

行政院國家科學委員會補助專題研究計畫 成果報告
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可延伸性手機系統介面之研究

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計畫主持人：李嘉晃

共同主持人：

計畫參與人員：

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可延伸性手機系統介面之研究

Extensible MMI system for mobile device

計畫編號：

執行期限：96年8月1日至97年7月31日

主持人：李嘉晃 國立交通大學資訊工程

一、中文摘要

隨著科技的日益進步，在行動裝置產品上，過去的重點在強調功能強大，效能快速等技術層面，現在則有愈來愈多的使用者講求造型新穎、產品個性化。有鑑於此，本篇論文提出一種視覺化的使用者介面快速建模共享平台架構在手機上的應用，讓手機使用者能依照不同的喜好，設計出符合產品風格的個性化介面。

本篇提出的架構是用 XML、C#、ActiveX 和 ASP.Net 來實作。我們用 XML 來定義手機上各種可能的操作介面，進一步利用這樣定義出來的介面描述語言，讓使用者創造出屬於自己的手機畫面。而藉由 C# 強大的功能，希望達到在任何裝有 .net compact framework 的手機平台上，能夠用定義好的介面描述檔在不同的手機平台上執行。再利用 ActiveX、ASP.Net 的網頁技術，我們希望達到讓使用者將設計好的個性化介面置於網頁上讓其他人使用，而使用者也可以直接套用設計好的手機介面描述檔，創造出更具特色的手機介面。

二、英文摘要 (Abstract)

Recently, the design of electronic products has been gradually shifted from unified and multi-functional operations to intuitive and personalized interface. In this study, we proposed a rapid user interface prototyping and sharing system for cellular phones, in which phone owners can design their own layouts easily and visually.

To develop such a system, many techniques, such as XML [1], C# [2], ActiveX and ASP.Net, are integrated. XML is used to define interface objects of a cellular phone and users can then manipulate these objects by simple drag-and-drop using the proposed system. Besides users could create personalized phone interface visually. Once a layout has been decided, XML description file would be generated. This file can be interpreted by different cellular phones embedded with .Net compact framework [3]. Moreover, a web-based system, constructed by

ActiveX and ASP.Net, is provided for users to co-edit existing designs online and these designs could be shared with others.

三、計畫緣由與目的

With the increasingly development of the technology, electronic products have been changed gradually from multi-function and high-effect goals to special looks, novel design, easy to use and personalization style.

In recent years, personalization style is becoming popular, but the user interface of cell phone could not be changed easily to match users' personalization requirement. In practice, the design of cell phone user interface has been fixed when this cell phone is produced by vendors, so users could not change it according to their own requirements.

In the past, when designing a cell phone, user interface, application software and hardware design are usually designed at the same time. Therefore, even user interface is changed slightly, it also needs to reset all system's settings. Moreover, it could not be modified by users and it can only be changed by cell phone vendors. Hence, in order to let user and cell phone designer can design cell phone interface by themselves, Extensible Man Machine Interface system version 3.0 (XMMI v3.0) is proposed to achieve the goal.

XMMI v3.0 includes Mobile Interface Framework (MIF), Mobile Interface Description Language (MIDL), Mobile Interface Edit System (MIES), Mobile Interface Simulator (MIS), and Mobile

Simulator Creator (MSC). This paper focuses on how to design and develop MIES to let user generate MIDL, which is cell phone interface description files, quickly, and discuss Web-Based MIES further to let user put the MIDL files on the web to achieve the goal of resource and originality sharing.

四、想法與討論

XMMI v3.0 includes Mobile Interface Framework (MIF), Mobile Interface Description Language (MIDL), Mobile Interface Edit System (MIES), Mobile Interface Simulator (MIS) and Mobile Simulator Creator (MSC). Fig. 1 shows the system flow chart.

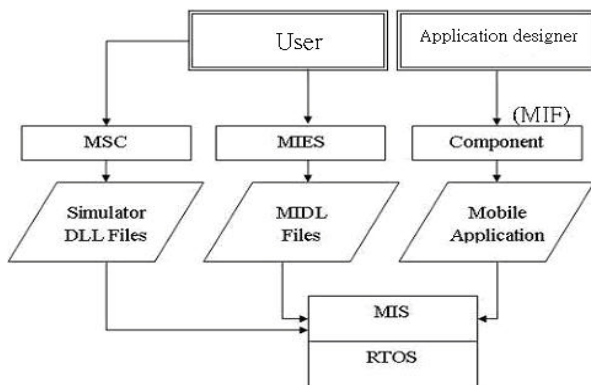


Fig.1 Flow chart of XMMI v3.0

Application designers use the components that are provided by MIF to develop applications and users make use of MIES to generate MIDL files according to different applications requirement. Meanwhile, MIS loads the dynamic link files designed by MSC to generate the looks of cell phone, loads MIDL interface description files, and calls corresponding application to work.

In order to let users and cell phone interface designers can edit MIDL files rapidly, MIES is designed to achieve the goal.

■ Mobile Interface Description Language (MIDL)

Base on our observation, the interfaces of cell phone include idle statuses, menu status and list status as shown in Fig. 2. The resources used

by these statuses can be divided into two categories: dynamic and static. Dynamic resources include the strength of signal, the remaining power, the text resource when the focus of menu interface changed, while static resources include image, button, etc. Different Components are provided to represent different resources, just like the MobileButton component represents button resource, and MobilePicture component represents image resource. These components will be used to compose cell phone status applications that include idle status application, menu status application, etc. Therefore, the goal of the reuse of component and reducing cost could be achieved as well.



(A) idle state (B) 3x4 Menu status (C) list menu

Fig. 2. Interface status of cell phone (SE K700)

All cell phone interfaces based on XMMI v3.0 are applications which composed of components. Therefore, we will introduce the meanings and properties of variant components, and describe it's usage.

Presently, XMMI v3.0 provides five components: MobileScreen, MobileButton, MobilePicture, MobileLabel and MobileInformation. Different component has different properties, but some properties are the same. The same properties include "Name" (the name of the component), "X" (coordinate of X), "Y" (coordinate of Y), "Width",

“Height”, “BackColor” (background color), and “Visible” (whether presented on cell phone).

Users and cell phone interface designers can use the text editor to edit MIDL files easily due to the MIDL files have to follow well-formed and validated properties. In this system, the Mobile Interface Edit System (MIES) is designed to let users and cell phone interface designers to edit MIDL file by using graphical user interface.

■ ITE

According to our survey, the most time consuming part when using XMMI v2.0 [4] is the input of the text of menu and list. However, users and interface designers must input numbers of texts frequently when they want to create a fully cell phone interface description files. XDE is a new concept of XMMI v2.0, therefore, it does not solve this problem. Based on the understanding level of the operating manner of low layer, it needs about one hour to complete MMDL files when using XDE.

Therefore, we design ITE to let users and interface designers create mobile text and save to the text database. When users and interface designers want to design MIDL files, they only need to refer to the data of text database without inputting text by themselves.

Take SonyEricsson K700 as example, it's architecture is shown in Fig.3.

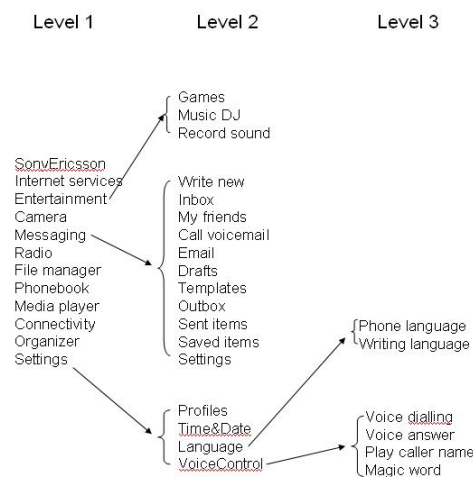


Fig.3. Architecture of text of SonyEricsson K700

Base on our survey, the architecture of cell phone text is tree-form architecture. The first text interface when users use cell phone is Level 1, and when users select specific function based on different purposes, it goes into the corresponding Level 2 and so on. The result of ITE is shown in Fig. 4.

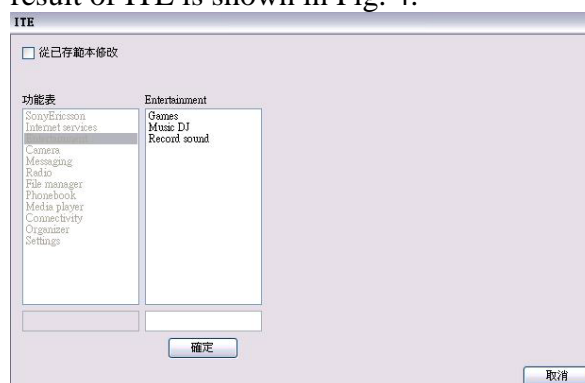


Fig.4.snapshot of ITE

■ Mobile Interface Editor

Besides using part of the operating manner of XMMI v2.0 XDE, MIE makes numbers of improvements to co-operate with XMMI v3.0. It let users and interface designers who understand the operating manner of low layer use and those who do not understand low layer to operate the system easily.

According to our survey, the users' cell phone behavior is the switching between the screens. For example, the switching includes switching from idle screen to menu screen, and then from menu screen to list screen according to different requirements. Therefore, the design of MIE adopts this concept. It lets user edit a screen one time, and then sets the type of this application, and sets the behavior that switching between the

screens.

After using ITE to edit the data of cell phone text, user can use MIE to edit the MIDL file as shown in Fig. 5.

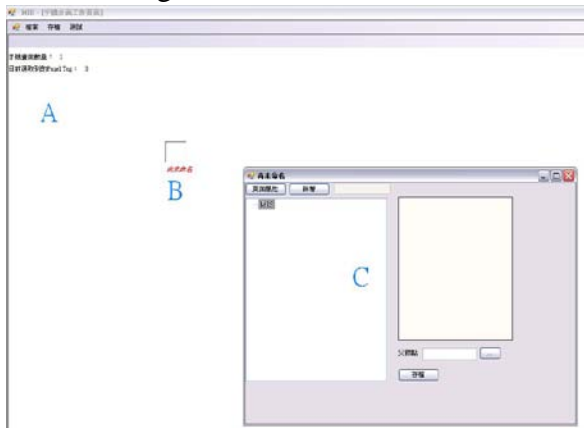


Fig. 5. snapshot of MIE.

Users can add a cell phone status by right clicking the mouse at location A, and MIE will use a rectangle to represent this cell phone status at location B. When double clicking the left mouse on this rectangle, the main edit window C will appear. In the main edit window, user could choose the property of the page to determine which application this cell phone status is. After that, main edit window loads components that the application needs, and showing in tree-form form in the left side of the main edit window, and let the corresponding graphical user interface show in the right side of the main edit window as shown in Fig. 6.



Fig.6. snapshot of MIE.

■ An example of constructing graphical user interface of a mobile device

Take SonyEricsson K700 as example, it's cell phone interface Status which user using the MIE to edit is like Fig. 6.

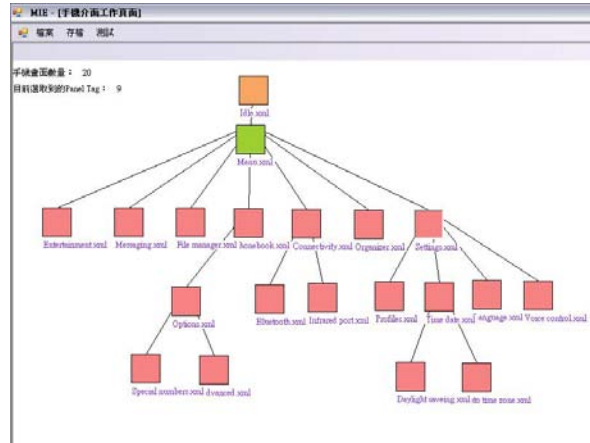


Fig. 6. The cell phone interface status of SE K700

Status is represented by using tree-form architecture, where two statuses that have the connecting line represent that user can switch between them when simulating. Every rectangle represents one cell phone status application, and different colors are used to distinguish different applications. For example, orange represents the idle application, green represents the menu application and red represents the list application.

When finishing the MIDL files, users and interface designers can use the MIS provided by XMMI v3.0 to simulate the cell phone immediately, and modify the MIDL appropriately. Fig. 7 shows the comparisons of SonyEricsson K700 and the simulate results





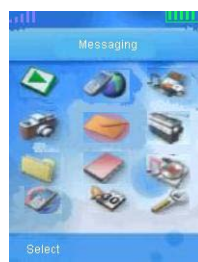
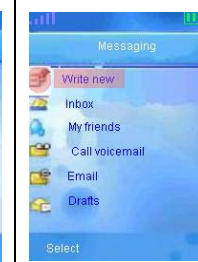
		
(A) Idle status	(B) Menu status	(C) List status
SonyEricsson K700 cell phone interface		
		
(A) Idle status	(B) Menu status	(C) List status
Simulate the MIE MIDL files using simulator		

Fig. 7 SonyEricsson K700 and XMMI v3.0 simulator.

which adopts the simulator to simulate MIDL files. In the comparison of Fig. 7, the result is the same in the idle status, and the result in the menu and list status has a little difference in the processing of focus. SonyEricsson K700 uses the manner of enlarging the icon to represent the focus, while MIS uses a color chunk to represent the focus.

When users and interface designers have the ability of modify cell phone interface, they can create different style interfaces according to different favors. Therefore, through the different design and idea, user can create

different cell phone interface even if it is the same cell phone. Fig.9 shows the different menu styles on different days.


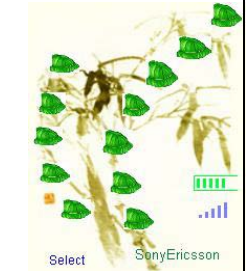

		
(A) New year	(B) The Dragon Boat Festival	(C) Christmas

Fig. 8 The Menu of SonyEricssonK700 of different day

■ Web-Based MIES

The main differences between developing web application and windows application is that the web application is client/server architecture. Due to this architecture, the web applications which server provides no longer access the client resources freely just like the windows applications do because of the risk of safety. Therefore, the MIES has to be re-design to under this architecture, and provides the same functionality which windows-based MIES provides.

Web-based MIES uses the C# programming language to write ActiveX Control component and deploy on the computer which has Internet Information Services (IIS) version 5.1 by co-operating with the technique of ASP .Net as shown in Fig. 9.

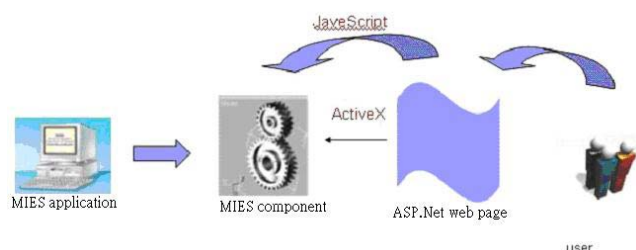


Fig.9 Architecture of Web-Based MIES



Fig. 10 : The operating interface of Web-Based MIES

The right side of the operating interface of web-based MIES is the settings that access the information of MIES and it will communicate with the server. Meanwhile the right side is the web-based MIES which users could manipulate this MIES similar to windows-based MIES. The only difference is the accessing of files, since what windows-based MIES accesses is the local files, and what web-based MIES accesses is the server site files. Users can use the upload function which provided by the system to upload files to the server if they want to use their own data.

五、計畫成果與自評

在本計畫中，我們設計並開發了一套可延申式的行動裝置人機介面系統 – XMMI 3.0，透過 XMMI 3.0 的輔助，介面設計者以及使用者可以自行設計個人化的手機圖形介面。目前系統包含了行動裝置介面描述語言 (MIDL) 以及一個編輯系統，透過編輯系統的圖形化操作可以讓使用者輕鬆的編輯個人化界面，並且產生該介面的 MIDL 描述語言檔案。當使用者將產生的 MIDL 描述檔案上傳到事先安裝 MMIS 系統的手機，即可在手機使用自行製作的介面。

此外，近年來，手機與其他行動裝置已突破以往的限制，使得多媒體與娛樂軟體開始普遍的被移植在行動裝置上。本計畫利用行動

裝置上的攝影鏡頭，搭配所開發出來的運動軌跡感測系統，感測使用者手指的運動軌跡，操作複雜的軟體系統，達到以單一輸入裝置操作複雜系統動作之目的，例如：3D 遊戲環場控制。而該成果已經申請台灣、大陸、日本以及美國專利 [5]。

隨著手機的功能日益完整，以及手機的普及化，手機已經不僅僅只是單純的溝通工具；因此若是手機介面操作可以人性化，可依自己喜好程度來定義選單或畫面，將會更滿足使用者對於手機的需求。本計畫已經實作出一個雛型系統，並且開放給一些人做實際測試使用，希望可以從使用者的使用回饋資料中得到系統修正的意見，以便讓我們可以做系統的修正與加強。在論文發表方面，我們已經發表了一篇論文於 International Conference of Human Computer Interaction [6]。

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