ISSN: 0974-2115
www.jchps.com Journal of Chemical and Pharmaceutical Sciences

Design and Development of Embedded Image Capturing & Processing System

K. Gopalakrishnan[1]*, G. Senthilkumar[1]
[1] Department of Electronics, Bharath University, Chennai
[1] Department of Electronics S.N.R Sons College, Coimbatore – 06.
***Corresponding author: E-Mail:gopikrishna2804@gmail.com**

ABSTRACT

An embedded image capturing and processing system can capture an image and also Selection of Raspberry Pi board module and its peripherals are because it can run the image capturing and recognition algorithm in a easy and effective manner when compared with other embedded platforms.

KEY WORDS: Image capturing, Face recognition, Raspberry Pi, Image database.

1. INTRODUCTION

The Embedded Image Capturing and Processing System (EICPS) are developed with an objective to capture an image and later using it for recognition of a person. In earlier days there were several this can be overcome through biometrics, since every human being has a different and unique biometric feature. Biometric identification has gained increasing attention during recent years. A large number of methods which are used for such identification are fingerprint, palm print, handwriting, face pattern and voice pattern.

The advantages of face recognition are as follows. Face image acquisition can be done without the knowledge of the user. It doesn't require any physical contact, so it's a non-invasiveness system. The probability to find two people in the world whose face textures are identical is very less making face recognition as the most accurate method and it has the lowest false recognition rate. The face recognition method is a stable method because unlike other biometric identification methods, face has more features and also it doesn't varies with time. Because of these advantages, face recognition has been most widely used in research and development to design a system for security, accessing an equipment or access to a secured / prohibited area etc.

EICPS receives data i.e. images from the camera which is then transferred to the Raspberry Pi system and processed to store in a database residing on the memory or to recognize the person with the available face signatures. Very Large Scale Integration (VLSI) provides a lot of computing devices which are less in cost and consume very less power. This paper proposes the design method of embedded image capturing and processing system.

Python is used as the main programming language for developing the application coding's.

System Hardware Design: The designed system has the following blocks

- Image capturing camera
- Raspberry Pi board
- DVI compatible monitors

Entire block diagram of the designed embedded image capturing and processing system is shown in Figure 1.

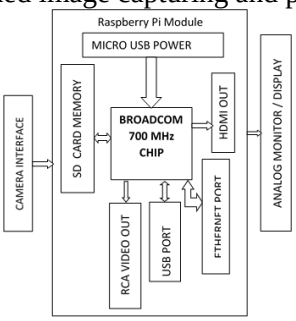

Figure.1. Block diagram of embedded image capturing and processing system

Raspberry Pi Board: The central module of the embedded image capturing and processing system is Raspberry Pi board. Main parts of the Raspberry Pi board are main processor, memory to store programs and images, power supply, HDMI Out, Ethernet port, USB ports and abundant global interfaces. Raspberry Pi board and its peripherals are shown in figure 2.

Main Processing Chip: The main signal processing chip in Raspberry Pi board is a Broadcom 700MHz Chip with a 32 bit ARM1176JZF-S RISC processor. It has very rich peripheral. This chip connects the camera unit and also captures the images through the camera.

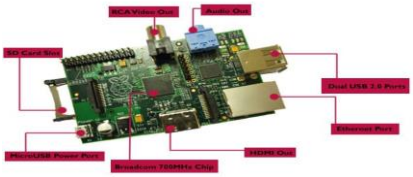

Figure.2. Raspberry Pi Board

Memory: The Raspberry Pi board does not have a built in memory like hard disk. This made us to depend on an external SD card for storing the operating systems (Linux based OS) and application programs. This Raspberry Pi module has a Micro SD card adaptor to insert the SD card memory.

Interfaces: Interfaces available in the Raspberry Pi board are

- 2 USB ports
- HDMI out
- A standard RCA composite video
- Lead
- Ethernet port
- Audio lead
- SD card Slot

USB ports are used to connect keyboard and mouse. HDMI out is used for connecting HD TVs to view the face acquired while training the system. If needed an analogue display can also be interface using standard RCA composite video lead. Ethernet port is used for networking for updating and getting new software for Raspberry Pi board. Audio lead can be used for hearing the stereo audio.

Camera Interface: Camera interface consists of following modules

- Programmable controls for frame rate
- 32 bytes of embedded one time programmable (OTP) memory
- Digital video port (DVP) parallel output interface
- Excellent Imaging and video capturing.

Figure.3. Camera Board Working of the System

It is divided in to two are

- Training mode
- Recognition mode.

This is shown in figure 4. A key in this system is used an input to select any one of these modes.

Training Mode: In this mode, the system is captures the user's images in order to generate a face image database.

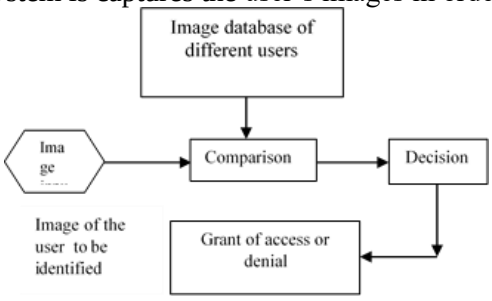

Figure.4. Recognition mode

Images are captured by the camera which is later sent to the Raspberry Pi board using CSI flat cable connector. A HDMI compatible Display is used here to show the user about the captured image which in turn stored in the face image database. Like this, a large number of images of different users are captured and a face image database is created and stored in the SD card memory.

Recognition Mode: In this mode, the images which are captured from the camera module are processed and compared with the face image database available in the SD card memory. Here Eigen face algorithms are used for face recognition. Once the images are recognized with the face image database, the system gives authentication for the user otherwise it denies the access.

Face Recognition Algorithms: There are some traditional algorithms used for face recognition such as

- Eigen Face
- Fisher Face
- 2D-PCA
- Elastic Graph Matching.

Future Application: In total pattern matching the end to end part of the pattern is matched with other pattern whereas in partial pattern matching a part of the given pattern is checked for matching with the pattern which reduces the time.

2. CONCLUSION

Face recognition can be done through raspberry pi board with high illumination. In future the same project with slighter modifications in the software and hardware assembly, it can also be used for pattern recognition in Industries where a same pattern is manufactured in huge volumes.

REFERENCES

Bayhan M.S and Gokmen M, Scale and pose invariant real time face detection and tracking, Proc the 23 rdInt Symposium on Computer and Information Science, 2008, 1-6.

Brintha Rajakumari S, Nalini C, An efficient data mining dataset preparation using aggregation in relational database, Indian Journal of Science and Technology, 7, 2014, 44-46.

David Zhang, Joseph P, Campbell, Davide Maltoni, Ruud M, Bolle, Guest Editorial Special Issue on Biometric Systems, IEEE Transactions on Systems, Man, and Cybernetics-Part C, Applications and Reviews, 35.

Jayalakshmi V, Gunasekar N.O, Implementation of discrete PWM control scheme on Dynamic Voltage Restorer for the mitigation of voltage sag /swell, 2013 International Conference on Energy Efficient Technologies for Sustainability, ICEETS, 2013, 1036-1040.

Kaliyamurthie K.P, Parameswari D, Udayakumar R, QOS aware privacy preserving location monitoring in wireless sensor network, Indian Journal of Science and Technology, 6 (5), 2013, 4648-4652.

Kaliyamurthie K.P, Udayakumar R, Parameswari D, Mugunthan, S.N, Highly secured online voting system over network, Indian Journal of Science and Technology, 6 (6), 2013, 4831-4836.

Khanaa V, Thooyamani K.P, Saravanan T, Simulation of an all optical full adder using optical switch, Indian Journal of Science and Technology, 6 (6), 2013, 4733-4736.

Khanaa V, Thooyamani K.P, Using triangular shaped stepped impedance resonators design of compact microstrip quad-band, Middle - East Journal of Scientific Research, 18 (12), 2013, 1842-1844.

Kumaravel A, Dutta P, Application of Pca for context selection for collaborative filtering, Middle - East Journal of Scientific Research, 20 (1), 2014, 88-93, 2014.

Raj M.S, Saravanan T, Srinivasan V, A modified direct torque control of induction motor using space vector modulation technique, Middle - East Journal of Scientific Research, 20 (11), 2014, 1572-1574.

Saravanan T, Raj M.S, Gopalakrishnan K, VLSI based 1-D ICT processor for image coding, Middle - East Journal of Scientific Research, 20 (11), 2014, 1511-1516.

Sengottuvel P, Satishkumar S, Dinakaran D, Optimization of multiple characteristics of EDM parameters based on desirability approach and fuzzy modeling, Procedia Engineering, 64(1), 2013, 1069-1078.

Sundararajan M, Optical instrument for correlative analysis of human ECG and breathing signal, International Journal of Biomedical Engineering and Technology, 6 (4), 2011, 350-362.

Thamotharan C, Prabhakar S, Vanangamudi S, Anbazhagan R, Anti-lock braking system in two wheelers, Middle - East Journal of Scientific Research, 20 (12), 2014, 2274-2278.

Udayakumar R, Khanaa V, Saravanan T, Saritha G, Retinal image analysis using curvelet transform and multistructure elements morphology by reconstruction, Middle - East Journal of Scientific Research, 6 (12), 2013, 1781-1785, 2013.

Vanangamudi S, Prabhakar S, Thamotharan C, Anbazhagan R, Design and fabrication of dual clutch, Middle - East Journal of Scientific Research, 20 (12), 2014, 1816-1818.

Vanangamudi S, Prabhakar S, Thamotharan C, Anbazhagan R, Design and calculation with fabrication of an aero hydraulwicclutch, Middle - East Journal of Scientific Research, 20 (12), 2014, 1796-1798.

XIE Yonghua, LIU Chuancai, YANG Jinyu, Thealgorithm based on DDCT and TCSVD of humanface feature extraction and recognition, The Compute Engeniering, 08 (1), 2008.

Yang G and T.S. Huang, Human face detection in complex background, Pattern Recognition, 27 (1), 1994.

Zhang Rui, YU Zhongtang, The method of human-face recognition based on analyzed of two ranks and doubles two dimensions The Computer Engeniering, 08 (5), 2008.