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Voice Based Mailbox System for Blind Using Face Recognition Technique

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Abstract—In today's world communication has become so easy due to the coordination of communication technologies with internet. However, the visually or physically challenged people find it very difficult to utilize this technology because of the fact that using them requires visual and touch perception. Even though much advancement has been made in the recent applications, the physically or visually challenged people cannot use the technologies as efficiently as a normal person can use them.Mobile Application on Voice based Email is a system that would be useful to people who are visually impaired and physically challenged or handicapped. It provides the facilities to use the emails just as a normal person does using the speech-to-text and text-to-speech algorithms where the user without eyesight can use the application efficiently.

1. INTRODUCTION

Today, communication has become so easy due to the coordination of communication technologies with internet. It can be seen that in 2015, the number of worldwide email users was nearly 2.6 billion. By the end of 2019, the number of worldwide email users will increase to over 2.9 billion making emails the most used form of communication. It is estimated that 285 million people globally are visually impaired 1 with 39 million blind and 246 million with low vision [5][6].However, use of this technology is quite tough to utilize this technology to the physical or visual impaired people because of the fact that using them needs visual and touch perception[6].Various system are designed to help visually impaired people such as navigation and location determination system for the blind using an RFID tag grid[8] , a system in [9] helped many people who have difficulty in typing by speech recognition.Email has turned out to be a vital a part of formal communication in skilled world. For the people who can see, checking and giving reply to the mail is normal thing , but the people who are not able to see, this emailing concept is a key concern.Thus for blinds it is a tedious job to use the internet [7] and retrieve the information without any reference. So it is important to make internet facilities available for them too as the entire population now uses cell phones.The increase of computation capability of mobile devices gives inspiration to build up applications that can helpvisually impaired persons. With the ease of use of mobile devices, these people can be help out by an additional method of identification i.e. image processing techniques. We are devloping a system for visually challenged peopleto easily access their mail.

2. LITERATURE SURVEY

A.Piotr Kardysietal.[1] propose an android application supporting blind and partially sightedpeople in smartphone use. It helps them to call, send and receive text messages, make use of a "phone book" as well as of additional options such as positioning or battery monitoring, through voice commands.

B.PayalDudhbaleetal.[2] describe the voice mail architecture used by blind people to access E - mail and multimedia functions of operating system easily and efficiently. The system also reduce cognitive load taken by blind to remember and type characters using keyboard. ASR (Automatic speech recognizer) and TTS (text to speech) get used for converting speech to text and vice versa.

C.T. Shabana et al.[3] propose developing an email system that will help even a na¨ıve visually impaired person to use the services for communication without previous The system will not let the user make use of keyboard instead will work only on mouse operation and speech conversion to text. Also this system can be used by any normal person also for example the one who is not able to read. The system is completely based on interactive voice response which will make it user friendly and efficient to use.

D.Shonal Chaudhry et al.[5] presents the design and implementation of a face detection and recognition system for the visually impaired through the use of mobile computing.The face detection is done using a cascade classifier. Face detection, is done using a temporary image of the detected face. Google TalkBack was used to provide users with feedback on the operation of the application. This experiment results show high face detection accuracy and

promising face recognition accuracy in suitable conditions.

3. FUTURE SCOPE

For the further development of the application , the attachments like images, word documents, audio and video files can be incorporated. Encryption and decryption algorithm can used to protect the username and password that is passed during login. More commands can be used to for different operations like search, mark important, delete, archive, go back, report spam, forward. Automated replying to received mails can be also integrated. The application can be adapted to different languages such that a variety of users can use the application.

4. PROPOSED SYSTEM

In proposed system, firstly user can capture their photo by voice command through their android phone. Face is detected with Haar cascade Classifier. All the feature sets are stored in the database for recognising the persons while using theapplication.At the time of sign-in the application user needs to capture their photo then using Support Vector Classification algorithm analysis on the LBP facial features can be done, to detect the face of the user. After that based on recognized face user can authenticate to the application.If the user is authorized then he can perform the functionalities like compose an mail,read mail and delete unwanted mail just by speaking the content.

5. SYSTEM SPECIFICATION

Hardware Requirements

Processor	: Pentium IV
Speed	: 1.1 GHz.
Hard Disk	: 40 GB.
Monitor	:15VGA Colour.
Ram	: 2gb

Software Requirements:

Operating system: Windows XPProfessional/7LINUX.
Programming Language : JAVA
Database: MYSQL
IDE : Eclipse

6. SYSTEM ARCHITECTURE

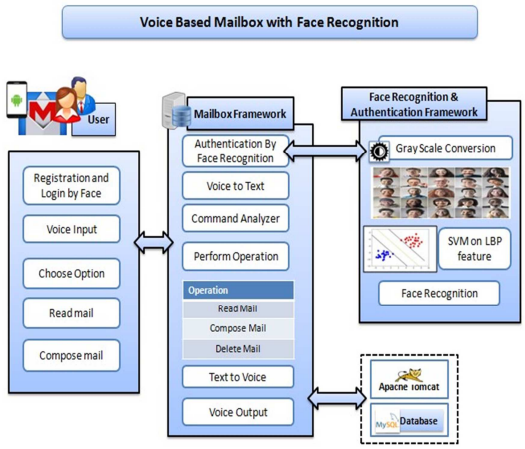


Figure 1 : System Architecture of Proposed System

7. ALGORITHM USED

1. Haar cascade Classifier for Face Detection :

In this system we used Haar classifier algorithm for face detection when one of these features is found, the algorithm allows the face candidate to pass to the next stage of detection. A face candidate is a rectangular section of the original image called a sub-window. Generally these sub-windows have a fixed size (typically 24×24 pixels). This Sub-window is often scaled in order to obtain a variety of different size faces. The algorithm scans the entire image with this window and denotes each respective section a face candidate. The algorithm uses an integral image in order to process Haar features of a face candidate in constant time. It uses a cascade of stages which is used to eliminate non-face candidates quickly. Each stage consists of many different Haar features. Each feature is classified by a Haar feature classifier. The Haar feature classifiers generate an output which can then be provided to the stage comparator. The stage comparator sums the outputs of the Haar feature classifiers and compares this value with a stage threshold to determine if the stage should be passed. If all stages are passed the face candidate is concluded to be a face.

a) Haar Feature Classifier

A Haar feature classifier uses the rectangle integral to calculate the value of a feature. The Haar feature classifier multiplies the weight of each rectangle by its area and the results are added together. Several Haar feature classifiers compose a stage. A stage comparator sums all the Haar feature classifier results in a stage and compares this summation with a stage threshold. Each stage does not have a set number of Haar features. Depending on the parameters of the training data individual stages can have a varying number of Haar features.

b) Haar Features:

Haar features are composed of either two or three rectangles. Face candidates are scanned and searched for Haar features of the current stage. Each Haar feature has a value that is calculated by taking the area of each rectangle, multiplying each by their respective weights, and then summing the results.

2. Support Vector Classification Algorithm :

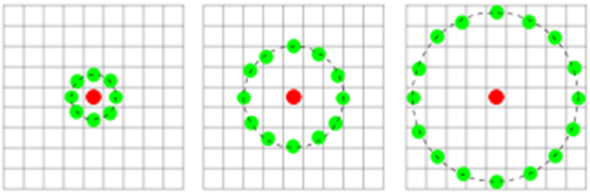
Support vector machine (SVM) proposed by vapnik and cortes have been successfully applied for gender classification problems by many researchers. An SVM classifier is a linear classifier where the separating hyper plane is chosen to minimize the expected classification error of the unseen test patterns.SVM is a strong classifier which can identify two classes. SVM classifies the test image to the class which has the maximum distance to the closest point in the training. SVM training algorithm built a model that predict whether the test image fall into this class or another.SVM require a huge amount of training data to select an affective decision boundary and computational cost is very high even if we restrict ourselves to single pose (frontal) detection.The SVM is a learning algorithm for classification. It tries to find the optimal separating hyper plane such that the expected classification error for unseen patterns is minimized.

For linearly non-separable data the input is mapped to high-dimensional feature space where they can be separated by a hyper plane. This projection into high-dimensional feature space is efficiently performed by using kernels. More precisely, given a set of training samples and the corresponding decision values {-1, 1} the SVM aims to find the best separating hyper plane given by the equation W^Tx+b that maximizes the distance between the two classes.

3. Local BinaryPatterns Histograms:

The LBP feature vector, in its simplest form, is created in the following manner:

1. Divide the examined window into cells (e.g. 16x16 pixels for each cell).
2. For each pixel in a cell, compare the pixel to each of its 8 neighbors (on its left-top, left-middle, left-bottom, right-top, etc.). Follow the pixels along a circle, i.e. clockwise or counter-clockwise.
1. Where the center pixel's value is greater than the neighbor's value, write "0". Otherwise, write "1". This gives an 8-digit binary number (which is usually converted to decimal for convenience).
2. Compute the histogram, over the cell, of the frequency of each "number" occurring (i.e., each combination of which pixels are smaller and which are greater than the center). This histogram can be seen as a 256-dimensional feature vector.
3. Optionally normalize the histogram.
4. Concatenate (normalized) histograms of all cells. This gives a feature vector for the entire window.



The feature vector can now be processed using the Support vector machine, extreme learning machines, or some other machine-learning algorithm to classify images. Such classifiers can be used for face recognition or texture analysis.

D. Modules.

1. User Authentication
2. Mail Functionality

1. User Authentication

1. **Capture User Photo:**
   Firstly user can capture their photo by voice command through their android phone.
2. **Face Detection & Preprocessing:**
   Apply the Haar cascade Classifier for the face detection in images. Once face are detected then apply the pre processing on input images like noise removal, normalization etc.
   a. **RGB to Gray Scale Image :**
      Convert the image into Gray scale by taking the average of the each pixel RGB.
   b. **Local Binary Patterns Histograms:**

1. Divide the examined window into cells (e.g. 16x16 pixels for each cell). For each pixel in a cell, compare the pixel to each of its 8 neighbors (on its left-top, left-middle, left-bottom, right-top, etc.). Follow the pixels along a circle, i.e. clockwise or counter-clockwise.
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i. Optionally normalize the histogram.

ii. Concatenate (normalized) histograms of all cells. This gives a feature vector for the entire window.

4. Feature set is then saved to a model for later matching process.

3. Face Recognition and Authentication:

Using Support Vector Classification algorithm analysis on the LBP facial features, detect the face of the user. After that based on recognized face user can authenticate to the application.

2. Mail Functionality.

1. **Sign-Up:**
   This module is used for to register new user in application.

2. **Sign-In:**
   The existing user can sign-in in application by their face authentication. The user needs to capture their photo and then the system can authenticate the user.

3. **Inbox:**
   The user gets a notification of an email received and the application will allow the user to listen to the email.

4. **Compose Mail**:
   The user can compose an email just by speaking the content and the application will automatically convert it into text.

5. **Delete:**
   The user can delete unwanted emails and put it into the trash folder using this module.

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