AUTOMATED OBJECT RECOGNIZATION FOR THE VISUALLY IMPAIRED PEOPLE

[1]KOUSALYA.R,[2] KEERTHANA.N, [3] KEERTTHANA.B, [4]MRS.KAVITHA
[5]SUBRAMANI(SUPERVISOR)

DEPARTMENT OF CSE

Panimalar Engineering College, Chennai- 600 123

Abstract

Visually challenged are majorly dependent on the Braille language for comprehensive reading of textual documents and their walking sticks they hold everyday for their obstruction identification. Making them virtually visible in an environment and get them workable in a technical organisation this system innovates the technology which provides audio descriptions of their blind surroundings. The design involves human face, object and textual recognition which make vision for visually challenged. The smart kit contains an eye glass provided with camera, an ear phone, a microphone and the system where the processing is carried out. The camera present at the nose head of eye glass captures the intended image of the user as snapshots and transfer to the system where it gets processed and produces the specified audio descriptions as output. The system's database holds a corresponding text for each image which is then converted to audio stream when sounded. In case of any mismatch or no entry of the image in the datasets then the new image is stored as new dataset with the name specified through microphone. This avoids mismatch of that image in the future search.

Keywords:- *Image processing ,eye glass, database, datasets, visually challenged , audio stream*

Introduction

Visually challenged people are one among the very bold in the world because they sense, smell and hear to lead their life. They are bold enough such that they have entered into the field of government, engineering, teaching etc. Also, there is a lot of responsibility for them to lead their daily happenings with their authenticated persons, their objects and their readable documents. In accordance with their interest in many fields here is a technology where they can able to virtually see the happenings of the world through the Eye glass. The mainstay of the project is to design involves human face, object, and textual recognition which make vision for visually challenged along with the face emotions identification. Globe wide there are many natural blinds and some by accidental manner have lost their vision. In order to credit their attitude this innovation provides an information of the users doubted scenes through an audio stream. This makes visually challenged smartly survive in an environment as others.

Past related works

The existing technology provides a camera jacket as a kit that is to be hold by the visually challenged for use. The camera focuses form the center chest and records the video stream of the environment. The recorded video frames will be checked with the datasets of the system to check for an obstruction. The drawback found in this technology is that it can only identify the obstruction. Rather it could not accurately identify the nature of the object. Also, user updation of datasets is not allowed. The algorithm's processing is done at the smart phone and audio stream of the extracted obstacle is sounded through an earphone. Object Recognition For Blind describes a haptic application that allows blind people recognize three-dimensional (3D) objects that exist in virtual environment. The system allows

blind people to touch, grasp and manipulate objects that exist in the hap-tic enabled VE. The system is designed in order to provide an alternative way of human computer interaction to blind users.

The Mobility Aid for the visually impaired Electronic Travel Aids, which transform visual environmental cues into another sensory modality, have been proven to help visually impaired people travel with a greater degree of psychological comfort and independence. The People Sensor is an Electronic Travel Aid designed to address two issues of importance to visually impaired people: inadvertent cane contact with other pedestrians and objects, and speaking to a person who is no longer within hearing range. The device uses piezoelectric and ultrasound sensors to locate and differentiate between animate (human) and inanimate (non-human) obstructions in the detection path. The distance between the user and the obstruction, along with the nature of the obstruction (human or non-human) is transmitted via modulated vibrotactile feedback.

Implementation of RFID For Blind Bus Boarding System outlines implementation of RFID for a bus detection mechanism to help blind in travelling from one place to another. Generally, journey in a bus is highly difficult for those who have congenital blindness from a very young age .Blind bus boarding system aims to develop a bus detection prototype using Radio Frequency Identification (RFID) for blind. RFID has the potential to be a useful aid with further standardization of RFID tags and improvement of current RFID readers.

Bus identification system for the visually impaired have established the need and utility of accessible urban transport system for visually impaired persons. Onboard, the bus identification and homing system has been developed to address these needs. A radio-frequency based, completely user-triggered system helps the user first to identify the route number and then enables the user to board the bus using the auditory cues from the entrance of the bus. The design improvements which enable the installation of the bus module in varying buses of different service providers. Objective of our study has been to generate empirical evidence that would facilitate the move towards incorporation of such a system in public buses globally. The positive feedback received confirms that the system enables independent access to the visually impaired without compromising on their safety.

Wearable Object Detection System for the Blind capacities to navigate in a particular place and to organize their daily activities are of vital importance for their health and well-being. RFID, or radio frequency identification, is a technology that can provide a support for improving the organization and orientation during the daylight activities. RFID uses radio waves to deliver data from a tag, which stores information, to a reader, which can elaborate the information making decisions. It may involve additional improvements for numerous applications in the field of health care. In this paper, a RFID device designed as a support for the blind in searching some objects is presented; in particular, it has been develop for searching the medicines in a cabinet at home. The device is able to provide to the blind some pieces of information about the distance and simplify the search.

Target tracking and mobile sensor navigation in wireless sensor networks studies the problem of tracking signal-emitting mobile targets using navigated mobile sensors based on signal reception .The mobile sensor controller acquires the TOA measurement information from both the mobile target and the mobile sensor for estimating their locations before directing the mobile sensor's movement to follow the target. Target tracking propose a min-max approximation approach to estimate the location for tracking which can be efficiently solved via semidefinite programming (SDP) relaxation, and apply a cubic function for mobile sensor navigation. Mobile sensor estimate the location of the mobile sensor and target jointly to improve the tracking accuracy.

Proposed system:

The proposed technology introduces the concept of the eye glass containing the camera for taking the snapshots of the blind surroundings. The taken snapshots are processed with the corresponding algorithm like Discrete Wavelet Transform(DWT) Speeded Up Robust Feature(SURF) ,Euclidean Distance(ED), Optical Character Recognition (OCR) and a relevant text document of that image is retrieved . Sometimes images obtained from satellites and conventional and digital cameras lack in contrast and brightness because of the limitations of imaging sub systems and illumination conditions while capturing image. Images may have different types of noise. In image enhancement, the goal is to accentuate certain image features for subsequent analysis or for image display.

Various techniques have been developed in Image Processing . The key function of preprocessing is to improve the image in ways-that increase the chances for success of the other processes. Preprocessing typically deals with techniques for enhancing contrast, removing noise, and isolating regions whose texture indicate a likelihood of alphanumeric information. The processing of image involves recognition and classification of images

Finally the neural network classifier is implemented in order to check the input image with database image. Then the output layer produce the corresponding name which will be heard through the earphone if the person is identified and if the person is not identified it is displayed as unknown person. And, the text document is converted to an audio file and sounded at the earphone along with which the emotions on the face is recognized using electro encephalogram signals.

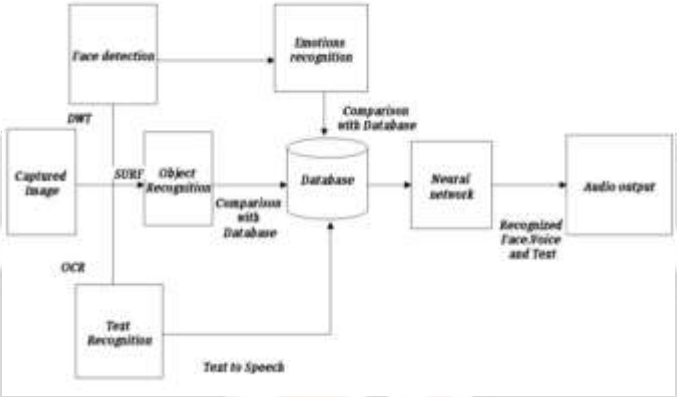


Figure.1 Proposed System Architecture

Algorithms used:

Discrete Wavelet Transform

The purpose of feature extraction technique in image processing is to represent the image in its compact and unique form of single values or matrix vector.

Low level feature extraction involves automatic extraction of features from an image without doing any processing method.

In this paper, we consider the use of high level feature extraction technique to investigate the characteristic of narrow and broad weed by implementing the 2 dimensional discrete wavelet transform (2D-DWT) as the processing method. Most transformation techniques produce coefficient values with the same size as the original image.

Euclidean Distance (ED):

In mathematics, the Euclidean distance or Euclidean metric is the "ordinary" straight-line distance between two points in Euclidean space. With this distance, Euclidean space becomes a metric space. The associated norm is called the Euclidean norm.

ED is used to verify whether the person is in database or not .It used to find the Distance between database and test image features.

Speeded Up Robust Features:

SURF is a patented local feature detector and descriptor. It can be used for tasks such as object recognition, image registration, classification or 3D reconstruction. It is partly inspired by the scale-invariant feature transform (SIFT) descriptor.

The algorithm has three main parts:

1. Interest point detection,
2. Local neighborhood description and
3. Matching

Optical Character Recognition(OCR):

Optical character recognition (OCR) is process of classification of optical patterns contained in a digital image corresponding to alphanumeric or other characters. The character recognition is achieved through important steps of segmentation, feature extraction and classification. OCR has gained increasing attention in both academic research and in industry.

Neural networks

A Neural Network (NN) is an information processing paradigm that is inspired by the way biological nervous systems, such as the brain, process information. The key element of this paradigm is the novel structure of the information processing system. It is composed of a large number of highly interconnected processing elements (neurons) working in unison to solve specific problems. NNs, like people, learn by example. An NN is configured for a specific application, such as pattern recognition or data classification, through a learning process. Learning in biological systems involves adjustments to the synaptic connections that exist between the neurons.

A linear regression model can be a model of the form,

$$y_i = \beta_0 + \sum_{k=1}^{K} \beta_k f_k\left(X_{i1}, X_{i2}, \cdots, X_{ip}\right) + \varepsilon_i, \quad i = 1, \cdots, n,$$

The fitted linear function is

$$\hat{y}_i = b_0 + \sum_{k=1}^{K} b_k f_k\left(X_{i1}, X_{i2}, \cdots, X_{ip}\right), \quad i = 1, \cdots, n,$$

Train the network

Once the network weights and biases are initialized, the network is ready for training. The multilayer feed forward network can be trained for function approximation (nonlinear regression) or pattern recognition. The training process requires a set of examples of proper network behavior network inputs p and target outputs t. The process of training a neural network involves tuning the values of the weights and biases of the network to optimize network performance, as defined by the network performance function net .performance . The default performance function for feed forward networks is mean square error msg—the average squared error between the network outputs a and the target outputs t. It is defined as follows:

$$F = mse = \frac{1}{N}\sum_{i=1}^{N}(e_i)^2 = \frac{1}{N}\sum_{i=1}^{N}(t_i - a_i)^2$$

There are two different ways in which training can be implemented: incremental mode and batch mode. In incremental mode, the gradient is computed and the weights are updated after each input is applied to the network. In batch mode, all the inputs in the training set are applied to the network before the weights are updated. This topic describes batch mode training with the train command. Incremental training with the adapt command is discussed in Incremental Training with adapt. For most problems, when using the Neural Network Toolbox™ software, batch training is significantly faster and produces smaller errors than incremental training. For training multilayer feed forward networks, any standard numerical optimization algorithm can be used to optimize the performance function, but there are a few key ones that have shown excellent performance for neural network training. These optimization methods use either the gradient of the network performance with respect to the network weights, or the Jacobian of the network errors with respect to the weights. The gradient and the Jacobian are calculated using a technique called the back propagation algorithm, which involves performing computations backward through the network.

Training algorithm

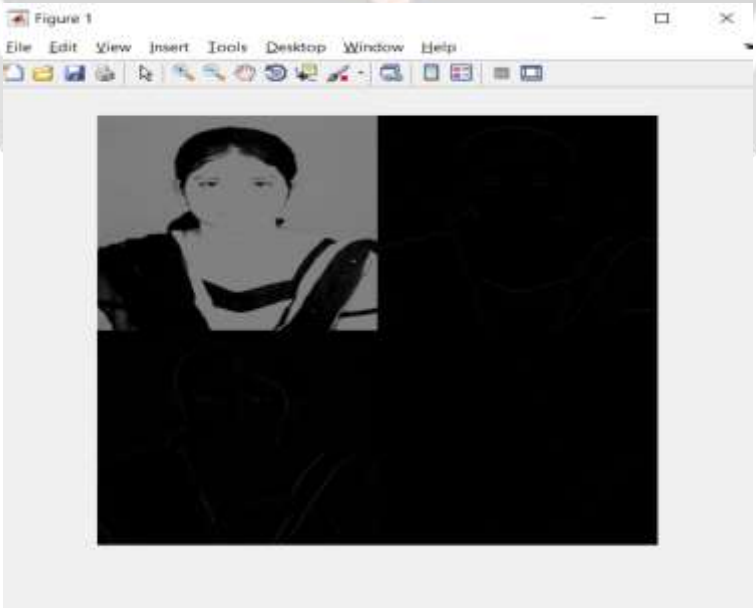
As an illustration of how the training works, consider the simplest optimization algorithm — gradient descent. It updates the network weights and biases in the direction in which the performance function decreases most rapidly, the negative of the gradient. One iteration of this algorithm can be written as

$$\mathbf{x}_{k+1} = \mathbf{x}_k - \alpha_k \mathbf{g}_k$$

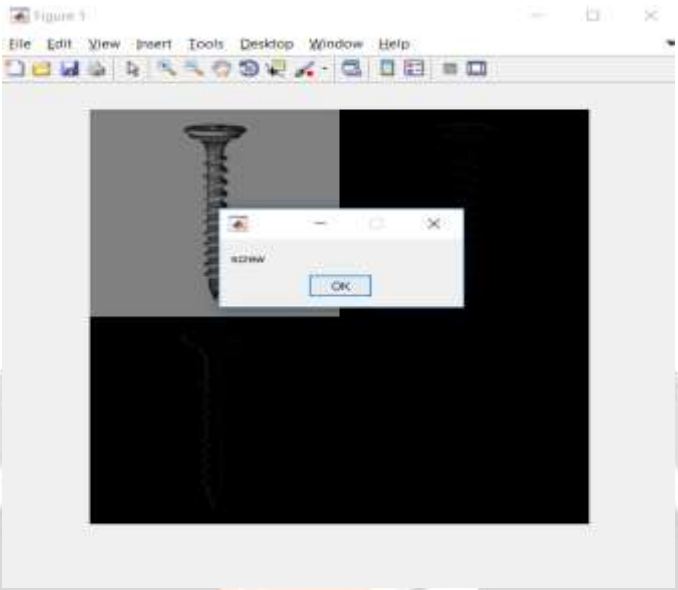
Where x k is a vector of current weights and biases, g k is the current gradient, and αk is the learning rate. This equation is iterated until the network converges.

Experimental result

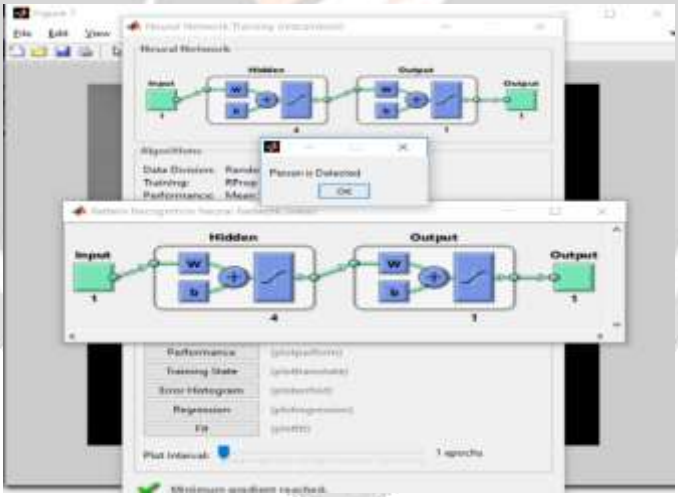
Face recognition



Object recognition



Live face recognition



Conclusion and future enhancement

Visually impaired are one of the bravest people in the world as they face lots of challenges to complete in this world .The life of darkness has made them the habit of touch and sense .Touch and sense methods cannot be efficient and sufficient at all times .Though in the absence of sight they intrest themselves in many areas of education and employment and etc. .we have proposed a technology to provide vision to visually challenged peoples in order to encourage and honor them this system makes the visually challenged most achievable in their fields of interest providing an imaginary view of their surroundings to create a greatest knowledge of surroundings.

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