PROJECT PROPOSAL REPORT

2010-2011 CENG491 DESIGN – I

Group Name : Korsan Yazılım

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Project Name : Context Aware User Interface Project (Aselsan 2)

Project Sponsor : Aselsan

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Project Description:

In the present day, mobile devices are commonly used by most of the people in any kind of environment and situation. Despite the fact that uses of these devices are so widespread, unfortunately, screens of mobile devices are not legible when we consider some difficult environmental cases. Therefore; we decide that we will develop a system which identifies the environment and state changes and then adapts the graphical user interface to provide convenience to users accordingly in these extreme situations. This system will use images taken by camera of mobile devices as inputs and will process them in order to determine how user interface will change itself for usability.

Motivation and Purposes:

Most of us are faced overexposing of sunlight problem when it directly hits our mobile devices. We cannot see anything in the screen and try to block the sunlight to use it. Why do not our mobile devices identify the amount of the light and change the screen brightness? There are lots of situations such that constrain users. Who wouldn't want that his/her mobile device provides good readable display even in the worst case of environment? As far as we know, there is no specific worked project about this issue in Turkey. This encourages us to be able to become bringers of this system to Turkey. Moreover, since the project contains processing the images according to some properties such as amount of light, motion of the user, it gives us valuable experience when compared to other projects. We all are interested in image processing because we think that jobs which are more visual and sensuous are more appealing than the other jobs. We want to continue our career lives in jobs which are related to image processing, therefore, we willingly want to learn anything we can about this subject.

We are all more or less familiar with visual-related technologies that will be used in this project. The main idea of the project will be more widespread and will be used in different types of areas in proportional to its success.

Current state of art in Turkey and the world

In Turkey, adaptable user interface is a new technology. Since mobile devices and technology of those are newly developing, this project may become pioneer and encourages innovative side of mobile-based companies.

In the world, there exist many companies work on mobile technologies, but only small percentage of them considers adaptable user interfaces. SUN, which is global supporter of Java Language, provides a library to facilitate developers to implement this type of interfaces. By using this library, after handling of events, redesigning the GUI is much easier when compared to AWT (Abstract Window Toolkit).

Synaptics, which is well-known touchpad and touch-screen producer, works for supplement Dynamic GUI's to its products. Its product called ClearPad provides Dynamic and adaptable GUI to users for Character Recognition.

Marketing

Increasing popularity of mobile devices in past years has drawn attention of service providers to provide highly flexible and adaptable user interfaces. Mobile devices are supposed to work in highly dynamic environment and demands entirely different output because of inherent mobility. Presence of numerous governing factors present during mobile use of environmental-information, by nature which keeps on changing continuously needs to be handled dynamically. These factors include user's profile, preferences, task to be performed, context elements etc. Each set of combination demands entirely different information content and Human-Computer Interaction. Adaptation appeared here as possible solution to address these issues. The objective of this study is to find out the suitability of various adaptive techniques for visualization. Rule based approach is also used here. The subjective nature of governing factors demands Human Computer Interaction to be interactive. In the present era of computing, where most of the services are being developed for static computing, it is needed to pay more attention to make use of environment information common not only among professionals but among mass population also using popular mobile computing devices.

APPROACH AND CHARACTERISTICS OF PROJECT

We are going to propose a solution for user interface adaptation for different contexts, different light conditions and different colored environments to increase viewability of displayed information and interaction of the user interface while user is in a continuously moving state. We will develop a system which works in mobile devices to determine environmental conditions and to adapt user interface for these cases. Camera and accelerometer are sensors which helps us to recognize environmental changes. This is a real-

time system, since the system should determine environmental conditions immediately and change the user interface according to them.

This project is comprised of activity recognition, image processing, computer vision and GUI design. Firstly, Activity recognition part is for recognizing the motion of user. This can be done by using accelerometer or camera. However, using accelerometer may be additional load for mobile device; therefore, just using the camera will be more efficient. Secondly, deciding the environmental circumstances by analyzing the image taken by camera is in image processing part. In this part, different contexts (color density of environment, light etc.) are determined by processing images. Computer vision part is also for deciding the conditions of environment, since computer vision is used to extract information from an image that is necessary to solve some task. Lastly, the user interface should be changed and the readability of displayed information should be increased according to the information gathered in other parts.

This system will be implemented for middle and high level mobile devices and can be implemented for Windows CE, Android and / or etc. There are some limitations due to the mobile devices:

- Limited Screen space available on the devices.
- Large variations across many different mobile devices available in the market and everyday new models being launched.
- Many different platforms on the devices.
- Lack of any standard and consistency across the device platforms.
- Performance issue of mobile devices due to the memory limitations.

The system will take images and deciding how should be the user interface according to information extracted from these images briefly. Although there are many environmental conditions, we are going to handle some major cases such as light and color density. Moreover; a feedback from user should be gotten for redesigning GUI.

Although our sponsor is military-related company, our project is for general mobile device users. After we show that this system can be used favorably, it may spread many different work areas.

LITERATURE SURVEY

Context, context awareness and context aware applications are defined by Dey and Abowd as follows:

“Context is any information that can be used to characterize the situation of an entity. An entity is a person, place or object that is considered relevant to the interaction between a user and an application, including the user and the application themselves. A system is context-aware if it uses context to provide relevant information and/or services to the user, where relevancy depends on the user's task. Context awareness is the facility to establish context. Context aware applications adapt according to location of use, collection of nearby people, hosts and accessible devices, and their changes over time. The application examines the computing environment and reacts to changes.”

Context-aware systems have three main contextual parameters: user, environment and platform. User parameter includes user behavior and preferences. Environment parameter consists of the conditions. For instance, in our case color density of the environment is one of them. Platform parameter includes the device used, device's operating system,etc.

In a context-aware system, state of system and user interface can be changed by external context information. For this reason, context-aware systems are less predictable than static systems. Therefore, we need deeper thinking during the phases of the project.

References

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