IMPLEMENTATION OF LANGUAGE RECOGNITION SYSTEMS USING RASPBERRY PI

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Abstract

Two top tier and flexible voice-based affirmation and language affirmation systems are portrayed in this paper. While the confirmation systems engage secure access to the media focus at home and the language affirmation structure can be utilized as a past development to normally unravel and saw substance is deciphered from its one of a kind language into another. The essential ideal position of the made system is that they can continue running on a simplicity embedded contraption, for instance, a Raspberry Pi (RPi) and using simply open-source adventures, which makes it conceivable to mimic (or) consolidate into various structures. to plan English language affirmation is predominantly engaged.

Keywords: Speaker acknowledgment, Language acknowledgment, I-vectors, installed gadgets, open-source devices

I. Introduction

Interest in online character recognition has increased because of the rapid addiction to smart phones and Tablet PCs. Writing is one of the easiest ways to exchange information between human and any hand held devices. Disabled people generally have the problem to convey their message to other people. In order to communicate with people using hand held devices in native languages, character recognizer tools are helpful. The basic objective of character recognition is to interpret the character written by the user and then compare it with an existing database which contains different variations of the same character written by different users. Character recognition has been classified in to two types as online character recognition and offline character recognition. Character recognition is in research for many decades. This paper focuses on development of character recognizer custom made for Telugu Characters. In this paper, it is clearly explained about character recognizer developed on ARM11 processor using Raspbian operating system which is used to recognize individual characters. Embedded hand held device consists of one electronic board which consists of Broadcom BCM 2835 system on chip (SOC) which has ARM11 processor. LCD screen acts as an input and output device.
II. Theoretical Background

(a) Areas of Character Recognition

Character recognition can be subdivided into two categories namely offline and online and can be further classified into write dependent and writer independent. This paper has been implemented for both writer dependent and writer independent. Some of the tools work only for single user and those are called as writer dependent. Tools working for multiple users are called as writer independent. The detailed description of online and offline recognition has been explained in the further sections.

(b) Offline Character Recognition

Character acknowledgment can be subdivided into two classifications specifically disconnected and on the web and can be additionally ordered into composing ward and author independent. This paper has been actualized for both essayist ward and author autonomous. A portion of the instruments work just for a single client and those are called essayist subordinate. Instruments working for different clients are called as author free. The itemized depiction of on the web and disconnected acknowledgment has been clarified in the further areas.

(c) Online Character Recognition

As opposed to the disconnected, there is ongoing acknowledgment of characters in online character acknowledgment frameworks. Online frameworks have better data for doing acknowledgment since they have timing data and since they maintain a strategic distance from the underlying hunt venture of finding the character as on account of their disconnected character acknowledgment. Online framework utilizes the situation of the pen as an element of time straightforwardly from the interface. In general in online handwriting recognition stylus is used, to write the letter but here “mouse” is used in order to write the letter on the LCD screen.

III. Proposed System

Character Recognizer (CR) is implemented on Raspberry Pi board by porting Raspbian operating systems. The proposed system will be developed on an embedded Linux operating device which will ported with advanced Linux kernel, and an Automatic speech Recognition (ASR) engine will be designed and ported to the board such that it works at higher accuracy with out any internet connection. We totally train the system with 5 words, which will be recognized by the system and prints them back on the screen in English language. The below figure shows the Block Diagram of the proposed systems.
The above figure consists the following blocks, ARM11 (Raspberry pi Board), USB Microphone, Power supply.

(A) Lcd Screen

LCD screen is interfaced to the Raspberry Pi board using HDMI port which is on the Raspberry pi board. The resolution has been set to 1024x768 pixels in the config file of the Raspbian OS for proper output.

(B) Raspberry Pi Board

The Raspberry Pi is an open-source, single-board PC based on ARM 11 processor. The Raspberry Pi is shoddy, it's incredible, and it doesn't expend a great deal of intensity. It is pocket estimated or charge card measured board. As opposed to a commonplace PC design, these incorporate a processor (CPU), illustrations handling unit (GPU), and some memory into a solitary unit. The BCM2835 SOC contains an ARM1176JZ-F processor running at 700MHz, 256MB of RAM, and a GPU named Video Core IV.

The Raspbian OS dissemination of Debian is intended to furnish implanted programming software engineers with a commonplace and completely useful interface to custom equipment advancement.
VI. Proposed System Flow

(A) Training
Initially the user should create a new project and train the Character Recognizer. During training phase, user should create a database of different variations of the Telugu Language characters written by different users. This training is done in the writing area where the letters should be written in the writing area. If some user was unable to write a character similar to the original character then he can train the character to the desired manner in the training mode and name that character to the original letter. This helps the user to write the character as per their ability in training and name them to the original character.

(B) Preprocessing
Because of equipment and programming confinements and convert it into smooth penmanship preprocessing stage in penmanship acknowledgment is done to evacuate commotion or bends present in information character

(C) Feature extraction
Subsequent to preprocessing, include extraction is conveyed, where a portion of the distinctive highlights are separated from a letter. A portion of the Preprocessed x-y highlights are Shape setting (SC), Tangent edge (TA), Generalized shape context (GSC), Preprocessed x-y highlights, standardized first and second subsidiaries, Sub stroke shape extractor.

(D) Recognition
In this character recognizer we are utilizing two calculations so as to perceive a character. The two calculations that are utilized here so as to perceive a character are closest neighbor and dynamic time wrapping, where the closest neighbor calculations is utilized to shape the groups and dynamic time wrapping is utilized to gauge the separation between the put away examples and composed letter.

(E) Nearest neighbor algorithm
During the training phase all the similar characters are grouped as a cluster. After completing of the cluster formation then whenever the letter has been written in the writing area in order to recognize, it initially compares to which 5 clusters the letter closely belongs to and identifies those clusters. After completion of the identification of 5 nearest neighbors then nearest distance is calculated using DTW algorithm.

**VI. Result Analysis**

CR is implemented on embedded development board by using Raspbian operating systems. When the user writes a letter in the writing area for recognition, the letter that has highest recognition rate is recognized and the output is displayed in a text file. The output that has been displayed in text file will be linked to the text to speech engine and produces the sound output through the speakers connected to the Raspberry Pi board.

**VII. Conclusion**

Character recognition tools are becoming hugely popular these days, as cost of mobile devices like tablets are decreasing dramatically. As a result of this more students and corporate are using these low cost mobile devices to get their work done more effectively. This character recognition tool, is one step forward in the journey to make devices more accessible to people who wish to interact with mobile devices in their local languages. Even letters which, different users write completely different from the other users, are recognized with high efficiency. We are making continuous efforts to improve the recognition accuracy and usability of handwriting interfaces.
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