e-Waiter Using Virtual Keyboard

Vipul V. Joshi¹, Pratik R. Devikar², Hussain Limdiwala³
Department Of E&TC, Sinhgad Academy Of Engineering, Pune University
Email : vipuljoshi@ymail.com

Abstract: Application of e-waiter can be implemented using concept of virtual keyboard. The implementation of virtual keypad can be designed by using finger interaction through webcam. Virtual keypads are commonly used as an on-screen input method in devices with no physical keypad such as touch screen equipped mobile phone. The user input keys by tapping a virtual keypad built into the operating system of the device and webcam is used in an embedded vision system for capturing image. Embedded system processes image to extract application-specific information in real time. In this paper we describe a low cost alternative which is based on ARM platform for virtual keypad implementation.


1. INTRODUCTION

Virtual keypads are commonly used as an on-screen input method in devices with no physical keypad, where there is no room for one, such as touch screen equipped mobile phone. It is common for the user to input keys by tapping a virtual keypad built into the operating system of the device. But the issue with such virtual keyboard is the high cost of implementation and maintenance, in restaurants this becomes the main deciding factor.

The main objective of this project was to develop a low cost implementation of virtual keyboard which can be used for placing the orders at the restaurants hence providing a substitute to the manual waiter. This will reduce the time lag and manual errors that occur while placing the order. Generally the concept of e-waiter is implemented in restaurants using iPad’s, tablets etc. but this makes the system cost ineffective and requires high level of maintenance.

This paper describes an innovative concept using the platform of raspberrypi for image processing and using paper keyboard as an interface between the user and the hardware.

2. BLOCK DIAGRAM

3. COMPONENT DESCRIPTION

1.1 Keypad

A virtual keyboard can be built for very little cost as compared to the traditional keyboard. By using a paper
made keyboard as a input method for user will make the system low maintenance and cost effective.

1.2 Webcam
Webcam is used to capture the input given by the user on the keyboard. All the captured images are sent to the ARM processor mounted on the raspberry pi board. The output format of the webcam images are in RGB, BGR, YUV and even JPEG. Here we can use any webcam but the main factor bounded with its resolution and quality of the image. For good results webcam should have following resolutions.

**Specifications:**
- Frame Rate: Up to 30fps
- Still Image Resolution: 16 MP
- Image Capture Resolution: 4608 * 3456
- Connectivity: USB
- Focus Range: 4cm to infinity
- Sensor Type: CMOS

1.3 Arm Processor
ARM processor is used for extracting meaningful information from the images sent to it from webcam. There are various boards which has inbuilt ARM processors. Here we are using Raspberry pi (Model B) because of its low cost and facilities which are sufficient enough for this system.

**Specifications:**
- 700 MHz ARM1176JZF-S core
- Broadcom CPU+GPU:
- 512 MB RAM
- Boots of SD card for file system
- USB, Audio out, LAN
- HDMI+Composite video out
- GPIO Pins
- Powered of 5V,~700 mA

1.4 LCD Display
Here we are using two LCDs (128 X 64). One is placed at the transmitter side or user side for display of the menu and the other is placed at the receiver side for displaying the order placed by the user.

1.5 PIC 18 Processor
This is used for interfacing with LCD display at the receiver side. You can use here any other processor which has capacity of interfacing with large size LCD.

1.6 NAND Flash
Image processing technique requires more memory due to working on various frames present in the video. To increase storage capacity, additional memory in the form of NAND FLASH is used. If you are using high resolution or full HD webcam some additional memory is required.

4. DESIGN METHODOLOGY
The menu is displayed on the LCD Screen in front of the user. The user selects the desired item with the help of Virtual Keyboard. By selecting up-down arrows using marker the item is correspondingly selected. The side arrows are used for placing order or switching back to the main menu. The image of virtual keyboard is scanned by the webcam. The image is processed by ARM Processor on Raspberry-Pi development board. According to the results of image processing corresponding item on the menu is selected.
4.1 Softwares
For image processing we have used the libraries of OpenCV and QT Compiler for code implementation and GUI designing.

5. Future Scope:
In order to optimize the results we can use the camera specifically designed for Raspberry-Pi as the output of that camera is compatible to the input format of Raspberry-Pi. Also if the RAM of RPi is increased from 512MB to 1GB it will process the image faster. We can design board that is application specific in order to optimise the performance. For hotels and restaurants the output of the RPi can be sent to the receiver via wireless transmitter. Also a network can be established for multiple tables which is controlled by a server.

6. Conclusion
The Virtual Keyboard has a central advantage of Low cost and easy implementation. It is because there is no need of any physical keyboard and the required components are less and compact thus easily portable. Also it can be a low cost alternative for existing e-waiter system in hotels and restaurants. Hence as a conclusion we can replace manual waiter in a more cheap and efficient manner.

Acknowledgement
Acknowledge the previous work done on this subject like some research paper or the person or company who has firstly introduced this concept of e-waiter, etc. We will also like thank our project guide for his support and contribution.

References