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AN INNOVATIVE APPROACH TOWARDS VIRTUAL KEYBOARD

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Abstract: Input to small devices is becoming an increasingly crucial factor in development for the ever-more powerful embedded market. Thereforethis paper presents an innovative approach towards virtual keyboard for consumers of mobile, laptops, personal computer, tablet or any industrial machine. A virtual keyboard can be defined as a touch typing device that does not have a physical manifestation of the sensing areas.This paperuses an inexpensive technique to transform an ordinary piece of paper into a touch screen using an ordinary camera. Here we are using different image processing algorithms to accurately recognize finger touch such as segmentation, thresholding etc.The keyboard layout is reconfigurable,hence allowing user to change the layout based onapplication, for example user can select different languagefor editor or select a specialized layout for gamingapplication.

Keywords: virtual keyboard, reconfigurable, image processing

I. INTRODUCTION

Touch typing or machine writing was invented formechanical typewriters which had the current QWERTY keylayout since 1874.This QWERTY interface survived becauseof its many positive aspects. QWERTY is the most common keyboard layout on English-language computer and typewriter keyboards. It takes its name from the first six characters present in the far left of the keyboard's top first row of letters.

However, this is not feasible fortext entry in smaller computing devices such as PDA's andmobile phones and input to the small devices is becoming anincreasingly crucial factor in development for ever-morepowerful embedded market [1].Touch typing is an input method that employs discrete sensors, or sensed area, or buttons for one or a set of atomic symbols (letters, digits, characters) of a language. Examples are the common keyboard, the keypad of a mobile phone and on-screen keyboards on PDAs. This definition explicitly includes virtual buttons that only differ from the surrounding physique in that their extent is sensed by some technique for touch by a finger or pointer [1].

A virtual keyboard can be defined as a touch typing device that does not have a physical appearance of the sensing areas i.e. the sensing area which acts as a button is not per se a button but is programmed to act as one. Therefore, sensing area can be realized with photo-electric sensors, active finger tracing methods, or a touch pad. The latter is different from a keypad as it does not have a-prioridesignated areas for buttons. Virtual keyboards that employ discrete sensing area for each symbol re(rather than cording methods) inherently allow the realization of soft keyboard [1].

Up-till now, many designs of virtual keyboard have beenproposed and implemented: finger-joint gesture wearable keypad [2], visual panel [3], thumb code [4], chording glove [5], fingering [6], touch stream, multi point touch pad, V Type, combined projection and recognition virtual keyboard [7], sense board etc.

II. VIRTUAL KEYBOARD

As the demand for computing environments evolves, new human-computer interfaces have been implemented to provide multiform interactions between users and machines. Nevertheless, the basis for most human-tocomputer interactions remains the binomial keyboard or mouse. We are presenting here a technology for the next generation, which is the Virtual Keyboard. As the name suggests the virtual keyboardhas no physical appearance. Virtual keyboard is an application that virtualizesthe hardware keyboard with different layouts.

Recent advancements in the Information and Communication Technologies (ICT) open up a scope for computing in different languages. Off late, computing devices are evolved in different shapes like cell phone, PDA, iPod etc. In these devices, it is not possible to afford hardware keyboard because of the problems in size and weight of devices. To alleviate this problem, the application developers propose virtual keyboard.

Virtual keyboard enables the user to type on any surface, including a plain paper on your desk. Some virtual keyboards give vibration as the in feedback; some are projected on the typing surface, while others give different kind of visual feedback such as showing it on a smart phone's screen. The user "presses" the virtual keys thus typing the desired input text. The proposed solution is applicable to any surface. The system has been implemented on a computer, operates in real time, and gives excellent results.

Enormous advancement in communication and information technology instantiates the flourishment of the

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mobile and handheld devices in urban and rural areas in India. These devices become popular to the common people in India.In these devices, text entry task is not possible throughconventional hardware keyboard due to mobility restriction,size factor etc. This motivates researchers to propose avirtual keyboard model which imitates the hardware keyboardambiance for an effective text entry system. Further, theutilization of virtual keyboard appears in space savingsituations and also can be extended into requirement in virtualprogrammability of keys or systems avoiding mechanicalfailure or in movement situations where usability of standardkeyboard is limited. In these days, virtual keyboards findtheir position in transport environments e.g. rail, plane orautomotive. Virtual keyboards are also designed for publickiosks. This reveals the fact that virtual keyboard has becomea very essential needs in every area like performing text entry,simulating hardware keyboard, and adequately in accessingInternet to perform different kind of tasks like E-mailing,chatting, blogging etc.

III. WORKING

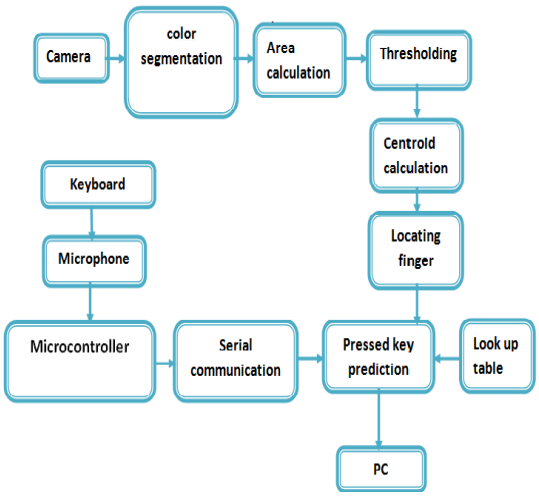

Fig 1 Block Diagram

This paper describes an improved method implementing a virtual keyboard using the single integrated standard two dimensional (2D) cameras. Camera based virtual keyboards can be implemented using a single or multiple cameras. One of the major challenges is how to determine ifthe finger touches the surface or not. Touch detection based on real three-dimensional (3D)model built from stereoscopic camera based systemsis more accurate than single camera based solutions. However, since stereoscopic cameras are not common in mobile phones, therefore this method isless applicable to mobile solutions.Also the challenge of accurate touchdetection is even greater when using a single camera and almost any surface.Floating virtual keyboards, which are portableand enabledirectingthe camera to any surface, are even more challengingto implement.The proposed solution is based on single standard camera; and presents an improved touch detection method, based on microphone input. Thus enables working on any surface or paper, as long as both the camera input and microphone input are there.

The set-up is like this- first the camera is positioned accordance with the paper which acts as the keyboard and the microphone which is attached to the paper is interfaced with the pc with the help of microcontroller. The user has to apply red nail paint on the finger nails. Now as the user starts typing in front of the camera and touches the paper, the sound generated by tap of finger on keyboard is detected by controller and 1/0 is sent to PC by serial communication. The Matlab code triggers the camera and the photo is captured. Then by applying different image processing operations like segmentation, thresholding etc. the required character is displayed on the text editor.

Basically image processing is any form of signal processing for which the input is any form of an image, such as a photograph or video frame; the output of an image processing may be either an image or, a set of characteristics or parameters related to the image. The Image processing usually refers to digital image processing, but optical and analog image processing can also be done. With the help of this proposed system, the keyboard layout can be generated using a paper. The image being displayed on the paper is scanned via a camera connected to the computer.

An image processing application will then detect the key press events by user and process them accordingly. The application must also generate virtual key press events for OS as if a normal keyboard is used. The keyboard layout can be changed hence allowing user to change the layout based on application, for example user can select different languages for editor or a specialized layout for gaming applications. User can even design his own layout in hardware version. User must also be able to reconfigure the keyboard. i.e. the application must allow the user to map keys based on his preference. This would allow the user to set the keypad layout according to his requirements.
There are 3 modules:

- Image Capturing
- Processing
- Display

These modules do the processing when the layout is provided the module does some processing on the image captured by the camera. After processing this layout is stored temporarily. When the user select character from the keyboard and gives some input, the character is captured by the camera, processing is done on it, location of the character is checked. The provided input and the stored character is compared and the desired output is displayed on the screen.

Image Segmentation- It is defined as the process of partitioning a digital image into multiple segments (sets of pixels, which known as superpixels). The goal of segmentation is to simplify and/or change the representation of an image into something that is more meaningful and easier to analyze. Image segmentation is typically used to locate objects and boundaries (lines,

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curves, etc.) in images. More precisely, image segmentation is the process of assigning a label to every pixel in an image such that pixels with the same label share certain characteristics.

The result of image segmentation is a set of segments that collectively cover the entire image, or a set of contours extracted from the image. Each of the pixels in a region are similar with respect to some characteristic or computed property, such as color, intensity, or texture. Adjacent regions are significantly different with respect to the same characteristic(s). When applied to a stack of images, typical in medical imaging, the resulting contours after image segmentation can be used to create 3D reconstructions with the help of interpolation algorithms like marching cubes.

Thresholding-The simplest method of image segmentation is called the thresholding method. This method is based on a clip-level (or a threshold value) to turn a gray-scale image into a binary image. There is also a balanced histogram thresholding.The key of this method is to select the threshold value (or values when multiple-levels are selected). Several popular methods are used in industry including the maximum entropy method, Otsu's method (maximum variance).Recently, methods which have been developed for thresholding computed tomography (CT) images. The key point is that, unlike Otsu's method, the thresholds are derived from the radiographs instead of the (reconstructed) image.

IV. SUMMARY AND CONCLUSION

With the growing popularity of small mobile devices, there is a need for convenient data entry units that are easy to use and considerably flexible to handle with the small mobile devices without affecting the mobility and portability of those devices. Many alternative data input methods and various types of virtual keyboards are available. However, these methods have the lack of accuracy and the convenience of a normal full size keyboard. In order to address some of the issues raised above, a new projection virtual keyboard called "Reconfigurable Virtual Keyboard". It provides a simple touch typing style with the use of paper layout keyboard & webcam. By using this system we can create keyboard layout as per our convenience. So, its cost is also less than existing keyboard. This system is very easy to use and in security purpose it better than the existing keyboard.

A virtual keyboard, based on a single camera has been presented, implemented on a computer, and runs in real time. Since this implementation runs on a paper, no extra hardware is required. The touch detection is performed using improved microphone and camera synchronization. Also, hand detection is based on HSV color space, which although a heuristic method, still provides better results than the RGB color space. The virtual keyboard implementation took system complexity into consideration, allowing the final product to run on a less powerful machine than a pc. Within our project we implemented the option of choosing more than one language, and many more can be added. This was possible as our virtual keyboard is shown on a smart phone's screen, rather than on a physical desktop.For future work, we believe that it is possible to improve the system's complexity even further and add extra functions, like more languages, font change, multi-touch typing and more. Althoughthere is always place for improvement, we have provided a rock-solid virtual keyboard implementation that comes to solve certain challenges met in the past, and may be a milestone for future outcomes.

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