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Static Indoor Object Detection Using MATLAB For Visually Impaired

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***Abstract*—** Detection of indoor static objects by visually impaired without help of third person is a crucial task. The indoor object detection enables a visually impaired to settle on suitable and convenient choices of route to follow in an indoor area. Literature presents that methods such as Electronic Travel Aids (ETA), Augmented Reality (AR) and Navigation Assistance for Visually Impaired (NAVI) are used to assist visually impaired. These methods are expensive and involves overhead for every decision. This paper presents an algorithmic based model which uses machine learning technique. In the proposed methodology firstly, the database is prepared which consist of various images of objects to train the system. During the use, the image which is captured by the visually impaired is compared with entries of the database to detect the object. The experiments were conducted using MATLAB for image recognition and analysis.

***Keywords*—** Image processing; Machine learning; Indoor object detection; Visually Impaired; Blind people; Navigation; Object recognition applications; MATLAB.

I. INTRODUCTION

Late update of visual weakness definition in the worldwide measurable characterization of maladies, did in 2006, has uncovered that visual keenness and execution are arranged by of the accompanying four levels, to be specific, typical vision, moderate, extreme, and visual impairment [1]. Regardless of the wonderful therapeutic endeavors being devoted to adapt to vision inability, the enormous planned jump to full sight recuperation has still not achieved. In any case, strong arrangements could be methods toward a fractional recuperation. Therefore, assistive restoration advances have been discovering their way to satisfy such need to a sensible degree.

In journey of visual inability recovery, a few models and plans have been proposed in this way, and have managed distinctive issues. Concerning route issue, which has been given the greatest piece of enthusiasm as contrasted and the acknowledgment perspective, distinctive commitments have been completed, and by and large two primary gatherings are considered in the writing. In the general PC vision writing, a few works managing multi object acknowledgment can be found in [18] – [22]. In [18], for example, a novel methodology for semantic picture division is researched.

Displayed in [19] is an adaptable multiclass indicator, in which a common discriminative codebook of highlight appearances is mutually prepared for all article classes. In this manner, a scientific classification of article classes is based in light of the educated sharing circulations of components among classes, which is immediately taken as a way to decrease the expense of multiclass item identification. Taking after a plan that joins neighborhood representations with locale division and layout coordinating, in [20], a calculation for grouping pictures containing numerous items is displayed. In [21] a different model is mentioned which makes utilization of a codebook from edge based components. Pantofaru et al. [22] present an article acknowledgment strategy which begins from a base up picture division and dissects the numerous division layers of the picture. By and large, it rises that the majority of the commitments manage the multi recognition issue as a picture division issue and propose arrangements not especially adjusted to the connection of visually impaired help in light of tight time preparing prerequisites.

To provide a solution to the above mention problem of visual disability, our paper proposes an approach intended to take care of the issue of multi object discovery that are present in image. The proposed methodology will be realized through picture multi labeling. Given a question picture as an initial step it is used as a minimal grouping of coefficients by method for the compressive detecting (CS) representation [23], [24]. In our proposed methodology we deal with two types of images out of which one is main image and other is sub image. The main image is the image which is stored in the database and the sub image is the image which is searched in main image for object detection. The sub image is the input by visually impaired. If the sub image is successfully located in the main image, then a voice is generated which contains the name of the detected object otherwise no generation of voice.

II. LETERATURE REVIEW

There exist many distinctive methodologies for detection of static objects which has its own advantages and disadvantages. Furthermore, some methodologies propose the combination of several existing methods [7]. The most

generally used sensors in these methods are: radio repeat (RF), laser, GPS, acoustic, vision or the mix of a couple of them. By far majority of the methodologies using GPS information offer near issues: low precision in urban-circumstances, signal misguidance. Loomis et al. [8] work shows that accuracy of GPS is limited to approximately 20m considering extraordinary satellite detectable quality conditions which can be a problem for visually impaired.

In [9] GPS precision is upgraded by including semantic information into the confinement structure to help visually impaired in urban circumstances. In [11] a Radio Frequency Identification (RFID) method for detection of static objects which requires the arrangement of a thick arrangement of region identifiers. In [7], a blend of various strategies is mentioned which incorporates the information from spinners, a foot-mounted pedometer and 2D laser scanner. In [5] researchers presented a different approach that makes use of 3D map of the region to help the visually impaired. In [1] the researcher represents a head-mounted stereo vision structure for the visually impaired. In [12] an improved control and mapping technique for helping visually impaired is proposed that turns out be very beneficial in dynamic environment. In [13] vector field histogram based approach is used.

The FIU undertaking presents a method with PDA and six sonars, which was attempted by some visually impaired. Then again, its course execution was moderate. In association with structures using vibro-material interface, some of them join stereo cameras as identifying system as mentioned. Most of the methodologies concentrated on techniques in [3] are wearable structures fit in small get ready units but they are not affirmed by visually impaired. In [17] a method that uses the installed camera on a mobile phone which is fit for perceiving on-floor hindrances. The drawbacks of this method are the circumstance is emulated regardless of the way that few execution tests of the proposed computation were executed inside. Additionally, urges the need of a '45 degrees' tilt edge of the telephone concerning the base level meanwhile the client is carrying it for risks on the floor [18]. In [19] another approach is presented which involves ultrasound sensors. In a surprising path, in another later approach [20], the makers put the consideration on the obstruction division undertaking, which relied on upon significance and saliency maps and a neural framework. In spite of the way that, they both yielded taking care of readings less than 5 plots for consistently and it was not attempted by visually impaired. Standard responsibility of system is a hindrance avoiding strategy that works consistently and been attempted by visually impaired. The system is sans ears in light of the fact that the sound-related sense is the most indispensable perceptual hotspot for the visually impaired and it is moreover without hands to give them a chance to hold the white stick.

III. METHODOLOGY

The above mentioned objects are accomplished through the improvement of the present creation that can help the millions who require an innovation that can review their visual handicap. The present creation can be seen both as an item and as a service. As an item, it can be a product of the business sector where individuals can purchase it. As a service, it can be given to the non-benefit associations that are working for the visually impaired group. The block diagram of our proposed methodology is shown below

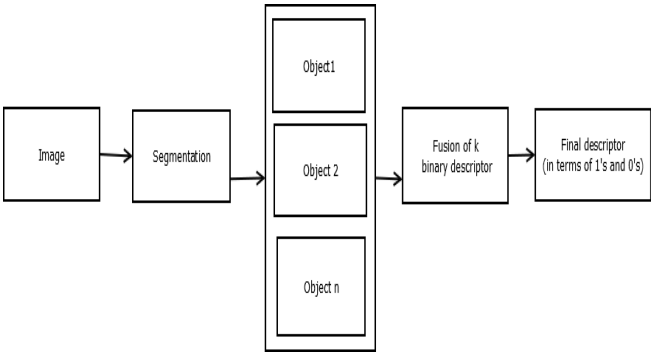

Figure-1 Architecture Diagram

A. *Image Segmentation Algorithm*

Image segmentation algorithm is used to partition the image into various objects. These are object that are to be compared during further execution. This image segmentation is done through the various algorithms include Region Based Segmentation, Watershed Segmentation, K-means Clustering Algorithm, Graph Based Methods, Edge Based Image Segmentation.

B. *Other Recommendatations*

In this phase the objects that are obtained from the image are stored in the database. These objects are further used during analyzing phase. Various database like MySQL, oracle and so on are used for this propose. This invention is based on the machine learning technique which includes two phases training and testing phase. In the training phase the machine is trained by supplying the adequate amount of data. In our invention this training phase is done by supplying the image objects to the database. The block diagram of training phase is shown below.

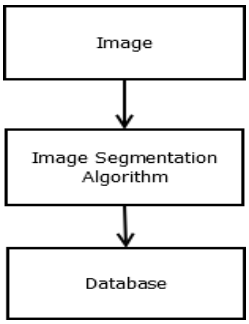

Figure-2 Block Diagram of Training Phase

In testing phase the system should predict the presence of the object based on the testing objects. The block diagram of testing phase is shown below.

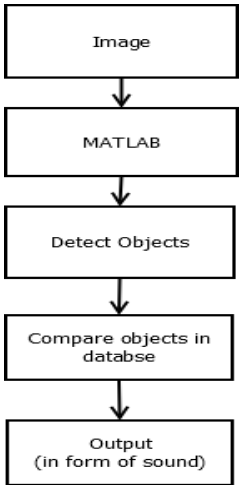

Figure-3 Block Diagram of Testing Phase

C. Comparision Phase

In this phase actual comparison is done between objects that are stored in the database and captured objects. In our project, the comparison is done between the objects and the image. The system should predict the presence or absence of the object in the image in the form of audio or text to the visually impaired person.

IV. RESULTS

A. Total Image

It is the image in which the presence of the object is to check.

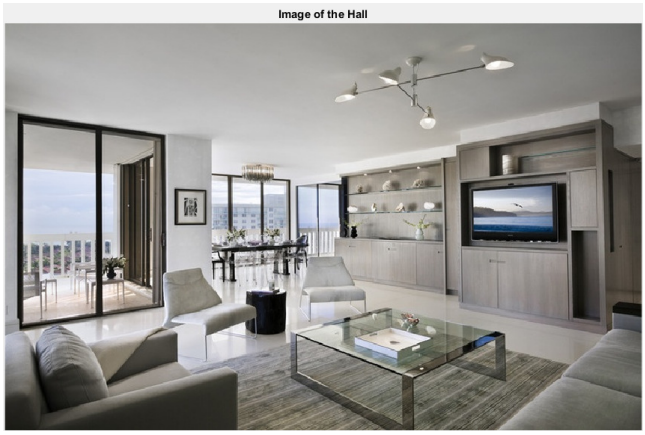

Figure-4 Main Image

B. Object Image

It is the mage which is checked into the total image for the presence.

Figure-5 Sub Image

C. Feature Extraction for Total Image

In this phase, features are extracted from total image based on color, texture, shape etc.

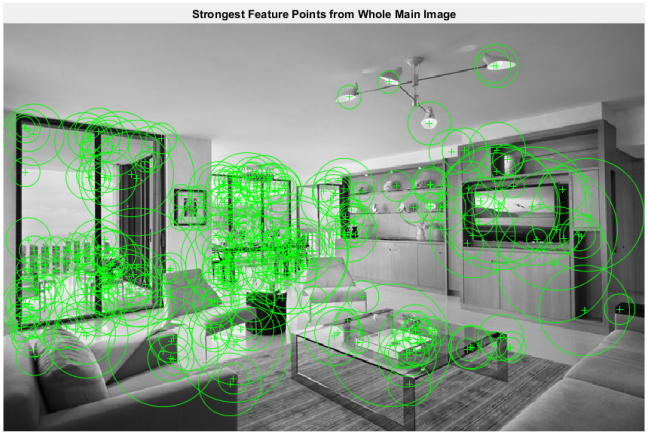

Figure-6 Feature Extraction

D. Feature Extraction from Object Image

In this phase, the features i.e. color, texture, shape from the image.

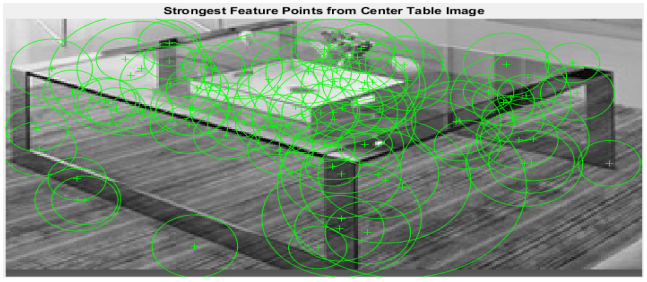

Figure-7 Feature Extraction from Object Image

E. Feature Matching

In this phase, the pattern is match between the total image and object image. It is the mapping from object image and total image.

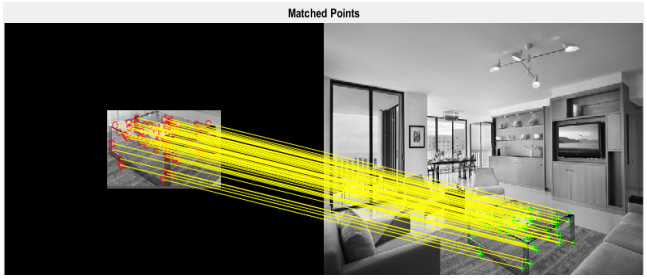

Figure-8 Feature Matching

V. ANALYSIS

The experiment results were compared with existing methods such as the Electronic Travel Aid and Augmented Reality. In our proposed methodology we used indoor object detection algorithm along with inbuilt Text-to-Speech synthesis available with MATLAB. The detected object is realized by the visually impaired with the help of voice generated by TTS engine.

Figure-8 Detected Image

Table 1.1 has the comparison of some existing algorithms for indoor object detection and extraction. The time require for the proposed algorithm and existing methods.

Sr. No.	Comparison of Existing and Proposed Methodologies	
	Function	***Processing Time***
1	Execution Time (Proposed)	2.831 Second
2	Electronic Travel Aid (Existing)	45 Second
3	Augmented Reality (Existing)	10 Second

VI. CONCLUSION

The proposed methodology is an improved algorithm when compared with previous techniques like Electronic Travel Aids (ETA) and Augmented Reality (AR). It can detect any static complex objects thereby assisting the visually impaired. Also the proposed method does not make use of any sensors which makes it simple and cost effective. Thus the invention of indoor object detection provides an efficient means navigation. It helps the visually impaired to be independent of the third person.

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