Context Awareness in Mobile Devices

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INTRODUCTION

Context awareness is the ability for a device, object or service to be aware of not only the users surroundings but about the user, their views, behaviours and their interests. They adapt their functionality and behaviour to the user and his or her situation. To do so, they need context information about the user's environment, e.g., about different kinds of real world objects. It is about improving the quality of interaction with the user or the object. It is almost like giving the object a brain which uses memory and senses to obtain information on the user and use it to enhance the user's experience.

Context-aware computing is different from the simple sensor-based applications seen on smartphones today. Instead of the user having to go and look for something like hotels, this device would already know what kind of hotel you are looking for by using the information gathered on what hotels they have picked in the past what facilities they used i.e. swimming pool, spa, and suggest hotels nearby based on those preferences. Adaptation is an essential element of a context-aware system as the applications need to adapt to their surroundings and to the users in order to provide them with the best user experience and context aware service. It is a challenging task trying to define what the word "context" means. There are a lot of different definitions of this. Many researchers have come up with their own opinion on what "context" means. Here are a few different definitions. (Ryan et al., 1997) referred to it as the user's location, environment, their identity and time. (Dey, 1998) believes it is also based on the users location, environment and orientation as well as the users emotional state, focus on attention, date and time and people and objects in the users environment. (Hull et al., 1997) describes context as the aspects of the current situation. These kinds of definitions are often too general.

Context relates to both human factors and physical environment factors. Human factors include information on the user- this is their emotional state, their habits, and interests. It also includes the user's Environment e.g. their group dynamics, social interactions and co-location of others. It also takes into account the user's tasks e.g. engaged tasks, general goals and their spontaneous activity. These categories help define the person involved with the object.

The Physical environment factors include location e.g. the user's absolute position, relative position along with co-location and infrastructure e.g. the users surrounding resources for computation, communication and task performance. Physical conditions as in light, pressure the noise, and atmosphere of the area also play a role (Intel, 2012). Typically, these models contain data about real world objects and virtual information objects that are relevant at a certain location. The main purpose of a context model is to provide dynamic context data at runtime on request for different applications. This article examines that concept.

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BACKGROUND

Augmented reality is modifying the view of reality by a computer. It is the use of technology to enhance a user's perception of reality and involves being aware of context and communicating context; this is a key part of human interaction. To create compelling user experience requires a great deal of research into the understanding of consumer behaviour and needs. Convenience is the number one achievement when creating a device. Less complications means it's more appealing. The key to making context work is when the design is people-centred. This will work out what they want, what their preferences are, what target market is out there and who to aim for. This is very important when creating and device as well as creating experiences for the customers. Context-awareness can make computing devices more responsive to individual needs and help to intelligently personalize apps and services. Intel's vision of the future sees the computer becoming adapted to a person enhancing their lifestyle and helping them make important choices. There many examples include using information gathered on your location, and your previous preferences of food they can guide you to a restaurant nearby which can accommodate your preferences. It can improve your health and fitness by taking all the information about your activities, eating habits and giving you guidance and recommendations to suit you. The remote control of your TV could be used in context aware by identifying the person that is holding it and displaying options suited to that viewer. All of these are aims for the future.

One example is Intel who are working on a project based on Context Awareness in the form of Activity Recognition. This involves combining the hard senses, which are Accelerometers (measuring relative motion), Location sensing, ambient light and ambient audio, with soft senses which include device activity, social networking actions and calendar data. Knowing and combining these senses will help the research team reach their goal of transforming a computer into an intelligent assistant which will intelligently guide, instruct, encourage, inform and support the user's activities in a personal way.

There are many ways this form of context awareness could be useful. One way it could be used is to determine a person physical activity to help treat such lifestyle-dependent disease as diabetes or heart disease. Using the object, like a mobile phone to track this information provides realistic information which can help access goals and monitor improvements. Also a context aware mobile phone may know that it is currently in the meeting room, and that the user has sat down, and therefore reject any unimportant calls; this is known as building smart environments where the device is aware of its surroundings. Technologies involved for this awareness are a Wireless communication, Speech Recognition, image processing or recognition, motion detectors or sensors design, parallel processing, a computer network and an operating system, these are only some of the main features involved.

Intel computing has been working on devices which will contain context awareness to create a good user experience. They have laid out a research agenda which is stated below:

- Identify areas where activity recognition data can be fused with other forms of context-aware data to create innovative mobile computing applications.
- Improve the fidelity of activity recognition algorithms and create personalized models.
- Develop context algorithms to be used as representative workloads, guiding the design of future platforms.
- Discover techniques to improve the responsiveness and usefulness of computers in supporting the lifestyles and activities of computer users (Intel, 2013).

Context awareness is poised to fundamentally change the nature of how we interact with and relate to information devices and the services they provide and "context aware" computing is fundamentally different than the simple kinds of sensor-based applications we see today (Intel, 2013).

Activity recognition (see Figure 1) aims to recognize the actions and goals of one or more users from a series of observations on the users' actions and their environmental conditions. This research field has captured the attention of several computer science communities due to its strength in providing personalized support for many different applications and its connection to many different fields of study such as medicine, human-computer interaction, or sociology. Using hard sensing and soft sensing the device is able to carry out the activity fusion algorithm which enables the device