

ECED4402- Real-Time Systems
Mini-project

An Ocean Sensor Platform

This is an open project that requires from you creativity as well as some research. In this project, the objective will be to create an embedded system to control a remote ocean sensor platform. The Remote Sensor Controller should act as an edge node that is responsible to gather information from multiple sensors, interpret the data, and forward it to a user. The global idea of the project is that the ocean-sensor platform is composed of three sensors connected to the host computer. Each sensor generates its own type of data. The generated data must be sent to the host computer, taking into consideration that it is required to minimize the size of the transferred data. The host computer will be able to display the decompressed original data.

To complete the project, you must:

- 1) Think about a useful project related to underwater ocean sensing and provide a proposal with clear outcomes of an application and a platform in this context. An example could be, but certainly not limited to, a platform for an autonomous sailboat, an underwater exploring robot to retrieve sunk ships or an oil and gas exploration device. Notice that you will be graded on the usefulness of your application/platform; (1 mark)
- 2) Describe a minimum of three sensors, and their engineering specifications (for example sample rate, units, dynamic range); (1 mark)
- 3) Define the communication protocol to these sensors; (2 marks)
- 4) Emulate these sensors on the Remote Sensor Platform so that they produce realistic data. This might need some research as you need to be realistic in your data emulation. For example, if your system includes a GPS, you need to understand what data is generated by a GPS sensor and how you can generate them to emulate the sensor; (4 marks)
- 5) Implement the code to acquire the data from the three sensors using the Remote Sensor Controller; (2 marks)
- 6) Using a fourth task in the Remote Sensor Controller, pre-process the data locally to meet your application requirements, and define a compression algorithm to minimize the data transferred between the Remote Sensor Controller and the Host Computer. (3 marks)
- 7) At the host computer, show the de-compressed data transfer. Demonstrate the functionality of the system. (2 marks)

Your system will be evaluated on creativity (it meets unique objectives), usefulness (it is not obvious), and completeness (it works).

You will be asked to submit your code for both embedded processors, and demonstrate the project in the lab. An oral presentation will be required to summarize each of the steps above.

The presentation will be graded on:

- Clear description of the problem statement and objectives; (2 marks)
- Description of the methodology; (2 marks)

- Description of the results and challenges; (2 marks)
- PowerPoint format (2 marks)
- Oral presentation skills (2 marks)

If you have any technical questions, the TA (Shahrooz) should be your first point of communication.

The deadline to submit your project will be midnight on Monday, November 28th. Presentations (10-15 minutes) will take place on the following three days: Tuesday, November 29th to Thursday, November 31st.