

# ERCIM “Alain Bensoussan” Fellowship Scientific Report

Fellow: Jani Mäntyjärvi  
Visited Location : ISTI-CNR, Italy  
Duration of Visit: 12 months

## **I - Scientific activity**

(1 page at maximum)

During the research period, considerable research towards enabling multimodal interfaces for mobile devices was carried out. Research carried out can be divided into four intertwined branches:

### 1. Research for enabling hand gesture interaction for mobile devices

Research in this branch was near HW level focusing on sensor, gesture recognition and interpretation. Gesture interpretation algorithms for producing tilt gestures from 2D acceleration sensor were developed. Gesture events were utilised in research branches 2, 3 and 4.

### 2. Research for describing gestures using universal description languages in order to enable wide deployment of gesture interaction on various systems.

Research in this branch was for examining and developing XML-based description language for describing gestures on concrete UI level. The gesture CUI-language developed includes descriptions for tilt-based gestures (supported by 2D-accelerometers) and for several sets of more complex free form gestures (supported by 3D-accelerometers). The gesture CUI language was utilised in research branches 3 and 4.

### 3. Research for enabling multiple interaction modalities for mobile devices

Research in this branch was to examine how various modalities, graphics, voice, gestural and touch (RFID) operate together in mobile devices, and to develop and test multimodal interaction models in real devices. Multimodal prototype of mobile museum guide with modalities mentioned above was developed and tested.

### 4. Research for examining and developing multimodal interaction authoring environments to support development of gesture interfaces.

Research in this branch was to examine and develop the UI design & development tool TERESA to support gesture interaction modality. The extension for gesture interaction was developed and integrated to the core of the tool. The extension enables development of gesture+graphics mobile UI for mobile devices.

## **II- Publication(s) during your fellowship**

*Please insert the title(s), author(s) and abstract(s) of the published paper(s). You may also mention the paper(s) which were prepared during your fellowship period and are under reviewing.*

### Paper 1.

Jani Mantyjarvi , Fabio Paternò, Zigor Salvador, Carmen Santoro, Scan and Tilt – Towards Natural Interaction for Mobile Museum Guides , To Appear in International Conference on Mobile Human Computer Interaction (MobileHci2006), Espoo Sept. 2006.

#### **ABSTRACT**

*This paper presents a new interaction technique –scan and tilt– aiming to enable a more natural interaction with mobile museum guides. Our work combines multiple modalities –gestures, physical selection, location, graphical and voice. In particular, physical selection is obtained by scanning RFID tags associated with the artworks, and tilt gestures are used to control and navigate the user interface and multimedia information. We report on how it has been applied to a mobile museum guide in order to enhance the user experience, providing details on a first user test carried out on our prototype.*

### Paper 2.

Fabio Paternò, Carmen Santoro, Jani Mäntyjärvi, Sandro Sansone, Authoring Pervasive MultiModal Interactive Systems, To Appear in International Journal of Web Engineering and Technology, Special Issue on User Interface Description Languages, Oct. 2006.

*Abstract: In this paper, we present an environment for authoring pervasive multimodal interfaces. It is composed of a set of XML-based languages, transformations among such languages, and an authoring tool. It provides designers with the possibility of designing interfaces for a unique set of multimodal platforms. We describe how the environment has evolved from the initial mono-modality environment and provide example applications for a number of platforms.*

### Paper 3.

Jani Mäntyjärvi , Fabio Paternò , Incorporating Tilt-based Interaction in Multimodal User Interfaces for Mobile Devices, to Appear in international symposium on Task Models and Diagrams for UI Design (TAMODIA 2006), Oct 2006, Belgium.

#### **ABSTRACT**

*Emerging ubiquitous environments raise the need to support multiple interaction modalities in diverse types of devices. Designing multimodal interfaces for ubiquitous environments using development tools creates challenges since target platforms support different resources and interfaces. Model-based approaches have been recognized as useful for managing the increasing complexity consequent to the many available interaction platforms. However, they have usually focused on graphical and/or vocal modalities. This paper presents a solution for enabling the development of tilt-based hand gesture and graphical modalities for mobile devices in a multimodal user interface*

*development tool. The challenges related to developing gesture-based applications for various types of devices involving mobile devices are discussed in detail. The possible solution presented is based on a logical description language for hand-gesture user interfaces. Such language allows us to obtain a user interface implementation on the target mobile platform. The solution is illustrated with an example application that can be accessed from both the desktop and mobile device supporting tilt-based gesture interaction*

### **III -Attended Seminars, Workshops, and Conferences**

*Please identify the name(s), date(s) and place(s) of the events in which you participated during your fellowship period.*

No forums attended. Forums in which the research work is published will occur after the Fellowship period.