Preliminary requirements and approach for Tools that configure pervasive awareness applications: the ASTRA case

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1 Introduction

Awareness systems are computer mediated communication systems that help individuals or groups build and maintain a peripheral awareness of each other. ASTRA IST FET project (2006-2009) explores the concept of pervasive awareness and designs awareness systems that support it. The process of innovation is driven by end-user communities who act as designers of their own awareness services. Awareness systems can be thus made to fit the idiosyncratic needs of different communities, relevant to their own particular life-styles, culture and communication needs. End User tools are necessary applications that support communities to create, adapt and appropriate Research is outlined here that proposes requirements for such tools aimed specifically at the creation of awareness applications.

End user tools proposed are in fact a set of tools (interfaces, software mechanisms, models) that will support the composition of awareness applications by end users. The tools are to be given to communities of end users, who will via their use create awareness applications to fit their own needs, for informal home care and leisure use; thus the tools can also be improved iteratively.
End User Tools are software mechanisms that will support the creation of awareness applications by end users. These mechanisms can be implemented in a number of modalities (thus different interfaces can be supported). A semantically rich interaction can be additionally supported by an ontology that incorporates notions of Social Intelligence.
The various methods integrated within the end user tools support different levels of usability in order to:
1. help novice users to initially familiarize themselves with the system,
2. enable very advanced users to define more complex patterns of behaviour,
3. provide communities a set of methods able to collaboratively support the update and management of applications.

Applications supporting awareness through mobile and fixed devices need to be developed by communities of individuals who will be using experimentally an appropriately created platform and tools. The experimental usage of proposed tools

by a user community will serve as a means to validate the concepts behind them. By supporting end-user programming of services, this research has the potential to introduce a fundamental change in the way personalized communication services are conceived and created: a community based approach could potentially spawn the development of many new services and concepts.

2 Preliminary Requirements

End User tools for AmI Pervasive Awareness systems need to
- Provide different layers of system transparency designed to support end user interaction of different user groups.
- Enable the composition of basic building blocks, for constructing or reconfiguring awareness applications.
- Specify the details of these applications (fine tuning the applications, using detailed preferences, mappings, or agent based help)
- Support for awareness of a group (simple mechanisms for users to contribute to a collective awareness picture for the group).
- Use various user profiles to create personalized applications
- Allow for the composition of a privacy picture and the setting of borders for what information is collected and where it can be made available.
- Provide the supporting means for community participation, for adopting, supporting and encouraging the creation of awareness applications.
- Visualize virtual sources of information, represented on physical or virtual sensors.
- Provide appropriate interfaces to show information to end users via information visualization. (Possibly provide alternative ways to view awareness information (device maps, proximity maps, hierarchies))
- Provide the means of testing, feedback, and appropriate indications in case of modifications or errors from either end.

End User programming can range from tailoring information presentation, up to the definition of new functionalities and services. Depending on the different levels of the technical competency of end users, and their willingness to appropriate the system, different levels of end user programming will be supported. It is important, from an experience design perspective, for end users to be able to 'program' applications by adopting metaphors / building blocks, to which they can associate a meaning.
End user tools will provide a semantically rich interaction environment enabling for end users to compose awareness applications of their choice. The architecture of the End user tools will need to be independent of the interface modality (thus different interfaces can be supported), although the tested prototype will support a specific interface modality.
As End User tools can be considered the eGadgets Editor that is based on a recombinant system model [3]. It was developed as a prototype in the course of the FET/DC project e-Gadgets, and provides a mental model for users to reason in order to make the connection. The project ACCORD similarly aiming at a recombinant system provides the interface of a jigsaw puzzle [4].

3 ASTRA Awareness Scenario

Let's consider the following scenario. This scenario refers to a recently widowed woman called Amanda. She has few friends but they live far, so she sees them only rarely. This is a typical situation in the modern society. The problem with the elderly is that it is hard to come together. Let's say now that her neighbour Martha is also a widow so she feels that she should do something to socialize with Martha. One of Amanda's favourite activities is to go walking with her friends. The problem is that her friends aren't always available so she has to go alone. The same goes for Martha too. They have met together and discussed how much they like to go to walk so they have arranged to go for walk occasionally. The problem is that they are afraid of imposing upon each other, so they look for a low threshold way to go on walks together without putting too many obligations on each other. Amanda sends SMSs but these give the feeling of explicit invitations, impersonal compared to phones, and give little room for Martha to gracefully decline.

Our aim is to make both women able to express their wish for walk through a seamless information system that is able to express their wishes through tangible everyday devices, transfer them to their counterpart and express desires on the other person through her environment. This is the main purpose of the ASTRA system.

We consider that Amanda and Martha have installed the ASTRA system in their places. Installation of the ASTRA system is consisted of the Local ASTRA server that provides a gateway that gets local data and sends them to remote ASTRA servers or gateways. Furthermore both have installed a set of artefacts – that is computer enabled objects, able to perceive through sensors changes on their states or to provide data to the environment through actuation. Those artefacts can be everyday objects, such as chairs, books or electronic devices like IPAQs, mobile phones etc

Martha wants to set up an ASTRA application to provide to Amanda with the knowledge of her disposition of walking. She has a Mathmos Lamp – a lamp that changes its colour according its facing. She sets up her ASTRA application to have two states: want to go for walk and neutral. Martha changes the facing of the Mathmos Lamp so that it changes colour to green. This facing is now saying "want to go for a walk". Martha also adds a personal message. Amanda receives the want for walk information which is displayed through hewsr personal space. Amanda has created her part of the application were if a message for walk is given and she is sitting at her living room her radio to play a message and if she is lying at her bed her desk lamp to flash. So when Amanda gets a message, if she wants to go for a walk, she uses her local awareness information device (e.g. a photoframe with Amanda's picture that can tap and give information) to send to Martha the acknowledgement message. Another day, Amanda, would prefer to go walking with one her of her other friends. She would then avoid using the acceptance local awareness information device; then Martha would not know whether she has seen her status or not; as far as Martha is concerned Amanda was not there or not interested to go for a walk (plausible deniability).

4   Tools and Services

In the above ASTRA application we have 2 counterparts. The first is Amanda, the one that wants to express her wish for walk. The second counterpart is Martha that wants to express her availability. Furthermore, each one should be able to read the message sent from the other person through her environment. In terms of awareness application we define two base terms: Focus and Nimbus [1],[2]:

- *Focus* represents a sub-space within which a person focuses their attention. The more an object is within your focus the more aware you are of it.
- *Nimbus* on the other hand represents a sub-space across which a person makes their activity available to others. The more an object is within your nimbus; the more aware it is of you.

The way the information is transmitted through the local subsystem and sent to the remote one is shown in Fig.1
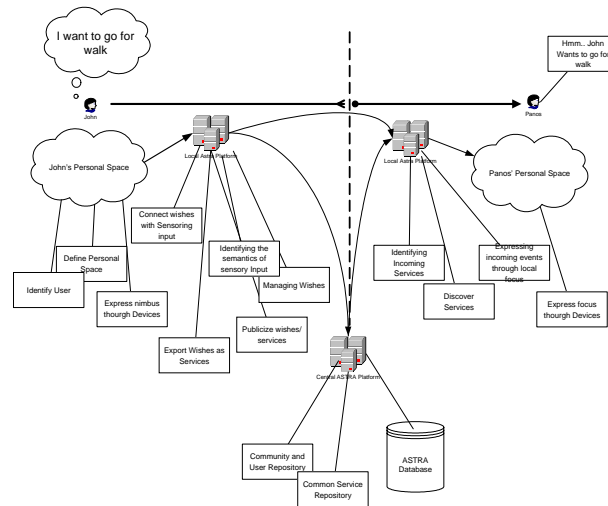

Fig. 1. ASTRA flow of information

For developing the previous scenario, certain tools and services should be developed. Taken as guidance the requirements that have been defined on Fig. 1 we have clustered them on the following categories:

- **Device Management:** Tools that are able to define, analyze, alter and translate the content and context of the devices and artifacts
- **Profile Management:** Tools able to modify the user's and community profile
- **Application Management:** Tools whose purpose is to define ASTRA application as well as to combine and define the artifacts that can be in the user's attention (focus and nimbus, see [2]).

For the **device management** the following tools and services have been developed

- **Associative Editor** (mapping selected connections): This tool is used to connect the local item states to user wishes (e.g. Mathmos Lamp state is *blue* – connect to wish for walk)
- **Connectivity Editor:** This tool is used to design the interconnections between the devices in order to best express people wishes
- **Interconnection Middleware:** This is the middleware that is used for common base communication through the ASTRA environment. It's purpose is the users wishes encode and decode them, and transmit them through available network technologies. This middleware should also be able to provide mechanisms to analyze the artifact's events to ASTRA messages

The Profile manager provides the following tools
- **Editor Personal profile Editor:** This tools helps the user to show his alter his personal profile, information availability states and awareness states
- **Community profile Editor:** This tool is used to manage the way the user is perceived by the community(ies), add privileges, visibility states and the way that each community use that users applications

Application management is of primary importance to the ASTRA awareness system. A specific tool is defined to provide the means to create an ASTRA specific application, connect the awareness states with specific artifacts and publish the application to other ASTRA users or to the user's application pool. Furthermore the tool should provide specific wizards to help define joined application between two or more users and to search through users application pools for similar applications to connect to. The application management consists of 2 more applications:
- **ASTRA Tester:** An application that tries to run application components in order to check whether the specified rules reach the desired states
- **ASTRA Application Status:** An application informs the user which applications are alive and the status of the objects that each application needs.

5   References

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