

Preliminary Project Proposal

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Due 2 October via Gradescope

Please prepare a brief, preliminary proposal for a project you may be interested in working on. This is an individual assignment. If you already found team members, each member should prepare a separate preliminary proposal. You will later prepare a more detailed team project proposal. Provided that you make a solid effort on your original submission, a higher grade on the team project proposal will cancel a lower grade on this submission.

Two example proposals and a list of project ideas follow. The level of detail and justification are inadequate for the team proposal, but adequate for the preliminary proposal. For both, the goal is to create something that, with a bit of luck, will be of value beyond the course. The first proposal is for a consumer product. The second is for a tool that might enable new research findings.

In both cases, some attention has been given to the course requirements that each project have a technical complexity appropriate for a typical team of perhaps three students. Having two easy-to-interface components won't fly because we require that non-trivial peripherals be integrated with a CPU/FPGA.

You may identify your own topic or follow one of the suggestions I will post separately.

Finally, I realize that you may have an incomplete understanding of which sensors and actuators are necessary to solve your problem. Do your best, and see us in office hours; we can help.

Home Security System

Team: DiY

Bob Newhart (bn@umich.edu), Larry (larry@umich.edu),
Darryl (darryl1@umich.edu), Darryl (darryl2@umich.edu)

1 Customer

Homeowner with concern about home security, unwillingness to pay monthly security fees, and limited ability to retrofit/rewire their home.

2 Values

Deter and detect intruders. Detect freezing pipes.

3 Approach

Light controlled to simulate human presence. Intruder detected using ultrasound-based sensors. Intrusion triggers siren and SMS/MMS message to homeowner.

4 Components

- SmartFusion board.
- RS232 SMS/MMS modem.
- 5 ultrasound-based range sensors.
- Solid-state relay to control power to lamp (not included).
- Siren.

Human Temperature and Activity Logger

Team: BrownFat

Bob Newhart (bn@umich.edu), Larry (larry@umich.edu),
Darryl (darryl1@umich.edu), Darryl (darryl2@umich.edu)

1 Customer

Researcher interested in managing energy expenditure, weight, and athletic performance.

2 Values

Data permitting an understanding of the relationships among human activity, body temperature, and energy expenditure, and the feasibility of measuring these things continuously and unobtrusively.

3 System architecture

Thermocouple is used for one-time calibration of thermistors. Thermistors, which are wired to a wearable SmartFusion, are attached to numerous points on the body and outside the clothing to determine skin and ambient temperatures. An accelerometer tracks body motion. A digital bathroom scale is retrofitted to transmit seven-segment display output to a SmartFusion, which uses an XBEE to transmit weight data to the wearable SmartFusion.

4 Components

- 2 SmartFusion boards.
- 6 compact thermistors.
- Thermocouple for thermistor calibration.
- Accelerometer.
- 2 XBEE modules.
- Digital bathroom scale.