

Mobile Office Platform, PPP-UFC, providing Mobility and Intuitive Presentation

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Abstract

This paper describes the issues and challenges in the design of a mobile office platform, PPP-UFC (Power Point Player), providing mobility and intuitive presentation. The device holder becomes able to take pleasure of the easier and more intuitive presentation. In order to realize the services, the device has been designed to have 1) an input device, called i-Throw for intuitive communication and control of presentation; 2) UFC (Ubiquitous Fashionable Computer) that is developed by KAIST; 3) software includes a macro program, a communication daemon, and an encoding/decoding program, which is computationally efficient and optimized for the mobile platform. Widely adopted office applications have technical difficulties in achieving seamless execution of mobile office applications because they do not have a sufficient computing power and limited user interfaces. To remedy these problems, we propose a new office file format for mobile platform, which is bi-convertible to the conventional office file and deployed i-Throw as a input device. It improves performance several-fold in terms of execution latency and computing overhead.

1 Introduction

The mobile PC market segment has entered a period of rapid innovation driven by an accelerated demand for mobile devices and advances in mobile technologies that enable new mobile usage models. PC manufacturers delivering mobile PCs that meet the demands for greater mobility can look forward to growing opportunities in this expanding market segment.

In this paper, we present its vision for the mobile office platform versions of UFC [1]. Presentation is one of the important factors in our life and it will become much more important. As the presentation is one of the methods for communicating with many people, it is often used in a meeting or a seminar. Therefore, the presentation technique

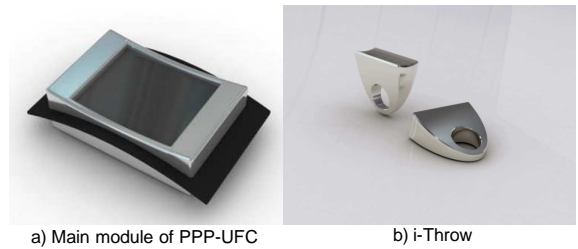


Figure 1. External View of PPP-UFC

was one of the essential and indispensable conditions for the modern people. However, we bring large and heavy devices such as a notebook computer and a tablet PC in order to make the presentation. These large and heavy devices decrease mobility and restrict usability. Also, it is inconvenient to control the data during the presentation. In order to control the presentation data, we approach the notebook computer and push the button or use a wireless control device. During the presentation, it is inconvenient to approach the notebook computer. And, because a wireless control device that improve to control presentation data is large and a difficult way of using, it is also inconvenient to use and bring it. In this paper, we propose a mobile office platform, PPP-UFC and introduce the method that effectively control the presentation data using i-throw [2] that is an intuitive input device.

The outline of this paper is listed as follows: Section 2 introduces the overall architecture of PPP-UFC. The implementation issues are described in Section 3. In Section 4, the performance evaluation of PPP-UFC in terms of execution overhead is presented and the conclusion is given in Section 5.

2 PPP-UFC Internal

The implemented mobile office platform, PPP-UFC is shown in Figure 1. Our platform consists of two parts: main

Table 1. UFC Platform Specifications

Modules	Specifications	
Main Module	CPU	XScale PXA270 624MHz
	Memory	Mobile SDRAM 256MB
Communication Module	WLAN	IEEE 802.11 a/b/g
	ZigBee	IEEE 802.15.4
User Interface Module	i-Throw	Intuitive Input Device using hand motion
	Video In/Out	Camera / VGA with HMD, 2.5" LCD
Software Part	Operating System	Embedded Linux 2.6.19

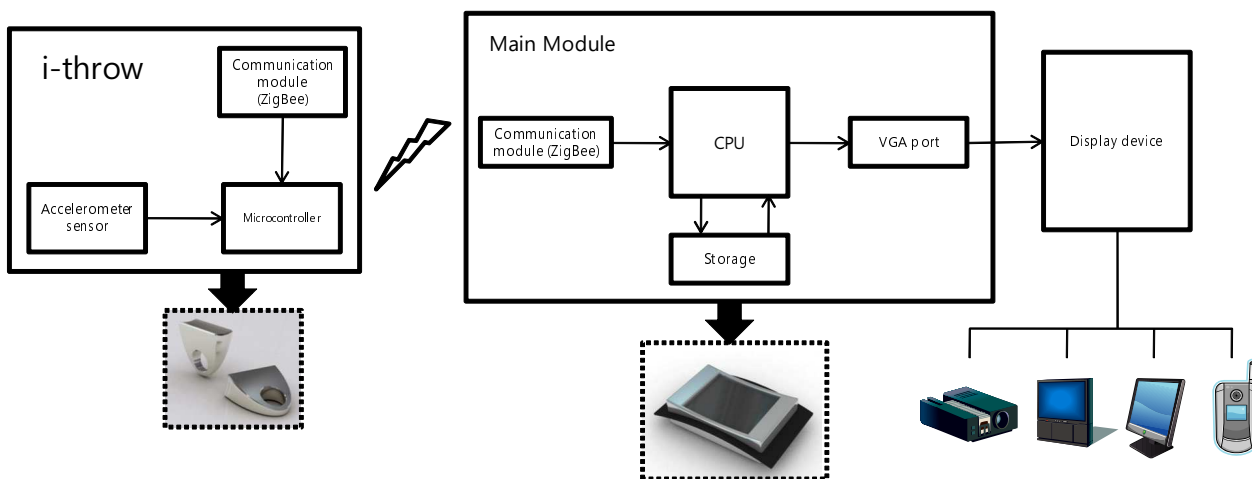


Figure 2. Block diagram of PPP-UFC

module including CPU, memory, and communication interfaces including W-Lan and ZigBee, and user interface module, called i-Throw. The main specification of PPP-UFC platform is described in Table 3. In the main module, the core of the PPP-UFC system is an ARM-based Intel XScale processor: the PXA270. Main features of this processor include clock scaling and dynamic voltage scaling up to 624MHz. With this, power management of mobile computer can prolong the life time of the platform. we present the main features of our wearable computing system as follows,

- **Novel User Interface:** In the PPP-UFC, novel user interfaces are integrated to help the intuitive presentation. This input device can recognize a user's hand gestures and direction in order to allow the user to control the presentation data.
- **Multi-modal communications:** By using dynamic channel allocation mechanism between communication devices that operate in the same ISM band, it supports the coexistence and interoperability of various communication interfaces such as WLAN and ZigBee. The W-Lan is for the communication with other com-

puter or U-Kiosk devices which contain office files to receive and ZigBee is for the communication with i-Throw.

- **System Software:** Operating system running on UFC is GNU/embedded Linux kernel 2.6.19, which with ARM processor shows feasible performance for real time embedded systems.

The block diagram of PPP-UFC is described in Figure 2. First, UFC, main module, consists of four parts that include CPU, storage, communication module, and VGA port. CPU controls whole systems and storage contains the presentation data. The ZigBee module in PPP-UFC makes it possible to communicate with i-Throw and VGA port is deployed for external display devices like as a projector. Before making the presentation, a user can confirm the presentation data through LCD of the main module. Second, i-throw consists of three parts that include microcontroller, communication module, and accelerometer. i-Throw has also ZigBee module for communication with the main module. And if the user take any gestures, the accelerometer detects user's motion and transmits sensing information to the microcontroller. On the reception of it, the microcon-

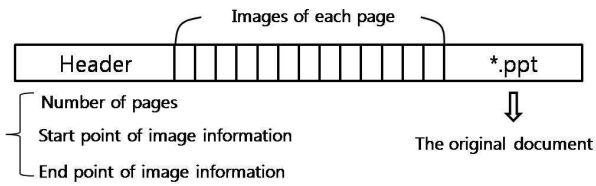


Figure 3. The new file format, *.ppp-ufc



Figure 4. Operation for storing the presentation data from PC to UFC

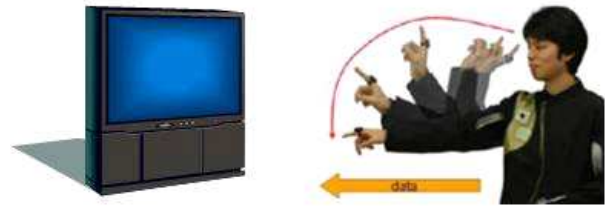


Figure 5. Operation for starting the presentation



Figure 6. Operation for page control of the presentation

troller detects and transmits the user's gesture to main module through ZigBee module. Finally, display device consists of devices such as project, TV, and Monitor that have a large display in order to be seen by many people. If the user connects the main module to a display device using VGA cable, the presentation data appears on the display.

3 Implementation of PPP-UFC

- File Specification:** Instead of executing *.ppt that is operated by office programs in PPP-UFC, we devise a new file format, *.ppp-ufc. This file consists of three parts that include file header, each page's image information, and the original presentation data, *.ppt that is represented in Figure 3. The file header has the number of the presentation data's pages and image information's start point and end point. For displaying presentation data that is based on the image, a new file format includes each page's image information. The original presentation data is needed for correction of contents.
- MACRO Program:** In order to display the presentation data in PPP-UFC, we extract each page's image information from *.ppt. So, we use MACRO express to extract each pages image information. Images resolution is 800x600 and JPEG format. After working the presentation data on Personal Computer, if pressing the button that is appointed in advance, we can get each pages information.
- Operation S/W :** There are four operations for the presentation. Figure 4 represents operation for storing the

presentation data from PC to PPP-UFC. If acting the gesture like Figure 4, the presentation data is transmitted to PC and *.ppp-ufc is stored in UFC. Figure 5 represents operation for starting the presentation. If pointing the display device and acting the gesture like Figure 5, the first page of the presentation data is displayed on the pointed display device. Figure 6 shows to control the presentation data. If acting the gesture like Figure 6, the next page or the previous page of the presentation data is displayed. Because controlling the presentation data through the intuitive gesture, anyone can easily use PPP-UFC.

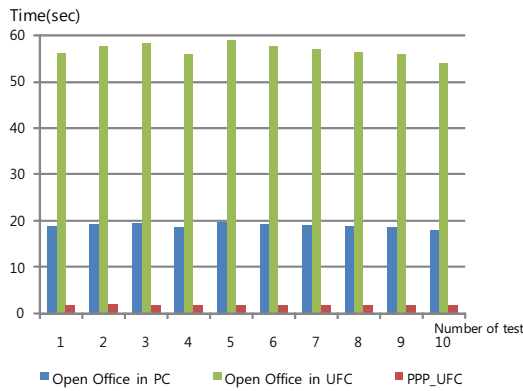
- Encoding S/W:** This software transforms the original presentation data, *.ppt, to *.ppp-ufc. It calculates the number of the presentation data and the size of each pages image and stores these information in *.ppp-ufc files header.
- Decoding S/W:** This software extracts the original presentation data that is *.ppt from *.ppp-ufc. When we need to modify the presentation data, we transmit *.ppp-ufc to PC, execute this software, and *.ppp-ufc is decoded to the original presentation data. Therefore, the presenter can modify the presentation data.

4 Experiment

In order to evaluate the performance of PPP-UFC comparing other device's performance for the presentation, we

Table 2. Starting time

	Open office in PC	Open office in UFC	PPP-UFC
1	18.7	56.1	1.9
2	19.2	57.6	2.0
3	19.4	58.2	1.9
4	18.6	55.8	1.7
5	19.6	58.8	1.8
6	19.2	57.6	1.8
7	19.0	57	1.9
8	18.8	56.4	1.8
9	18.6	55.8	1.7
10	18.0	54	1.7
mean	18.91	56.73	1.82

**Figure 7. Starting time**

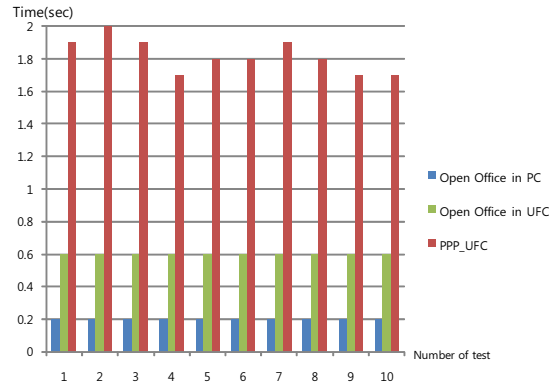
perform two experiments. First, we measure the starting time when we start the presentation. Second, we measure the time to turn a next page.

- **Starting time of the presentation:**

Figure 7 shows the starting time of the presentation. First, we measure the time when we execute the presentation data that is operated by open office in Personal Computer. The mean time of 10 evaluations is 18.91 seconds. And we assume that UFC is 3 times slower than Personal Computer because of computing power, CPU's performance, and memory. So, we expect that the starting time of the presentation in UFC is approximately 3 times slower than the starting time in Personal Computer. Second, we measure the time when we start the presentation is PPP-UFC. Its mean time is 1.82 seconds. Then, we conclude that the starting time of the presentation in PPP-UFC is much faster than that of the presentation which is operated by open office in PPP-UFC.

Table 3. Time of turning the next page

	Open office in PC	Open office in UFC	PPP-UFC
1	0.2	0.6	1.9
2	0.2	0.6	2.0
3	0.2	0.6	1.9
4	0.2	0.6	1.7
5	0.2	0.6	1.8
6	0.2	0.6	1.8
7	0.2	0.6	1.9
8	0.2	0.6	1.8
9	0.2	0.6	1.7
10	0.2	0.6	1.7
mean	0.2	0.6	1.82

**Figure 8. Time of turning the next page**

- **The time of turning a next page:**

Figure 8 shows the time of turning the next page. First, we measure the time of turning the next page in Personal Computer. But it is so fast that we can't exactly measure the time. So, we suppose that it is 0.2 seconds. Then, maybe the time of turning the next page is 0.6 seconds in UFC. Although the time of turning the next page in UFC is faster than that in PPP-UFC, the time of turning next page in PPP-UFC is properly to make the presentation.

Through above two experiments, we know that it is hard to execute Open Office in UFC because the computing power of UFC is constrained. In comparison, PPP-UFC's performance is good to make the presentation. Also, the open office doesn't represent all of contents such as pictures and fonts.

5 Conclusion

This paper introduces the device, PPP-UFC, for the presentation that allows people to make the presentation anytime anywhere. Although we bring a large and heavy device such as a notebook computer and tablet PC when making the presentation in old times, we only bring PPP-UFC nowadays because PPP-UFC is small and light. Because we make PPP-UFC for only the presentation, It is faster than other presentation devices. And anyone can use PPP-UFC because we control the presentation data through intuitive gestures.

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