solved. Be clear and specific. Do not bias the problem by including a specific solution (see examples at end).

PROBLEM SOLUTION

After considering alternative solutions, state, in general, how your proposed system will solve this problem. (see examples at end) Here you should omit specific details of the solution implementation because you still need to design it, but be clear about why your solution idea will solve the problem. The objective in the problem solution should be very clear so that it leads to target goals and constraints appropriate to the problem. At this stage you are not expected to include the details of **how** the problem will be solved, but you should specify what needs to be input, sensed, displayed, output and/or controlled.

PROJECT GOALS

Make a list of specific project goals. This should answer performance questions such as "how often, how fast, how long, how high, how many," as they apply to your project. You

may also have goals related to the user experience, or other task-specific goals. These goals will be the criteria that you use to measure the success of your project, so they should be as measurable and specific as possible, but it is not necessary to specify "how" they are accomplished, since this will involve some design decisions in future stages.

PROJECT ILLUSTRATION

Include an annotated sketch (can be hand drawn image), block diagram, or other form of illustration of the system that visually explains how the proposed system will solve the problem posed. This sketch should illustrate the problem and the solution, and should show the things being sensed or input, and things being controlled or displayed.

APPENDIX

Include the "work" that went on in your team to develop the project idea. This must include your list of 3 or more ideas from your brainstorming process, and the pros and cons of each idea, and might also include links to background material,

SOME EXAMPLES

Problem Definition Examples:

Partial definitions of a problem:

Clear: *A solar photovoltaic array is most efficient when it is oriented perpendicular to the incident sun rays, but solar arrays that are set at a fixed angle to the earth lose efficiency as the sun travels across the sky.*

Unclear: *Solar arrays need to track the sun.* (does not say why, or what type of solar array)

Biased: *Solar arrays need to respond to light sensors and moved with stepper motors to be perpendicular to the sun at all time for maximum efficiency. (states how the problem will be solved, while there are many other possibilities.*

Problem Solution Examples:

Clear and specific: An automated tracking system will tilt a solar photovoltaic array such that it is pointing perpendicular, within a few degrees, to the sun's rays as long as the sun is above the horizon. It will do this automatically without any user intervention.

Too vague: A tracking system will move the solar cells to point at the sun. (does not say for how long, whether it is automated or not, or how accurately).

Biased: Servo motors mounted on a pan and tilt mechanism for a security camera and some photosensors will be used to move a plywood platform with photovoltaic solar cells on it such that it is pointing perpendicular, within a few degrees, to the sun's rays as long as

the sun is above the horizon.. (jumps to particular design choices before alternatives have been considered)

Problem Goals Examples

- The system will continuously adjust the tilt position based on the sensed motion of the sun, starting when the sun has reached 10 degrees above the horizon at sun rise and sun set.
- The altitude and alimuth angles of the tilting system will be continuously displayed once tracking begins. A “tracking off” message will be displayed when the sun is out of range. The angles will be accurate within about 5 degrees.