

Pervasive Assistance: towards an integrated Family of Personal Information Appliances

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German Abstract

Ziel des Projektes Personal Environment Controller (PECo) ist es, dem Benutzer – insbesondere in unbekanntem physischen Umgebungen – zu ermöglichen, intuitiv auf seine Daten sowie in seiner Umgebung integrierte, unsichtbare Geräte zuzugreifen. Ferner diese direkt zu manipulieren und gezielt für die Durchführung seiner Aktivitäten zu nutzen. PECo besteht konzeptionell aus 5 funktionalen Komponenten, die durch eine dynamische Komposition von persönlichen Appliances und die in einer Umgebung befindlichen Geräte verteilt realisiert werden: Der Personal Environment Controller entdeckt und kontrolliert dynamisch die in einer Umgebung vorhandenen Geräte. Er erstellt auch einen Link zwischen erkannten Geräten, ihrem Ort sowie ihren virtuellen, graphischen Repräsentationen. Diese Zuordnung hilft dem Benutzer, sich in fremden und komplexen Umgebungen schneller und besser zu orientieren. Die Personal Media Management Komponente stellt dem Benutzer die für seine Aufgaben »relevanten« Daten auf dem »richtigen« Gerät und zum »richtigen« Zeitpunkt zur Verfügung. Die Komponenten Environment Monitoring und Personal Agenda ermöglichen eine situationsgesteuerte Assistenz. Die Komponente Communication ermöglicht eine Kommunikation sowohl zwischen Personen als auch zwischen Geräten. Dieser Artikel beschreibt die Zielsetzung und für die Realisierung dieser Ziele notwendigen funktionalen Komponenten sowie den aktuellen Status des Projektes.

Mobile information technology should assist the user pro-actively by performing his tasks and achieving his goals. In general, the user needs a set of features or appliances which would collaboratively provide him with ubiquitous assistance. Considering the following scenario, five functional components of such an assistant can be discovered (cf. figure 2):

The user – a scientist – aims to present his paper in a modern conference room, such as the »074 room« of the Fraunhofer IGD (cf. figure 1). The user wishes to be assisted by a mobile system when presenting his slides. In particular, he wishes to be able to control the complex infrastructure of the conference room, i.e. beamers, lights, etc. He wants to present two slides simultaneously on two different

display media. Furthermore, he wants to switch off a specific displaced light (directed to his eyes).

But the user interface of such a presentation infrastructure often becomes very difficult, when specific adjustments and controls are intended, i.e. when you want to switch off that specific light or when you want to display the presentation A at the right, small display, and not elsewhere. The user also wishes to be able to control his presentation while he is moving in the conference room. The user wishes to have an assistant allowing for the control of all those devices available (Personal Environment Controller component, which can be understood as an enhanced, intelligent version of universal remote controllers such as Phillips Pronto1).



Figure 1: A conference room and its integrated complex media presentation infrastructure

The user may also wish to have internal (PowerPoint file, for example) and external information (Web site of his organization, for example) relevant to his presentation at his fingertip, when and where he needs it – during the presentation, during a coffee break or at lunch when discussing with others. He should be able to access those data from any device (i.e. PDA), anywhere and at any time. Such a component should ensure that data relevant to a specific (potential) task are available on the device the user will have at his disposal. For instance, during lunch the user will only take his PDA. He will also have some discussions about his presentations. It is convenient to have the presentation available on the PDA. This kind of storage location and intelligent and device-independent access to personal data requires a Personal Media Management component.

For such a kind of pro-active and situation-aware data provision, the system should have some knowledge about the user's tasks, intentions, goals, and context (i.e. location). This requires the Environment Monitoring and the Personal Agenda components. The user wants to talk to his colleagues at his organization. He needs some means of communications (Communication component). Users usually have several personal mobile devices at their disposal (i.e. PDA, Phone, Notebook, etc.). They associate a certain physical device with one or some of those functional components (cf. figure 2). For instance, the communication component could be assigned to a smart phone. The personal Agenda could be assigned to a PDA. Within the PECo project, we aim to develop an assistant – composed of the user's personal appliances available – which realizes the functional components »Personal Environment Controller« and »Personal Media Store«.

Vision and Objectives of PECo

The objective of the ongoing PECo project is to allow the human to intuitively exploit mobile information technology to achieve his goals by developing a personal assistant that supports the user – specially in

unknown environments – by making data and physical environment (including its embedded devices) accessible and interoperable.

Usage Scenario

Imagine the user has taken several photos during his holiday with his camera-integrated smart phone. Furthermore, he has some mp3 music (among others from Beethoven, Bach, etc.) available on his PDA. Entering his hotel suite, the devices available in this new physical environment are detected and made accessible, thereby allowing for a recreational multimedia presentation: the photos and music files are passed to the interactive TV that is available inside the room. The TV presents the photos and it plays music according to user's preferences and his current (relaxed) situation. If the user walks from one room to the next inside his hotel suite, the presentation is transferred to the display unit inside the new room. If the user is interested in watching TV, the mobile phone or the PDA can be used as personalized control devices. Our user is interested in the latest news. So he switches to the synthetic news channel on his mobile device. The output is displayed on the TV Set.

The next day, the user joins a meeting in a conference room on the user's customer side. He wants to present his slides. He uses the same personal device for the presentation as he did in the hotel room. In this new environment, the presentation is displayed via an available beamer instead of on the TV.

PECo therefore ensures that all the internal and external information needed by the user is at his fingertip, when and where he needs it. PECo provides a unique and personalized interface for the performance of the same tasks (i.e. presentation) in different physical environments, always having the same support and results.

Also, PECo will use the information about the user's context to narrow down search requests to information available, thereby giving the user quick access to relevant data. Furthermore, based on knowledge about



Figure 2: Five Functional Components of a ubiquitous personal assistant

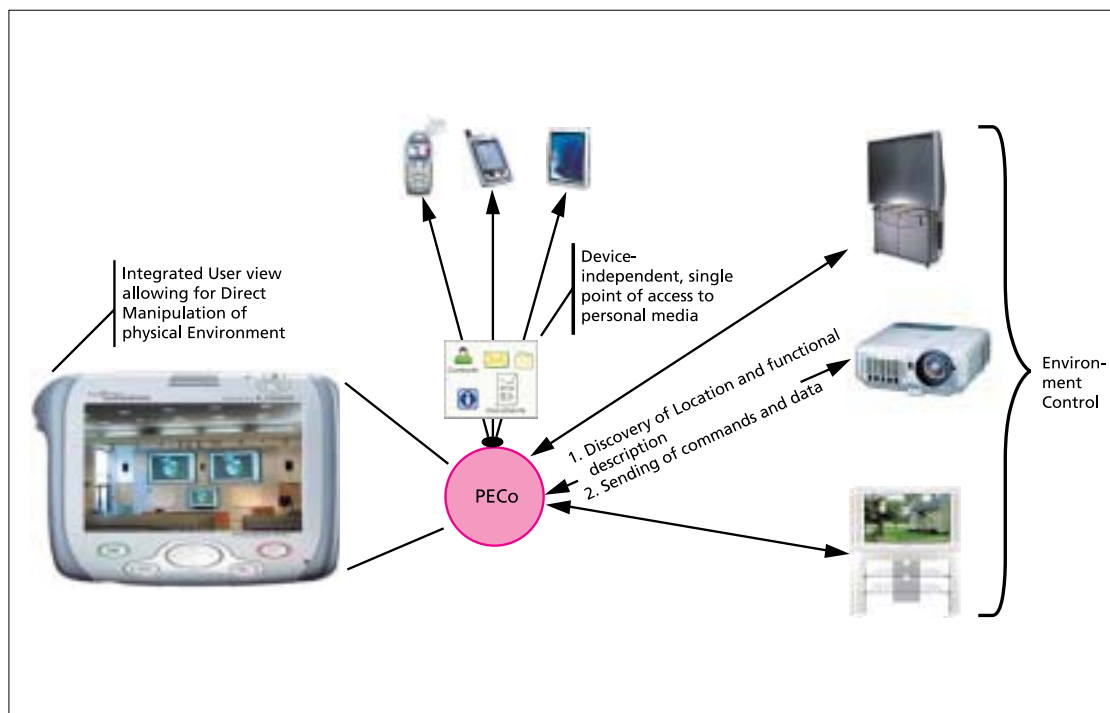
the user's future plans and locations, PECo will also develop a strategy to make the data required accessible, either by replicating it in advance or by fetching it on demand across a wired or wireless network, based on cost, efficiency, and quality of service.

Current Project State

The current version of this ubiquitous personal assistance – PECo – provides the user with a unified facility to organize and access the different media repositories which he has at his disposal and to manipulate his physical environment directly. In this way, both data and processing devices are made accessible to the user via PECo's integrated user interface (cf. Figure 3):

- Single point of access to personal data: the user can access his files and documents, regardless their physical storage location (Notebook, PDA).
- Device Discovery: entering a new environment (i.e. hotel room, meeting room), devices available in that environment are discovered. Then PECo negotiates the capabilities of those devices.

Figure 3:
PECo system
architecture



- Visualization of the Physical Environment: devices available and their location within the environment are visualized to the user. Through the visualization, the user is able to easily locate a specific device (i.e. the left one of 4 available beamers, light, interactive TV, Surround Audio equipment).
- Direct manipulation and interaction: PECo generates GUIs for devices available or embedded within an environment thus allowing the user to manipulate and justify the physical environment directly. For instance, the user can select his presentation (PPT file) and plug it into a specific beamer or display. He can also justify several lights and the acoustics available in the conference room.

The user will only need to activate a macro to perform a task. Such a macro will allow the user to easily perform the same task (presentation) in different environments (i.e. hotel room, meeting room) while letting the PECo and environment decide which device should perform which subtask. The subtask »start presentation« would be done via a TV in a hotel room while the same presentation would be displayed on a beamer in a meeting room.

Points of contact

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Future Directions

Extended versions of PECo will provide the user with a facility to describe tasks to do by means of »adaptive macros«. Such macros describe the procedure how to achieve a goal. A presentation scenario could be described by the following steps: »light off, beamer on, start presentation«.