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# User inferface for public information system

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**Abstract**— Public information system has been used in public places as such in rail station for purchasing ticket, kiosk- a small, temporary, standalone booth used for marketing purposes, etc. without the help of human being. Traditionally this type of system uses touch screen by which people interface with the public information system. In such cases, traditionally touch screen are built with the entire system. Thus, the whole system will be spoiled if somehow the touch screen does not work properly. To overcome this situation, in this paper we have designed a portable or movable touch screen device that can be used to control public information system. The positive side for using this type of touch screen is that it is portable and movable in spite of the entire system.

**Index Terms**— GUI, LDR, Light source, Parallel port, Touch screen

## 1 Introduction

The ability to directly touch and manipulate data on the screen without using any intermediary devices has a very strong appeal to users. In particular, novices benefit most from the directness of touch screen displays. A fast learning curve and inherent robustness makes touch screens an ideal interface for interacting with public installations, such as information kiosks, automated teller machines, ticketing machines, or gambling devices. While touch screen use is widespread in special purpose applications, the slow adoption of touch screens into more general computing devices has be attributed to known issues of relatively high error rates, arm fatigue, and lack of precision [1]. Due to technical restrictions, most commercially available touch screen devices in use today are only capable of tracking a single point on the surface of the device. However, with the recent emergence of many multi-touch prototype devices [2], [3], [9] research on multi-finger and multi-hand touch interactions has increased [4], [5], [8]. Today's WIMP (windows, icons, menus and pointing) user interfaces require frequent selection of very small targets. For example, window resize handles are often just 4 pixels wide. Noisy input, lower tracking resolution, and large potential touch area of a finger now become a problem. Touch screens require less physical space and thus the workstation environment in an office setting could be improved, allocating more space to the employee and less to the computer. Considering the above issues, to the best of our knowledge, researchers does not focus so much on making portable and movable touch screen for public information system. Thus, in this paper, we give a concept to build portable touch screen, which can be used with public information system.


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## 2 Related work

Touch screens are effective interaction devices. Sears et al. [6] found that the touch screen can be comparable to a mouse in selecting targets as small as four pixels per side and were significantly faster for larger targets. There is a large body of research that demonstrates the value of touch screens. Most of this work, however, investigated large desktop-size devices. It gave less attention to small touch screens often used in handheld mobile devices, as well as implications of user mobility on touch screen interaction. We believe touch screen haptic can be an important enhancement for mobile applications with many indirect indications supporting this suggestion. Indeed, despite evidence that touch screen keyboards are faster and more accurate for text entry, handwriting techniques still prevail on mobile devices.

Albinsson and Zhai et al. [1] explored several onscreen widgets for increasing precision while selecting small targets on a touch screen. Their interactions were designed to be used with touch screens capable of reporting only a single contact point and therefore the users were required to execute multiple discrete steps before selecting the target. These steps were delimited by the user lifting their finger from the screen, thus impeding the overall interaction performance. Matthew Gleeson, Nigel Stanger, and Elaine Ferguson [7] investigate how effective a touch screen overlay is in selecting typical graphical user interface (GUI) items used in information systems. A series tests were completed involving multi-directional point and select tasks. A mouse, being the standard selection device, was also tested so the results of the touch screen could be compared. As stated above, most related earlier works focus on the compared of the pointing devices such as touch screen, mouse and keyboard etc, and their precision of selecting locations. In this paper we have designed a portable touch screen device that can operate in public information system.

## 3 Technology of the Touch Screen

There are several types of touch screen technologies offered by various worldwide manufacturers. Each technology has its own set of characteristics and depending on our touch application, these differences may be viewed as benefits or disadvantages. Most touch solutions have a touch screen attached to a video display unit. The touch screen works with a controller and a software device driver to sense a touch, determine its location, and transmit the information to the computer's operating system. Touch solutions primarily use one of five technologies, each with characteristics that make it best suited for specific application. These technologies are:

- Resistive technology
- Capacitive technology
- Near field imaging technology
- Acoustic wave technology
- Infrared touch screen technology

We have used infrared touch screen technology to develop touch screen device describe in the following section.

### 3.1 Infrered Touch Screen Technology

Infrared touch screens are based on light-beam interruption technology. Instead of an overlay on the surface, a frame surrounds the display. The frame has light sources, or light emitting diodes (LEDs) on one side and light detectors on the opposite side, creating an optical grid across the screen. When an object touches the screen, the invisible light beam is interrupted, causing a drop in the signal received by the photo sensors. Figure 1 shows the Infrared Touch Screen. Based on this concept, we develop a portable touch screen that can be used with public information system. For this purpose, we exploit light dependent resistor (LDR). An LDR is a component whose resistance will be changed with the light intensity that falls on it. Figure 2 shows a light dependent resistor. An LDR is made with semiconductor material that has high resistance in dark stage. The basic idea behind the high resistance is that there are few free electrons that can move in LDR when no light fall on it. Thus, its resistance become high. On the other hand, when light falls on the semiconductor, in this case, electrons absorb the light photons and energy transferred to the electrons. This implies that electrons become free therefore, they can conduct electricity. In this stage, LDR has low resistance. Based on this idea, we use light source and LDR to vary the resistance in LDR. Then we measure the electricity produce by the LDR so as to get logic 1 or logic 0. Based on these values, we can make interface with any information system by the proposed touch screen.

Figure 3 shows a 4×4 resolution based implemented touch screen. In the circuit of this touch screen device, we use 4×4 LDRs in horizontal and vertical edge and 4×4 light sources of the corresponding to the LDRs. In the circuit, we have used voltage divider rule to produce either logic 1 or logic 0. The output voltage can be calculated by the following equation as shown in Fig. 4. Eventually, voltage divider rule is used to change a large voltage into a small voltage. In our case, since we need to produce logic 1/logic 0 in order to present of light source, thus we follow the voltage divider rule as shown in Figure 4. According to LDR characteristic, with shade light, its

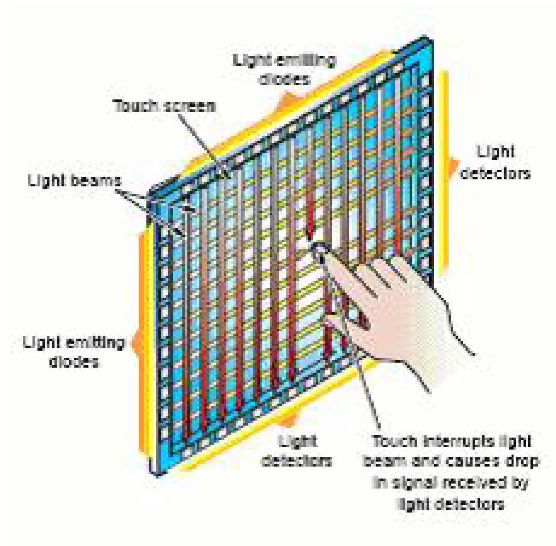


**Figure 1: Infrared Touch Screen Technology**

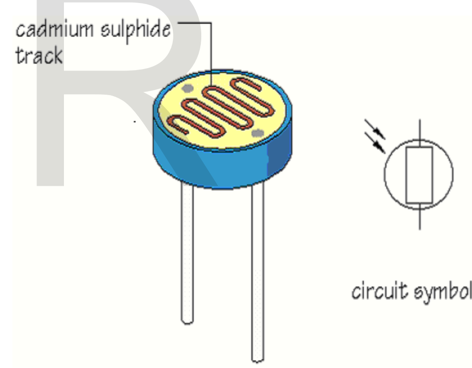


**Figure 2: A light dependent resistor (LDR)**

resistance will be increased. In our case, we have measured the resistance and it is 500 Ω, 0.5 kΩ. That Means the $R_{LDR}$ is 0.5 KΩ. The $R_{top}$ is 10 kΩ.

So in shade light, the $V_{out}$ will be:

$$V_{out} = \frac{0.5}{0.5 + 10} \times 5 = 0.23\ V$$

which represents the logic 0. In bright light, the resistance of the LDR is 200 KΩ, which means the $R_{LDR}$ is 200 KΩ. The $R_{top}$ is 10KΩ. So in the bright light, the $V_{out}$ will be:

$$V_{out} = \frac{200}{200+10} \times 5 = 4.76\,V$$

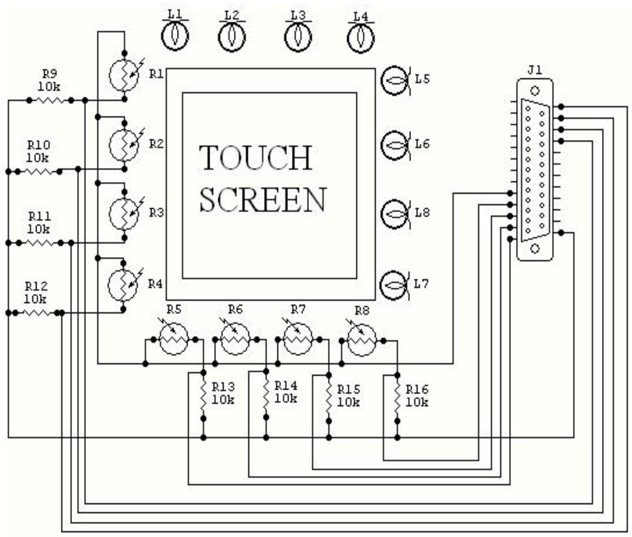


**Figure 3: The Structure of 4×4 Touch screen**

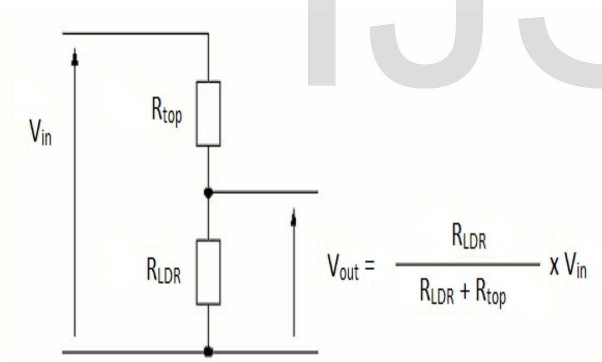


**Figure 4: Voltage divider rule**

which represents the logic 1. We use parallel port to make interface between touch screen and computer system. In the parallel port, logic 0 is between 0 to 0.8V and logic 1 is between 2.0 to 5V. Parallel port is generally a 25 pin female connector with which a printer is usually attached. The parallel port consists of a connector with 17 signal lines and 8 ground lines.

The signal lines are divided into three groups:
**Data Port:** It includes pin 2 to pin 9 with pin names Data-0 to Data-7. These are used for data output.
**Status Port:** Data can't be output on this port. It can only read. It includes pin 10 to pin 13 & pin 15.
**Control Port:** Control ports are a read/write port. It includes pin 1, 14, 16 & 17.

Figure 5 shows the parallel port.

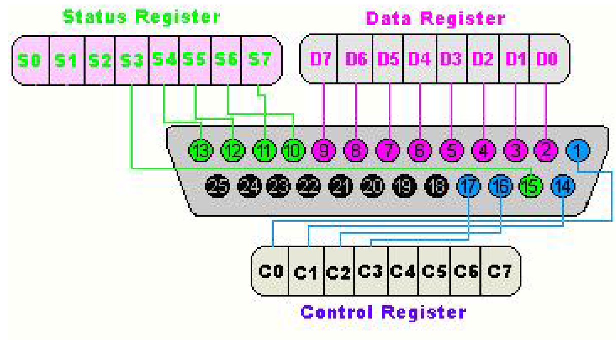


**Figure 5: Parallel Port**

Using parallel port, only nine inputs can be read simultaneously by the computer. So if we have to read more than nine inputs at the same time then we will use encoder. To increase the resolution of this touch screen, then we have to use encoder. The figure 6 shows the structure of touch screen where we uses encoders to increase the resolution of touch screen.

## 4 Read Parallel Port

We have used Visual Basic 6 to read Parallel Port. In Visual Basic 6, PortIn function can read the Status port and Control Port. The Status Port address is 889 in Hex and Control port address is 88A in Hex. The following code can be used for reading Status port and Control port.

```
Dim i as integer
Dim J as Integer
i = PortIn(889)
j= PortIn(88A)
```

After reading the parallel port by the function **PortIn()**, we have used these values for operating the public information system our program using the developed touch screen device.

## 5 Conclusion

The most popular use of touch screen is in the area of public center, where people need to interact with computer. In this paper we have developed a touch screen which can be used in the public center such as rail station, market place etc. to operate specific software. This will help those people who have a little knowledge on how to operate the software with computer. Moreover, as people can access only the specific software system, so the use of touch screen provides a high degree of system security. Nowadays all touch screen are built with the display system. Here is the different of our touch screen. It is really exceptional than the traditional touch screen because it is movable and portable without its display system. The limitation of our touch screen is that it makes errors if the light sources will not produce the desired light that is reflected on the Light Dependent Resistors. Since we have used parallel port to make interface between touch screen and computer system, thus the drawback

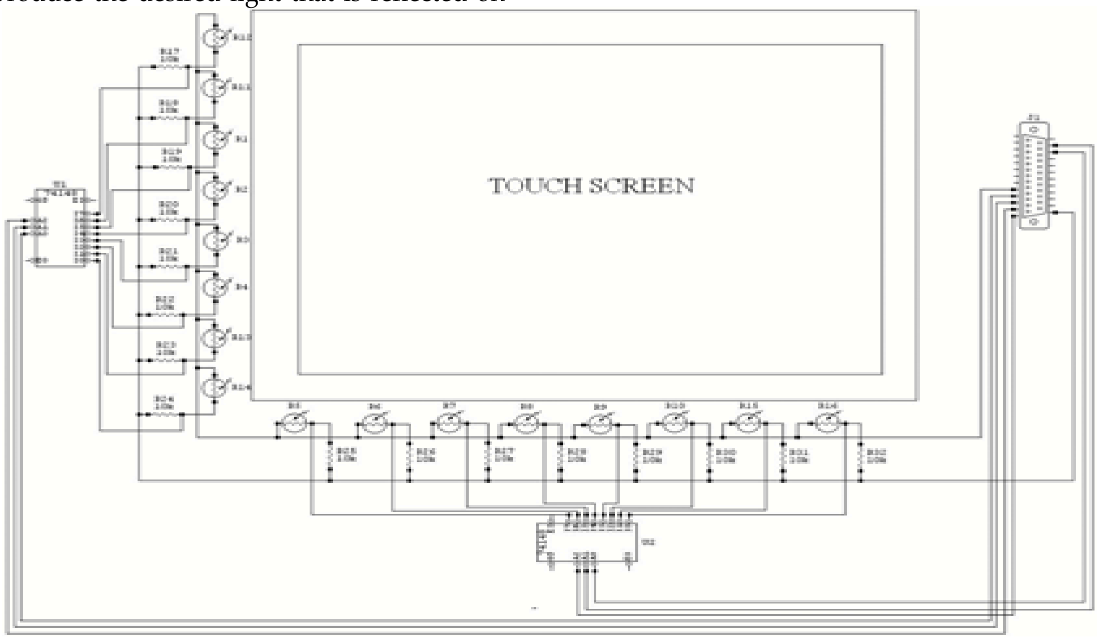


**Figure 6: The structure of 8x8 touch screen**

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of the parallel port also makes our system weakness. As we know, most of parallel port's configuration is set in the PC's BIOS, thus if somehow communication cannot be established between the PC and the touch screen, then the PC will be restarted. To recover from this situation, we have to enter the BIOS utility (usually by pressing F1 or DEL during startup) and tweak the parallel port settings. So in future, we plan to use USB port instead of parallel port for making interface with computer system.

## REFERENCES

[1] Albinsson, P. Zhai, S, "High precision touch screen interaction", *In Proc. Of CHI' 2003,* 105-112.

[2] Daniel Wigdor, Clifton Forlines, Patrick Baudisch, John Barnwell, Chia Shen, "Lucid touch: A See-Through Mobile Device", *Newport, Rhode Island, USA, UIST' 07, October 7-10, 2007.*

[3] Hrvoje Benko and Andrew D. Wilson, Patrick Baudisch, "Precise Selection Techniques for Multi- Touch Screens", *Montreal, Que' bec, Canada, CHI 2006,* April 22-28, 2006.

[4] Olwal, A., Feiner S., "Rubbing the Fisheye: precise touch-screen interaction with gestures and fisheye views", *In Conf. Supp. Of UIST' 03,* 83-84.

[5] Beaudouin-Lafon., M., "Instrumental Interaction: An Interaction Model for Designing Post-WIMP User Interfaces", *Proc. CHI 2000.* p.446-453.

[6] Sears, A., Shneiderman, B., "High precision touch screens: design strategies and comparisons with a mouse", *Int. j. Man-Mach. Stud.* 34(4): 593-613.

[7] Matthew Gleeson, Nigel Stanger, and Elaine Ferguson, "Design Strategies for GUI Items with Touch Screen Based Information Systems: Assessing the Ability of a Touch Screen Overlay as a selection Device" (Outstanding Honors student paper, December, 2004), ISSN 1172-6024.

[8] Ning Zhang, Junliang Chen, Zhengjie Liu, and Jun Zhang, "Public Information System Interface Design Research", IFIP Conference on Human-Computer Interaction, Springer, Beline, Heidelberg, 2013.

[9] Farooq Ahmed, "Haptics in Kiosks and ATMs for the disabled", MS thesis, 2009