Cruise Automation on Marine Boats

Project Proposal Document

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October 8, 2013

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Table of Contents

Table of Figures

1. Problem Definition and Background Information

The project is based on the problem that navigation and assisting technologies in marine boats are insufficient in the state-of-art and therefore provides facilities for monitoring the on-board electronics, map based route planning on a cruising (e.g., sailing) boat to assist the captain and the crew by developing software applications and some hardware components.

The main problems are that there are no available effective route planning solutions, affordable advanced devices and user-friendly interface and graphics on the on-board equipment of the marine boats. The problem exists in coastal areas where small marine boats are used. As stated in the website of University of Alaska Fairbanks, competencies for handling the vessel they intend to use in the suitable environment and conditions for their fieldwork are very important for boat operators. Seamen using cruising boat and crew experience this problem directly accordingly. The number of people who are affected by this problem is uncertain; however it is assumed that all marine boat owners are affected. Companies like Garmin have been working in this industry but they have not solved all of the existing problems yet such as effective route planning and affordable advanced solutions. There are some systems that focuses on marine navigation, however there does not exist any solutions that take all of the static and dynamic environmental parameters into account as far as computer assisted route planning is concerned. As mentioned before, there are expensive and insufficient solutions that are produced by the companies like Garmin.

2. Significance of the Problem and Motivation

Some of the characteristics that would make this project challenging are to reduce its price to an affordable value, to make it user-friendly, to enhance the technology that is being used now and to give the most effective assisting technically. We have examined all of the given public projects on many aspects, however we have decided to settle on solution of a different problem which involves both software and hardware components. Then, we started considering this project with the assistance of our advisor Attila Özgit, we have conducted internet research and finally we have decided on this project since it can easily be commercialized and moreover the technologies which we will be using in this project would enhance our know-how. Age-old technologies are still used to equip boats as a consequence of habits. Because of this, GUIs are so useless. Furthermore, route planning algorithms are inefficient. Existing solutions don't have effective route planning by evaluating both static and dynamic environmental conditions and they are not cheap enough for all users. Seamen and crew would be aware of the current and changing conditions and can make better navigational decisions by using this user-friendly solution.

We, as the developers of the solution, will learn the technologies used in the scope of this project. Moreover, we will have a detailed idea on the related industries. In the future, we may turn this business idea into a commercial product and earn money. We are planning to turn our

project into a commercial product when we finish our project. We will first prepare a very detailed business plan. Then, we may start with finding an investor to produce this product. After that, we will sell our product to related customers.

3. Draft Project Plan

We are planning to manage all processes in parallel. Firstly, we need to simulate on-board equipment of marine boats which will provide us required data by using Open DDS. We will create an embedded device which is programmed with embedded Linux which communicates with a data bus that enables on-board equipment to communicate with each other. The interface will be accessible on a user-friendly mobile device application developed on different platforms such as iOS, Android, Windows. The end-product will consist of an embedded device which is in communication with data bus that collects related data from on-board equipment, an application within the embedded device and mobile devices application. Finally, embedded device which is in communication with data bus will be able to display the current situation to the user via mobile application.

The distribution of the major tasks among our project members as following:

Major Tasks	Group Members
Documentation	Güliz COŞAN, Hacer Ece ERDEN
Embedded System Development	Feyzullah KORKMAZ, Alp KÜÇÜK
System Simulation	Feyzullah KORKMAZ, Alp KÜÇÜK
GUI Design and Implementation	Güliz COŞAN, Hacer Ece ERDEN

3.1 Use Case Diagram and Definitions

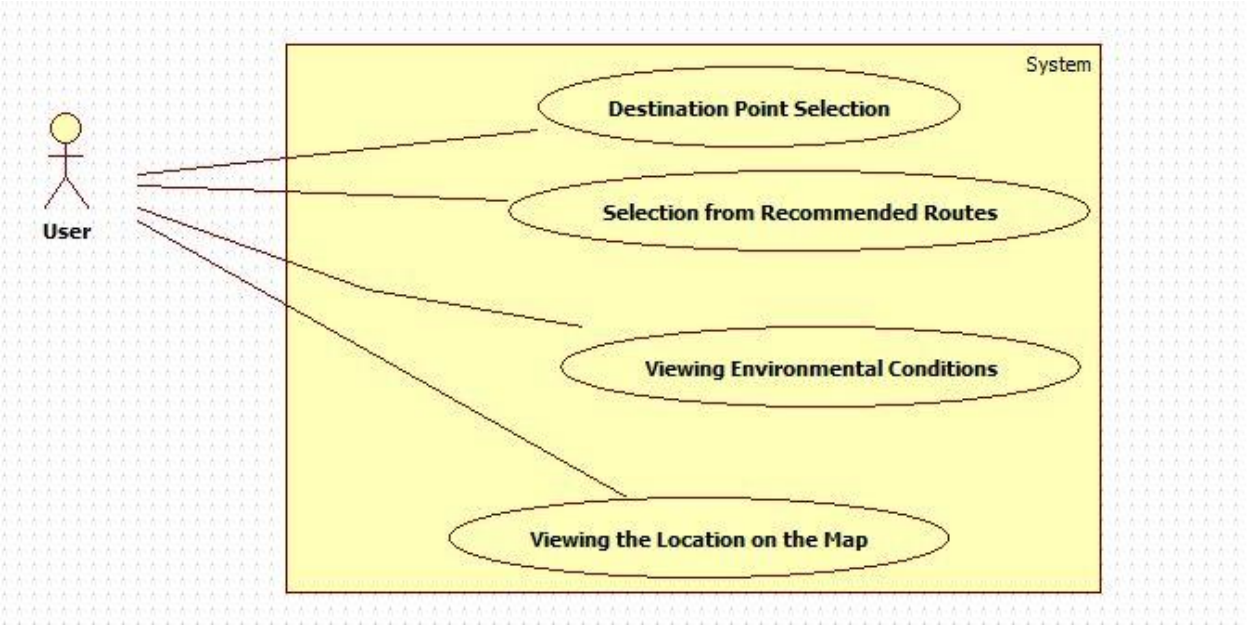

Figure 1: Use Case Diagram

Destination Point Selection: The user can select the point where s/he desires to travel. Destination point is chosen from the map provided. Open Sea Map is used.

Selection from Recommended Routes: The data retrieved from peripheral devices is used to determine possible routes. The user will be able to select one of the possible routes.

Viewing Environmental Conditions: The environmental conditions such as speed of wind, flow, and water depth and wind wave magnitude can be observed. Decisions can be made according to these conditions.

Viewing the Location on the Map: The user can view his/her exact location on the map. The location data will be provided by GPS.

3.2 Component Diagram and Definitions

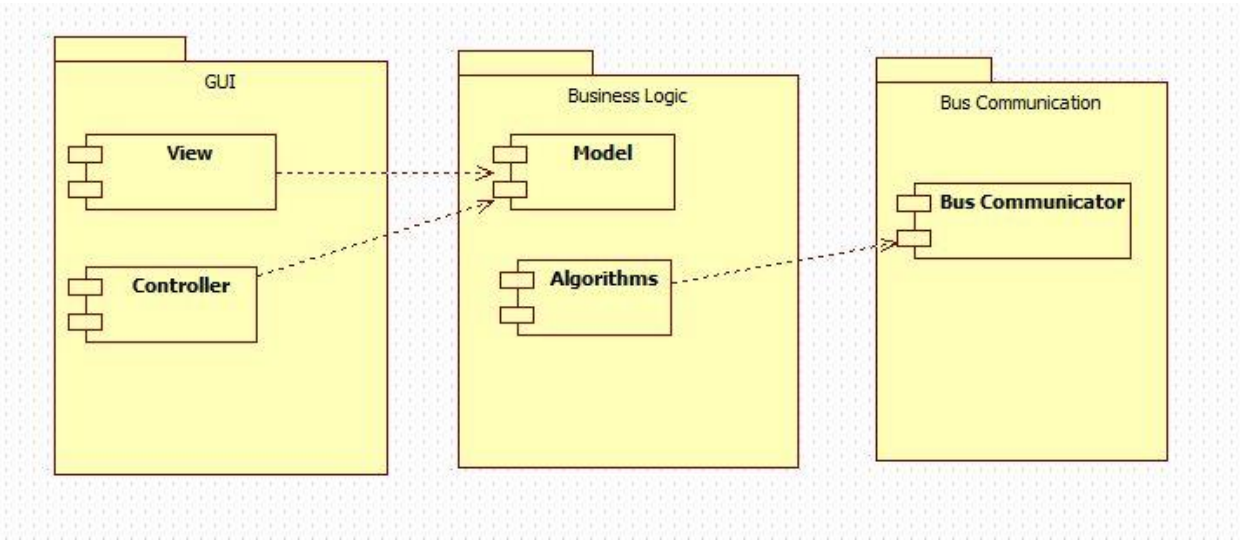

Figure 2: Component Diagram

GUI: Hacer Ece Erden and Güliz Coşan will be responsible for this module. Java, Objective-C and C# will be used on Android, iOS and Windows 8 platforms. MVC design pattern will be used in GUI.

Business Logic: All team members will be included in this section. Embedded system will be used here. The environment will be embedded Linux. Programming language was determined as C in embedded device programming. The algorithms to plan routes will be run here.

Bus Communication: Alp Küçük and Feyzullah Korkmaz will be responsible for this module. Communication with bus will be handled here and the data to be delivered to algorithms will be prepared in this module.

3.3 Deployment Diagram and Definitions

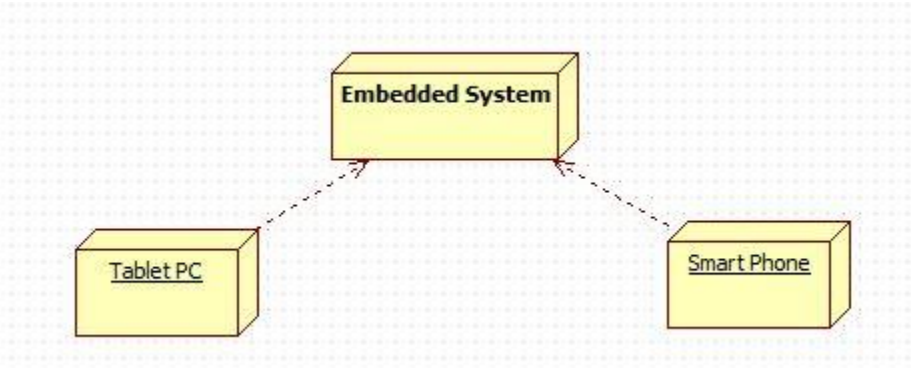

Figure 3: Deployment Diagram

Embedded System: It will include Embedded Linux OS. The algorithm that plan routes will be run here. This device will communicate other devices via the bus.

Tablet PC: Applications used here will be cross-platform. Tablet PC will be connected to the embedded device via USB or Wi-Fi. GUI will run on these devices. Tablet PC may also be placed to the helm.

Smart Phone: Same features of Tablet PC will be also available. Moreover, considering tablet pc, mobile features of smart phones will be more useful. This will make possible to use the system from everywhere in the boat.

4. Support

Invicta R&D Ltd. (Supporting Company)

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5. References

Small Boat Safety Manual. (2012). Retrieved October 7, 2013, from http://www.sfos.uaf.edu/fishdiv/files/boat-safety-manual.pdf