Smart Furniture Using IR (Infrared) Frames and Fingerprint Scanner

Priyanka Matere
Dept. of Comp
Joshua McKenzie
Dept. of Comp
Department of computer science, Suman Ramesh Tulsiani Technical Campus - Faculty of Engineering College in Pune, Maharashtra

Abstract: Over last years, the technology has shown a rapid rise. Multi-touch is one of the technologies that are rising with a rapid speed. Multi-touch is being implemented in many devices like mobile phones, desktop monitors. While "displays" have connotation of affording visual output, "surfaces" invites the users to interact with each others. Project planning is one of the important application where multi-touch technology is used. In the early days tabletop was proposed by using a camera which was placed at the bottom of the table, which was used to detect where the touch point was made by the finger. Then the touch was captured and further processed. However this system was more like a projection done from the bottom. Also the security of the system was not as reliable as the password was not a unique pattern. Moreover the entire system was also uncondensed, thus the system occupied a space. In the proposed system a led T.V screen will be converted into a touch screen panel. And developing a whole computer system but without a physical keyboard and a mouse. Unlike the old system the security of this system is reliable as a fingerprint scanner is implemented for having a unique password. Thus the ultimate goal behind developing this system is developing smart furniture with a space management as one of the important factor to be considered.

Introduction: Over the past decades, tabletop systems are becoming more popular. In real world, a physical tabletop provides public and private needs for people around the table. Multi-touch technology has shown a rapid rise in popularity over the last few years, being implemented in many devices from mobiles phones to desktop monitors.

It has provided user with an extremely intuitive means of interaction with electronic devices through gestures based on self-sensing control. The virtual panel is an intangible, privacy-protected virtual screen created by special optical mechanism which offers several promising characteristics, making it perfect to be integrated into a tabletop system.

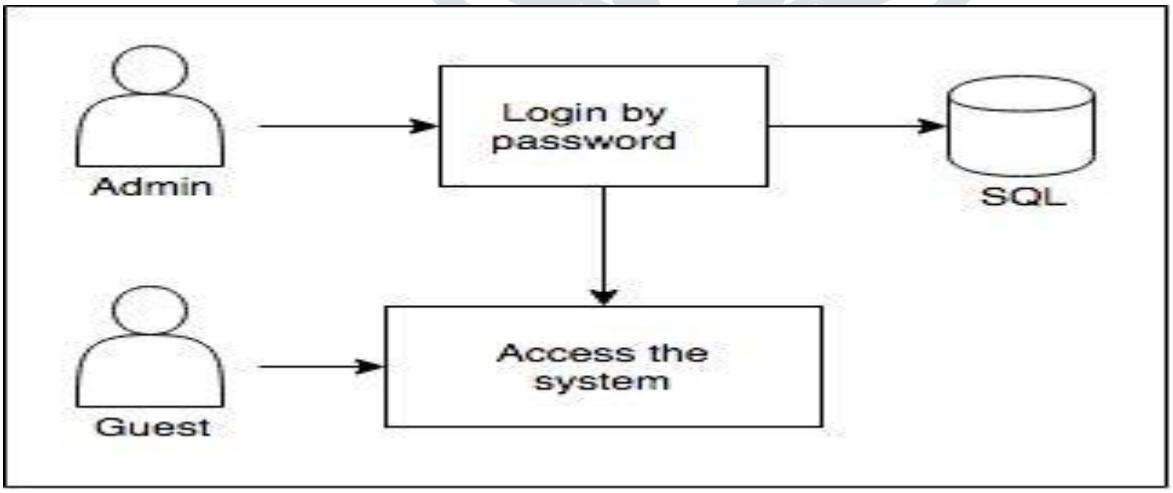

Fig. Over view of the proposed system

Literature Survey:

Touch Screen-An electronic visual display screen that responds to the touch of human finger interaction or any other objects within the display area.

Touch screen provides you with the freedom to touch the display screen and the screen itself will react to your touch and based on the area of the touch particular action will be performed , which earlier was done using some indirect system such as ATM machine , shopping malls , business ventures or your interactive presentations , each one is using this magical technology .

In general, a touch screen system needs 3 major subsystems.

- SENSOR-Which senses the touch event by recognizing the voltage changes
- CONTROLLER-Which converts the voltages change into signals understandable by operating system.
- SOFTWARE PROGRAM-Which performs the necessary action according to the touch event.

  The touch panel is always placed on top of the display panel.

- **HISTORY OF TOUCH IN LAST 5 DECADES –**
- 1965-1967: The first ever touch screen, though a capacitive one was invented by E.A.Johnson at the Royal Radar Establishment, UK.
- 1968: An article for air traffic control a full description of touch screen technology was published by E.A.Johnson.
- 1971: In the early years of touch by resistive touch screens an American inventor Doctor Samuel Hurst was patented by the University Of Kentucky Research Of Foundation.
- 1974: First true transparent touch screen was developed by Sam Hurst.

1. **Multi-User Interface and Interactions on Direct-Touch Horizontal Surfaces: Collaborative Tabletop Research at MERL(Chia Shen)**
   While “displays” have the connotation of affording visual output, “surfaces” invite the users to interact. What happens then when the surfaces are also displays, when a direct input interface space and output visual space are superimposed onto the same touch interactive surfaces? In the past three years at MERL, we have systematically examined, studied and evaluated, holistically, user interface and interaction techniques on one particular type of direct-touch computational surfaces – multi-touch multi-user tabletops. We have created and prototyped a set of novel interface systems ranging from a photo storysharing table called PDH (Personal Digital Historian) to the Diamond Spin tabletop tool kit, and UbiTable, to interaction concepts including CoRDs, Modal Spaces, Glimpse multi-level input model, Expressive Touch bimanual gestures and bifocal tabletop display interactions. We have also obtained preliminary findings on non-speech audio feedback on multi-user interactive tabletops, and some of the effects of the size of tables and size of groups on different aspects of multi-user collaboration. Our future research will investigate interaction and visualization across table centric interactive spaces with multiple surfaces of tabletops and walls in a new project called Diamond Space.

2. **On Top of Tabletop: a Virtual Touch Panel Display(Li-Wei Chan, Ting-Ting Hu, Jin-Yao Lin, Yi-Ping Hung, Jane Hsu)**
In the real world, a physical tabletop provides public and private needs for people around the table. For competing scenarios such as playing a poker game or running a price negotiation around a tabletop system, privacy protection is obviously an indispensable requirement. In this work we developed a privacy-enhanced tabletop system composed of two kinds of displays, the tabletop surface and the virtual panel. All users share the large tabletop surface as a public display while every user is provided with a virtual panel emerging above the tabletop as a personal display for viewing private information. The virtual panel is an intangible, privacy-protected virtual screen created by a special optical mechanism which offers several promising characteristics, making it perfect to be integrated into a tabletop system. The contributions of the paper include: Firstly, we introduce a novel display technique, the virtual panel, into a tabletop system to build a privacy-enhanced tabletop system. Secondly, an analysis on display optics of the virtual panel is presented to explore other potentials of the display and to claim the feasibility of the proposed combination. Thirdly a computer vision-based interaction technique is proposed to provide direct-touch interaction for the virtual panel. Finally, we discuss a wide range of considerations on designing the user interface and interaction for the virtual panel.

3. **Design and Development of a Distributed Tabletop System using EBITA Framework(Minyoung Kim*, Yongjoo Cho**, Kyoung Shin Park***)**
Over the past decade, tabletop systems are becoming more popular. However, prior works on tabletop system have mostly focused on supporting user interactions with digital contents on one single tabletop display, which are not easily extendable. In this paper we present a new scalable distributed tabletop system consisted of master/slave computer and tangible interfaces to provide high-resolution interactive tabletop display surfaces. Our work is to develop a tabletop system constructed with LCD panels and a cluster of low-cost commodity PCs to support a large high-resolution scalable tiled display. It also employs the tangible user interface using the infrared camera tracking and tangible blocks to support intuitive user interaction on the tabletop surface. In this research, EBITA (*Environment for Building Interactive Tangible Applications*) framework is developed to support various modules necessary for easy construction of any interactive high-resolution applications that run on the distributed tabletop system.
Tabletop system plays an important role in a ubiquitous computing era since it resembles the desks and tables in our working environments. Many researches and prototypes of such tabletop systems have been developed. However, these systems often provide limited resolution displays and not scalable enough. In this paper, we have presented a new distributed tabletop system prototype with four 20-inch LCD monitors and three computers. This system used a new software framework called EBITA that aimed at easy construction of the cluster-based tiled display applications. EBITA sets up the viewport information, virtual camera settings, and renders graphics correctly for each screen and slave node. EBITA also supports state-sharing among slave nodes, which allows rendering nodes to have exactly the same application state and synchronized displays. Also, the system used a fast infrared camera based tracking system to support intuitive interactions on the tabletop surface. A couple of applications, such as a high-resolution image viewer and Breakout-like game are developed to show the capabilities of the framework

4. **Living with a Tabletop: Analysis and Observations of Long Term Office Use of a Multi-Touch Table(Daniel Wigdor1,2, Gerald Penn2, Kathy Ryall1, Alan Esenther1 Chia Shen)**
Multi-touch tabletops have been the focus of significant recent study but, to date, few devices have moved from prototype to installed use. In this paper, we present observation and analysis of a subject

who has used a direct-touch tabletop as his primary computing environment for the past 13 months, driving all manner of applications in a standard MS Windows environment. We present the results of three research instruments: a structured interview with the user, an analysis of touch and click locations when operating in desktop and tabletop modes over several days, and linguistic analysis of email composition over several months. From the product of these instruments we then report on several open avenues for research, including physical parameters, hardware limitations, touch vs. click in the WIMP, and text entry techniques

5. **Framework and Architecture of an Interactive Multi-User Meeting Tabletop Based On Intuitive Gesture Recognition(Abdullah Mohd Zin, Haleema Sadia)**

Multi-touch technology has shown a rapid rise in popularity over the last few years, being implemented in many devices from interactive walls to interactive tables and from mobile phones to desktop monitors. It has provided users with an extremely intuitive means of interaction with electronic devices through gestures based on self-sensing control. One of the area where multi-touch technology can be applied is project planning. Up to now, a limited number of researches have been carried out in this area, although the application of multi-touch technology can provide a more effective project planning. This paper highlights functional and non-functional requirements, conceptual framework and architectural analysis of the multitouch based project planning application. Due to unavailability of hardware, the proposed application was tested using a simulator. The evaluation was done based in nine evaluation criteria. Feedback taken from a group of 50 respondents' shows that the proposed application satisfies all the stated evaluation criteria

Conclusion:

The system proposed has a more responsive touch panel. The processing of the touch panel is far more faster than that of the camera structure that was proposed before. The system is also made more secure by the use of fingerprint scanner.

References:

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[3] Li-Wei-Chan, Ting-Ting Hu, Jin-Yao Lin, Yi-Ping Hung, Jane Hsu "On Top of Tabletop: a Virtual Touch Panel Display" 2008 IEEE

[4]Daniel Wigdor, Gerald Penn, Kathy Ryall, Alan Esenther Chia Shen "Living with a Tabletop: Analysis and Observations of Long Term Office Use of a Multi-Touch Table" 2007 IEEE

[5]Chia Shen"Multi-User Interface and Interaction on Direct-Touch Horizontal Surfaces: Collaborative Tabletop Research at MERL" 2006 IEEE