

Review Paper on System for Voice and Facial Recognition using Raspberry Pi

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Abstract: The technology introduces an intelligent home security system. The basic system consists of two parts; facial recognition and voice recognition. The system provides a voice actuated security camera system. Facial recognition will recognize the face of family member who will be outside the door. If the face found to be among the family member then will display 'Recognized family face'. The term voice recognition refers to finding the identity of words spoken by the person outside the door. The proposed system aims to implement a face recognition software code and to successfully implement this code on the Raspberry Pi platform for real time recognition.

Keywords: Facial recognition, Voice recognition, Raspberry Pi platform, Home security.

I. INTRODUCTION

The system is developed through ARM microprocessor. The home security may include several ways of techniques as per a person expect his home to be secured. The two of the techniques here we are taking into consideration, facial recognition and voice recognition. A person inside his home can have identification for who is outside his home which will give identity in terms of recognizing his facing and voice (in textual form). ARM is a registered trademark of ARM Limited. Linux now provides support for the ARM-11 family processors; it gives consumer device manufacturers, commercial-quality Linux implementation along with tools to reduce time-to-market and development costs. The system aims to implement a face recognition software code and to successfully implement this code on the Raspberry Pi platform for real time recognition. Raspberry Pi is a credit card sized computer development platform based on a BCM2835 system on chip, sporting an ARM11 processor, developed in the UK by Raspberry Pi Foundation. Raspberry Pi model functions as a regular desktop computer when it is connected to the keyboard or monitor. Raspberry Pi is very cheap and most reliable to make a Raspberry Pi supercomputer. The Raspberry Pi uses Linux kernel-based operating systems, Raspbian.

II. NEED OF THE SYSTEM

Back in the 1980's and 1990's, home computers didn't rely on dedicated monitors to display the operating systems, applications, and games. Instead of paying extra for a monitor, the majority of console owners were happy to use their televisions only. But as far as computers go, the PC model of dedicated monitor was eventually widely adopted. The problem for a middle class human to buy the computer system should be taken into consideration. So the need of a cheap, alternative system raised; where the costly computer system should have an alternative.

Also for security purpose of home, small offices, there was a requirement of the system which can provide features such as facial recognition and voice recognition which should be available in very cheap rate and small in size. The rate and the size problem were covered where invented Raspberry Pi model by embedded manufacturers giving extremely super quality of minicomputer. Here arises the need of the system.

III. DESCRIPTION

The both of the two systems facial and voice recognition were separately considered which were having some approaches to use in last few years. The approaches are given below.

A. Face recognition approaches

- Eigen faces: The Eigen face is one of the most thoroughly investigated approaches to face recognition. It is also known as Karhunen- Loeve expansion, eigen picture, eigenvector, and principal component. It uses principal component analysis to efficiently represent the pictures of faces [6].
- Neural network : One of the first artificial neural network (ANN) techniques used for face recognition is a single layer adaptive network, which contains a separate network for each stored individual [5]. The way in constructing the neural network structure is crucial for the successful recognition. It is dependent on the intended application.
- Hidden Markov Models (HMMs) : The stochastic modelling of non-stationary vector time series based on HMMs has been very successful. This is method for human face recognition. Faces were intuitively divided into regions such as the eyes, nose, mouth, etc.; which can be associated with the states of a hidden markov model [1]. The HMMs require one-

dimensional observation sequence and images are two-dimensional.

B. Voice recognition approaches

- **Acoustic Phonetic Approach:** In this speech recognition approach, the system tries to decode the speech signal in a sequential manner based on the observed acoustic features of the speech waveform and the known relations between acoustic features and phonetic symbols. The first step in this process is the parameter measurement process, which provides an appropriate spectral representation of the speech signal. Next step in the processing is the feature detection stage, where the spectral measurements are converted to a set of features that describe the acoustic properties of the various phonetic units [4].
- **Pattern Recognition Approach :** In pattern recognition approach, the speech patterns are used directly without explicit feature determination and segmentation. This method has two steps-namely, training of speech patterns, and recognition of patterns by way of pattern comparison. In parameter measurement phase, the sequence of measurements is made on the input signal to define the “test pattern”. This unknown test pattern is then compared with each sound reference pattern and a measure of similarity between the test pattern and reference pattern is computed [2]. Finally, the decision rule decides which reference pattern best matches the unknown test pattern, based on similarity scores from the pattern classification phase.
- **Artificial Intelligence Recognition Approach :** The approach is a hybrid of the acoustic-phonetic approach and the pattern recognition approach. In the artificial intelligence (AI) approach, an expert system or self-organising (learning) system, implemented by neural networks is used to classify the sounds [3]. The basic idea is to compile and incorporate knowledge from a variety of the knowledge sources with the problem at hand.

IV. RASPBERRY PI BLOCK DIAGRAM

The functional block diagram of Raspberry Pi is shown in Fig.1. The various functional blocks are provided for different connections. This will require a power supply for its working, provided through a mobile charger. There are two USB slots available for connection of devices such as USB mouse or USB keyboard. Again, one ethernet slot is there.

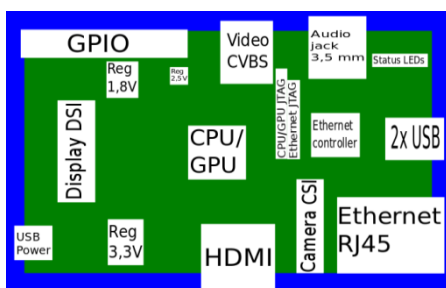


Fig.1. Block diagram of Raspberry Pi

The next slots are provided for display unit, camera and microphone for accessing required inputs.

V. SYSTEM DEVELOPMENT

The system of the project is now designed which will give its constructional details. The proposed system of the project is shown in following Fig. 2.

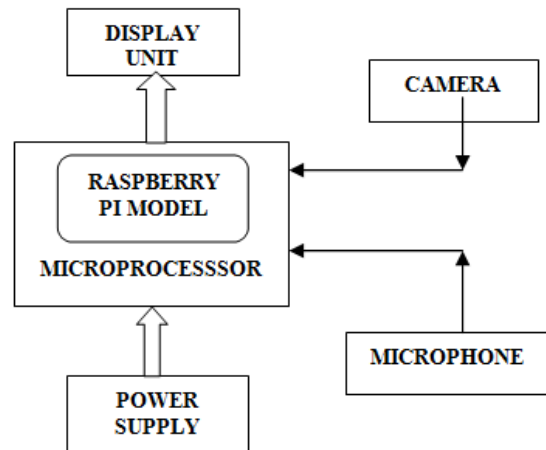


Fig.2. Block diagram of system

The system is basically designed for the home security purpose where the constructional details are shown in above Fig.2.

The camera and microphone are on the input side which will provide image of face of a person along with his or her voice to the microprocessor as inputs. The microprocessor will use the algorithms. Raspberry Pi model is having its memory card for all data and instructions storage.

In this case, it will be having code for face recognition and voice recognition. Raspberry pi will require a power supply which can be provided by mobile charger during processing. The output results will be displayed on display unit where we can recognize whether the person outside the door is a family face or not and the words spoken by that person will also be displayed on display unit in textual form.

VI. CONCLUSION

The system here is designed for voice and facial recognition using Raspberry Pi model. The requirement of basic operation of the system is described shortly. Now, the implementation of the system will be carried out in next stages by use of algorithms and the supported operating system by the Raspberry Pi model. As in next stages, the working will be defined with Raspbian software base, the system will turn in the affordable way of security.

The proposed system will provide mini-computer based home security system by use of very advanced, low cost, stable operating system. This system is easy for handle and will be user friendly. The future is having very much scope for this new mini-computer model.

ACKNOWLEDGEMENT

I take this opportunity to express my deep sense of gratitude towards my affable guide **Mrs. A. G. ANDURKAR**, Assistant Professor of the Electronics & Telecommunication Department, for her expert guidance, timely suggestions and constant encouragement.

I also thank **Prof. S. O. DAHAD**, Head of Department of Electronics and Telecommunication and **Prof. Dr. R. P. BORKAR**, Principal, for their moral support and for providing all the necessary facilities. Lastly, I express my sincere thanks to my colleagues, my family members and all those who directly or indirectly, have helped me.

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BIOGRAPHY



Pallavi Vijaykumar Hajari received her B.E. degree in Electronics and Telecommunication from Shram Sadhana Bombay Trust's College of Engineering and Technology, Jalgaon, India, in 2013. Her research interests include embedded systems, biomedical signal processing, electronic circuit design and its applications. At present, she is engaged in Master of Engineering in Government College of Engineering, Jalgaon, India. She is working with project on 'System for voice and facial recognition using Raspberry Pi'.