Touch the Exchange: Bridging the Physical and the Digital Environments

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ABSTRACT
Bridging the physical and the digital environments is critical to the well functioning of many projects. This paper presents a description of the hardware and software technologies used within the Touch the Exchange project, as well as the reason why these specific implementation decisions have been made.

Author Keywords
Interaction design; user experience; multi-touch; wrapper; kiosk.

ACM Classification Keywords
H.5.m. INFORMATION INTERFACES AND PRESENATION (e.g., HCI): Miscellaneous.

General Terms
Design

INTRODUCTION

The high number of gadgets available on the market is a direct response to the human need for tactile perception [6].

Touch the Exchange is a digital environment running on a touch-screen kiosk that provides support for persons interested in international exchange possibilities. The aim of the project is to encourage local students and university staff members to take advantage of the opportunities available to them. The kiosk draws attention through its attractive and unconventional design and its strategic position in the main library of Tallinn University, which guarantees access to a wide variety of users.

RELATED WORK

Depending on the size and functionality, kiosks have become an outstanding way for improving customer service and gaining user loyalty [5]. In the educational domain the majority of the available kiosks contain general knowledge about the university in question or information about campus or local buildings. Multi-touch is often not supported, most probably due to the high prices involved [6,8]. Universities from all over the world (e.g. Berkeley University of California [1] or University of Denver [8]) are realizing the major cost and timesaving benefits of using kiosks.

The most complex solution for public touch-screen development is offered by NCSU Libraries [3]. Their first public touch-screen information kiosk was designed to provide on-demand access to useful and commonly consulted real-time displays of library information. Their hardware configuration includes an Elo TouchSystems 4220L 42" single-touch display with an additional touch-responsive overlay that acts as a single-touch input device and a Mac Mini driving the screen.

RATIONALE

We proposed to design and build our own version of an interactive kiosk using up-to-date technologies that best fit the current needs of Tallinn University.

Our aim was to design and implement an interface that should be completely dedicated and self-contained, thus minimizing user awareness of operating system components or software and hardware infrastructure.

HARDWARE AND SOFTWARE CONFIGURATION

Touch interactions provide the user with a natural, real-world experience while using the screen. For the successful completion of this project we chose to use an infrared-based 6 touch-point Samsung overlay with a standard PC in accordance with the requirements of the Windows 8 operating system [9] and a motion sensor. The connection between the physical and the digital environments is in the form of a wrapper and the implementation has been done using the C# programming language.

Windows 8

This operating system has been chosen specifically because of its high degree of responsiveness and precision when dealing with touch gestures. Windows 8 features a user interface that emphasizes touch-input. The basic set of gestures Windows 8 for UI manipulation and interactions are tap, press and hold, slide, swipe, turn, pinch and stretch [9]. The multi-touch feature enables the user to produce different input interactions such as tapping, dragging, or pinching by using multiple fingers. The Windows Runtime through its different mechanisms for handling touch input enables developers to create applications that users can explore with confidence.

Windows Presentation Foundation

Although at first sight the natural choice considering the operating system used would be developing a Windows Store Application, for our project we decided on the WPF Application for various reasons.

First of all, we were not interested in obtaining the Windows Store look. The usage of custom controls and charms were not compatible with the functionality of our kiosk. The user is not supposed to have access to any menu or key combination that might allow him to close or alter the application running on the kiosk. Disabling these menus through coding has proved to be a problem with Windows Store apps. In addition, there is no coherent and simple way for deploying these applications rather than through the Windows Store. In contrast, WPF offers click-once deployment, making the usage and installation of the application very easy.

The Windows 8 UI applications and the Visual Studio developer environment make great efforts to provide touch APIs that enable smooth and reliable experiences for the end user. This is why we have made use of the Extensible Application Markup Language (XAML) and C# perspectives available within WPF.

We are aware that Windows 8 application development is still in its early stages so we are also considering upgrading our current WPF App if needed in the future. Upgrading it would not be a problem since the underlying XAML and architectural approach of these two types of applications are very similar.

Touch Screen

Tallinn University provided us with an infrared 32" LED LCD Integrated TC Display [7] with the specific purpose of creating the interactive kiosk. Using an additional touch overlay enabled up to 6 simultaneous touch points.

Motion Sensor & Other Components

We installed a motion-sensor in the base of the kiosk to detect when a user is approaching and activate the kiosk accordingly. The motion-sensitive sensor utilizes Atmel QTouch technology and ensures proximity detection by sending out serial port commands. The data received from the COM port represents the current state of the motion sensor and it is automatically updated at specific time intervals.

The PC used is in accordance with the requirements needed for good functioning with the Windows 8 operating system.

CONNECTING HARDWARE AND SOFTWARE

The hardware and software have been linked using a wrapper. The wrapper's main responsibility is to ensure the well functioning of the features triggered, especially by the hardware components of the kiosk.

Any impulse sent by the sensors needs to be analyzed by the wrapper and, in accordance with the type of the signal, the correct task is performed. For example, if the motion sensor detects a person stepping onto the platform of the kiosk, the screensaver disappears, enabling direct access to the application. The inverse process is performed if the sensor detects the user has left the platform. The kiosk is built to be fault tolerant, so in case of a malfunctioning from the sensor, the tasks can be triggered when the user interacts directly with the touch screen.

CONCLUSION

In this paper we presented our interactive kiosk, along with the technologies used and the rationale behind our choices. The up-to-date techniques employed not only provide an efficient way to distribute information, but also ensure an improved user experience.

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