DESIGN OF EMBEDDED TOUCH BASED VIRTUAL KEYBOARD FOR SMS

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ABSTRACT

The popularity of smartphones, mobile electronic devices and many types of information appliances is driving the demand for touch screens.Our Embedded project is to design and develop a low cost feature which is based on embedded platform using ARM architecture. Generally touch screens accept the tapping method for typing the messages, typing methods for small touch screens is still worth studying.Smartphone users facing the difficulties for typing on small touchscreens and experiencing errors in typing the alphanumeric keys bacause of their thick thumbs.Small virtual keypad provides very tiny sizes of keys even with the redused set of keys.So partial keyboard layout requires many number of switches between different layouts.This paper studies a new typing methods Drag-and-Type and Secure Drag-and-Type. In the Drag-and-Type method uses the dragging action for typing the messages instead of direct tapping on the small touch screens. The Secure Drag-and-Type metod is used for secure password entry against shoulder surfing and spyware attacks in the normal tapping methods.The typing speed is controversial, but Drag-and-Type method used when the accurate typing is required.Here we are using the GSM modem to transfer the messages to any number.This method is proposed for improved performance, accurate and secure password entry on the small touch screens for security sensitive appliances.

Keywords — ARM; GSM; smartphone; shoulder surfing; Touchscreens; Virtual Keyboard.

INTRODUCTION

The popularity of Touchscreen smartphones is surging, these become a part of electronic consumer's life. Key based keyboards contain hard button counterparts, but typing on them is seldom easy. Most of the people would rather type out a text or mail on a traditional QWERTY layout.These keyboards working on the mechnical push principle.But for the small devices like mobile phones and tablets it is impossible to carry big keyboard with them.With the popularity of touchscreen devices,finger operated virtual keyboards are useful. Virtual keyboards are also called as onscreen graphical keyboards. Smartphone contains small flat touchscreen enable the users to interact directly what displayed on the screen and used to navigate various kinds of services and applications very

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easily using interactive based gesture technology. Today's smartphones contains the virtual keyboards aka software keyboards based on high-resolution of small touchscreens, for example 4.7" 720x1280 pixels (316 ppi) and 4.2" 768x1280 pixels (355 ppi) and 3.5" 640x960 pixels (326 ppi). For typing the messages on small touchscreens require consumers to tap their fingers on small virtual keyboard through touch screen. There exist atleast two concerns that strongly motivate the study. Normally when we type on the smart phones visual echo problems will occur.

First, The smartphone users expereincing many difficulties when they are typing alphanumeric keys on the small touchscreens due the size of thumb. Because the thick size of thumb the users experiencing many errors, i.e they pressing wrong alphanumeric keys even with the reduced set of touchable keys virtual keypad can only provide tiny keys to the users.
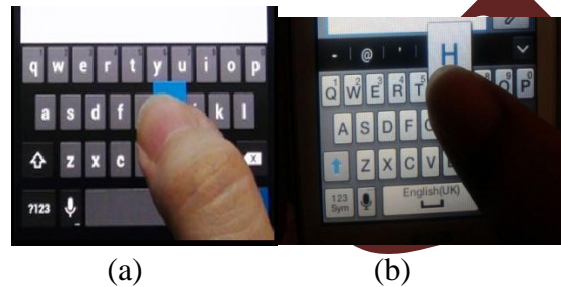

(a)   (b)

Fig 1: Visual echo problems. (a) The entered key visual echo occuled under the thumb. (b) Bigger echo of entered key H can be more easily observed easily notonly by the user butalso by the adversaries.

So partial keyboard is designed for the users with separate alphabets and numbers key board layouts, eventhough the reduced set of keys can also provide the small keys. Users prefer a larger key so as to type very easily.Unfortunately that larger keys not provided on the small touchscreens even with the partial keyboard. But the partial keyboard requires more switches between the different layouts and requires more popup keys. As illustrated in Fig. 1-(a), even worse the entered key and the visual echo are occuled under the users thick thumb thumb. This is normally used responsive method, but this method reduces the benefits from the recent and future advance in the high resolution touchscreens.

Second, the consumers are susceptible to malicious people and spyware inside because it gathers user information through the internet connection without users knowledge, it capture the key input, particularly secret input such as password in mobile environments. Fig. 1-(b), the entered key visual echo is eminently shown bigger, the malicious people nearby the user can easily read what actually was entered by the user. He can easily know the secret passwords entered by the consumer; this is called shoulder-surfing attack that is more easily done in croweded place. Also, spyware malcious people can get the touch event and user's information can known regardless of visual echo.

A. ARM architecture

A RISC based computer design approach means ARM processors require significantly fewer transistors than typical processors in average computers. This approach reduces cost, heat and power

use. These are desirable traits for light, portable, battery-powered devices including smartphones, laptops, tablet and notepad computers, and other embedded systems. A simpler design facilitates more efficient multi-core CPUs and higher core counts at lower cost, providing higher processing power and improved energy efficiency for servers and super computers.

B.GSM

Text messaging or texting is the common term for sending short text messages using the Short Message Service (SMS) from mobile phonesGSM uses a variation of time division multiple access (TDMA) and is widely used of three digital wireless telephony technologies (TDMA, GSM, CDMA). GSM digitizes and compresses data, then sends it down a channel with other streams of user data, each in its own time slot. It operates at either the 900 MHz or 1800 MHz frequency band. GSM, together with other technologies, is part of the evolution of wireless mobile telecommunications that includes High-Speed Circuit-Switched Data (HSCSD), General PacketbRadio System (GPRS), Enhanced Data GSM Environment (EDGE), and Universal Mobile Telecommunications Service (UMTS).

C. DRAG AND TYPE method overview

There are two concerns motivated to develop a new style of typing method called DRAG-AND-TYPE, on full layout of virtual keyboard on small touchscreens. On the flat touchscreen finger touch actions can be classified into two actions i.e tapping and dragging. Two kinds of Drag-and-Type methods proposed: Drag-and-Tap and Drag-and-Drop. In Drag-and-Tap method uses the the tapping method where as in the Drag-and-Drop method uses the dragging instead of direct tapping on full layout. In this method the characters are dragging into the blank space area where user wants to type some text. Although typing speed is controversial in both methods, but the drag-and-drop method is choose when the accurate typing is required. Mainely this method is used in password entry i.e more sensitive to the errors. Drag-and-Drop method is further extended to secure the password entry against the shoulder-surfing attacks. This method is called the Secure Drag-and-Type. This method is accurate and secure typing on the small touchscreens regarding security sensitive consumer electronics applications.

HARDWARE DESIGN OF DRAG AND TYPE

The general hardware structure of the drag and type is based on ARM processor is shown in Fig2. S3C2440 processor is used as core of hardware.
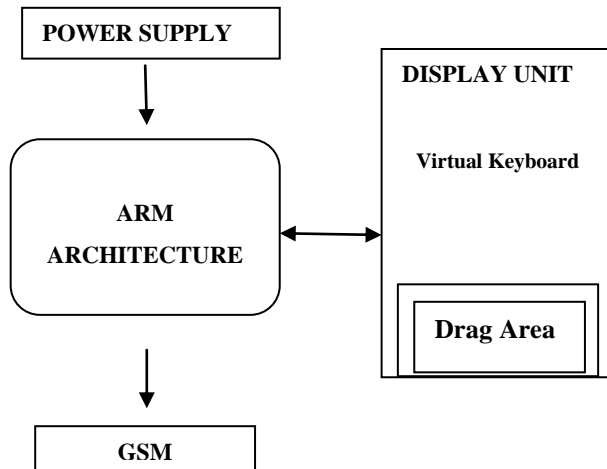
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┌──────────────────┐
│  POWER SUPPLY    │          ┌─────────────────────────┐
└──────────────────┘          │   DISPLAY UNIT          │
         │                    │                         │
         ▼                    │   Virtual Keyboard      │
┌──────────────────┐          │                         │
│     ARM          │◄────────►│                         │
│  ARCHITECTURE    │          │   ┌─────────────────┐   │
└──────────────────┘          │   │   Drag Area     │   │
         │                    │   └─────────────────┘   │
         ▼                    └─────────────────────────┘
┌──────────────────┐
│      GSM         │
└──────────────────┘
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Fig 2: Block diagram of hardware design

The main frequency of Samsung S3C2440 is 400MHz and can upto of a peek fequency is 533MHz. JTAG (Joint Test Action Group) is an international test protocol standard, software simulation; single-step debug and vivi-boot download can be carried out through the JTAG port. It is a simple and efficient means of developing and debugging embedded systems. S3C2440 contains the ARM920T processor i.e ARM9 in thumb state. We are dumping Linux OS into the ARM9 because linux is an open source.S3C2440 supports two kinds of boot modes: 1. Booting at NAND flash and 2. Booting at NOR flash. NOR flash memory gets high in price while an SDRAM and a NAND flash memory is comparatively economical, motivating some users to execute the boot cod eon a NAND flash and execute the main code on an SDRAM. S3C2440 boot code can be executed on an external NAND flash memory. In order to support NAND flash boot loader, the S3C2440 is equipped with an internal SRAM buffer called 'stepping stone'. When booting, the first 4Kbytes of the NAND flash memory will be loaded into stepping stone and the boot code loaded into steppingstone will be executed. Generally, the boot code will copy NAND flash content to SDRAm. Using hardware ECC, the NAND flash data validity will be checked. Upon the completion of the copy, the main program will be executed on the SDRAM.

FLOW CHART

Flow chart represents how the project is implemented. For using the S3C2440 board first we have to dump the Linux OS. Dump the OS into ARM board in NOR mode and load the application program into NAND mode. Now Switch on the board bootig will perform and virtual keyboard displayed on the touchscreen. Now type the characters by tapping the fingers to enter the password. Here we created a secure Drag-and-type mechanism to avoid the shoulder-surfing attacks. If the password is autherized then it will display the Drag-and-drop keyboard. We have to put our finger on the character and drag the character to text area for typing the messages.The messages will be displayed

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on the text area. To send that messages to different receivers first we have to type the number of that particular receiver and send that messages using the GSM.
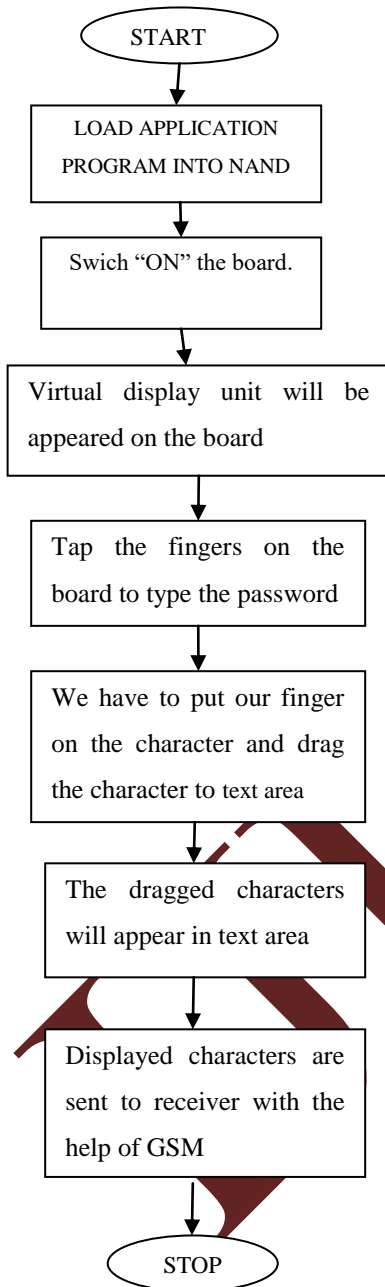

Fig3: Process flow

SOFTWARE DESIGN

Software development process based OS includes: the establishment of cross-compiler, the creation of root files system, the transplant of Boot loader, the porting of embedded Linux, and the development VOIP media stream. ARM Linux gcc is the cross compiler used. Boot loader vivi is used here. The function of Boot loader is to initialize the hardware devices, establish memory mapping tables, thus establish appropriate hardware and software environment, provides interface to send commands to target board and prepare for the final call to the operating system kernel. Linux is used as operating system because Linux system is having a hierarchical structure and completely opens its kernel source. Linux can port to a wide range of hardware platforms, and can run in most of the architecture.

Qt is a cross-platform application framework that is widely used for developing application software with a graphical user interface (GUI) (in which cases Qt is classified as w*idget toolkit*), and also used for developing no GUI programs such as command-line tools and consoles for servers.

Qt uses standard C++ but makes extensive use of a special code generator (called the *Meta Object Compiler*, or *moc*) together with several macros to enrich the language.

RESULTS

Here in this paper we are implementing the DRAG-AND-TYPE methods using the ARM9 processor and implementing message tranfer using GSM modem.

A. DRAG-AND-TAP METHOD

The first method Drag-and-tap presumes a full layout of virtual keyboard in small size and makes a user to type the alphanumeric characters by tapping the corresponding characters on the virtual keyboard.


(a)   **(b)**
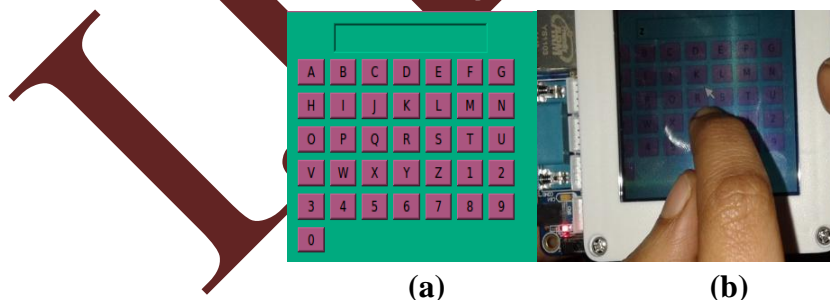
Fig 4: Drag-and-tap method (a) Prototype of Drag-and-tap
(b) Drag-and-tap method in use

Fig 4-(a) illustrates a prototype layout of Drag-and-tap keyboard. The layout designed using the Qt framework. Fig 4-(b) illustrates the Drag-and-tap method in actual use i.e developed in the ARM board.

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B. DRAG-AND-DROP METHOD

The second method also presumes a full layout of virtual keyboard in small size.

(a)   **(b)**
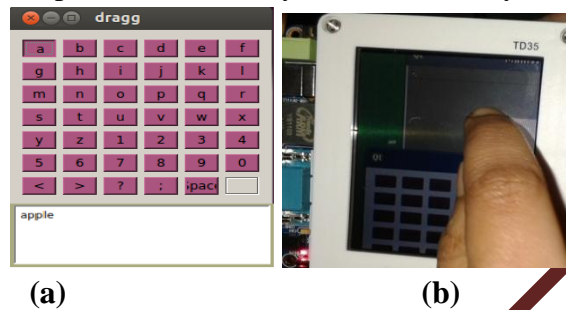
Fig 5: Drag-and-Drop method (a) Prototype of Drag-and-Drop
(b) Drag-and-Drop method in use

Here the user navigates the virtual keyboard by dragging the layout depending upon their convienenance. To type the alphanumeric characters user has to put his/her finger on the character and drag the character to text area.Dragging action enables more accurate targeting to a tiny key on the virtual keyboard. Fig 5-(a) illustrates a prototype layout of a Drad-and-drop keyboard. Generally this method is useful when accurate typing required. Fig 5-(b) illustrates the drag-and-drop keyoard in use i.e on the ARM board.

C. SECURE DRAG-AND-TYPE METHOD

For security of their information most of the people setting the passwords to their mobiles and for web applications also we are having the usernames and passwords. When ever we are entering the passwords with the normal touch keyboards the entered key visual echo will displayed and then after it converting into some dot or star symbol. In the crowded people our password can easily known to our adversaries.

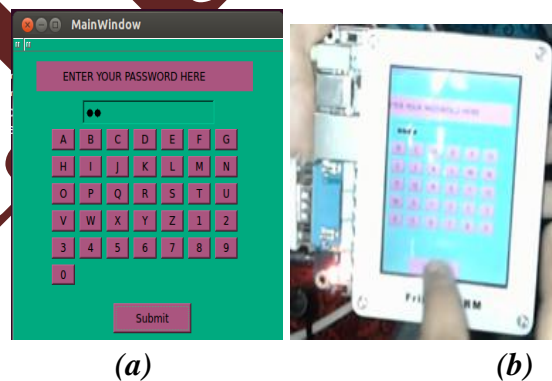
(a)   *(b)*

Fig 6: Secure Drag-and-type method (a) Prototype of Secure Drag-and-type (b) Secure Drag-and-type method in use

When the visual echo is eminently shown bigger, the malicious people nearby can read what actually was entered by the user.To avoid this type of Shoulder-surfing attacks we develop Secure Drag-and-type method.Fig 6-(a) illustrates the protype of Secure Drag-and-Type method. In this method the typed password can directly converted into dot symbol without any visual echo. Fig 6-(b) illustrates the Secure Drag-and-type method in use.

D. Sending SMS using GSM

Text messaging or texting is the common term for sending short (maximum of 160 charactersand spaces) text messages using the Short Message Service (SMS) from mobile phones. The individual messages are called text messages and more colloquially SMS. Text messaging has been a tremendous success in all over the world. To send the messages here we are using the GSM module. A GSM/GPRS module assembles a GSM/GPRS modem with standard communication interfaces like RS-232 (Serial Port), USB etc., so that it can be easily interfaced with ARM board. The power supply circuit is also built in the module that can be activated by using a suitable adaptor.

(a)

(b)
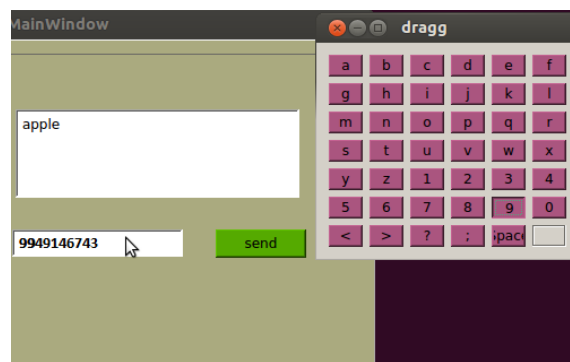
Fig 7: (a) Protype of sending the SMS using GSM (b) SMS sending in real time using ARM

We can send the SMS to any number whom we want to send the message. Fig7-(a) illustrates the prototype of sending SMS using GSM. Fig 7-(b) illustrates SMS sending in real time. Her we are giving the number to send the SMS to perticular receiver.

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CONCLUSION

In this paper, the Drag-ad-Type methods called Drag-and-tap and Drag-and-Drop methods and its extension Secure Drag-and-Type methods are developed by integrating features of all the hardware compoments and software used. The main use of the Drag-and-drop method is accuracy.The Secure Drag-and-type method is more secure then other authentication methods. Here we also implemented the message transfer using the GSM more accuratly.Using the advanced ARM board and with the help of growing technology the project has been successfully implemented.

ACKNOWLEDGMENT

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