IJCSE International Journal of Computer Sciences and Engineering Open Access
Research Paper Volume-3, Issue-5 E-ISSN: 2347-2693

Object Detection Using IP for Visually Impaired Person

Shruti Parkhi[1*], S.S.Lokhande[2] and N.D.Thombare[3]

[1*] *Electronics Department, Savitribai Phule Pune University, India*
[2,3] *Electronics and telecommunication Department, Savitribai Phule Pune University, India*

www.ijcseonline.org

Received: Apr/26/2015 Revised: May/06//2015 Accepted: May/22/2015 Published: May/30/ 2015

***Abstract*—** In this paper, we have proposed a real time android application for object detection using android Smartphone for visually impaired person. The proposed object detection system, the main module is to scan objects and match to a database of objects for object detection. Feature detector methods such as SIFT, SURF, FAST are good which yields high quality features but they are computationally complex to use in real time system. It also has limited resources for computer and Smartphone platform. In this paper, we have used Sobel edge detection method for faster feature computation by extracting object edge information. Normalization is applied to extracted object features. Further, back propagation neural network training is performed for efficient detection of objects. Compared to conventional SIFT, SURF and FAST algorithm. The proposed object detection system based on Sobel edge detection yields in increased speed of detection and low performance degradation on Smartphone.

***Keywords*—**Object Detection; Sobel Edge Detection, BPNN, Smartphone;

I. INTRODUCTION

The blind and the visually impaired face diverse kinds of life challenges that normally sighted people take for granted. As far as out-door activities are concerned the blind indicate difficulties in safe and independent mobility. It is depriving them from normal, professional and social life. The issues dealing with communication and access to information are pointed out. The software application offered for computers and touch screen devices equipped with various applications such as text to speech synthesizers. It provides easy access of Smartphone [1]. The object detection and recognition technology is used for object tracking, recognition and prediction of moving object as it is one of the major research area in computer vision.

Object detection technology recognizes objects from input image through the learning process it relies on objects features such as edge, shape and intensity. In general, the input image is analyzed in three stages for object detection. First, features are examined based on local image information. Second, classification is done based on extracted features from image. Finally, objects in the image are recognized based on training process [2]. Artificial neural network algorithm is used for detecting objects in the image.

A neural network model is a powerful tool used to perform pattern recognition and other intelligent tasks as performed by human brain. The neural network approach for pattern recognition is based on the type of the learning mechanism and it is applied to generate the output from the network. The learning can be classified as Supervised learning [3] in which the desired response is known to the system i.e. the system is trained with the priori information available to obtain the desired output.

For our image processing application we have decided to choose the Android platform, because of wide popularity of the Android based devices. According to Gartner's analysis in the end of 2012 the mobile platform has gained 70% share of the Smartphone market [4]. Moreover it is equipped with speech synthesis and accessibility software.

The proposed object detection system uses Sobel edge detection for feature extraction. For training and detection of object in a image, ANN classifier i.e. BPNN algorithm is used. In the proposed object detection system, input image given to system from that noise in a image is removed. Edge detection is done to extract corner information and remove the noise over edges. The corner information is extracted from the input image using the Sobel edge detector. After training or learning is performed the extracted object image data is saved to database.

II. RELATED WORK

Object detection using image processing algorithms and artificial neural network (ANN) on android phone is an emerging concept. Hence only few published literature were available. However, the available literatures mainly concentrated on desktop application.

Kanghun Jeong and Hyeonjoon Moon designed object detection application using Feature Accelerated Segment Test (FAST) algorithm based on Smartphone to describe environment, navigation and interaction [5]. FAST corner detector provides faster feature computation by extracting only corner information. Further normalization is applied to extracted features. Based on normalized extracted features information SVM and BPNN training are performed for efficient recognition of objects.

K.Matusiak, P.Skulimowski and P.Strumillo designed object recognition application using Scale Invariant Feature Tranform (SIFT) transform to detect and localize object in image robustly. It is insensitive to image restriction parameters i.e. scale, rotation and lighting condition [6]. Further, for classification and training matching keypoints technique was used.

Savitha G, Venugopal P S, Dr. Sarojdevi and Dr. Niranjan Chiplunkar designed object detection approach on android mobile phone using morphological opening and closing filters are used in sequence for object detection [7]. Contour based learning techniques are adopted for drawing contours of object detected. Open CV functions are used to implement these algorithms on android mobile phone.

Ruxandra tapu, Bogdan Mocanu, Andrei Bursuc and Titus Zaharia designed obstacle detection and classification system using multiscale Lucas-Kanade algorithm for extracting interested points. Through homographic transform camera and background motion is estimated [8]. For objects in motion Agglomerative clustering technique is used. Interested points are refining using k- nearest neighbors (K-NN) algorithm. Further, object classification in video stream HOG descriptor into bag of visual words (BoVW) retrieval framework is combined. For training SVM algorithm is used.

III. PROPOSED WORK

In proposed work, object detection system is designed for visually impaired person using android Smartphone. The goal is to design an application which will allow detecting objects from images captured by camera of a mobile device. The block diagram of proposed system is shown in figure 1.

The proposed object detection system implies Sobel edge detection for feature extraction. For object image training and detection ANN classifier i.e. (BPNN Algorithm) is used. In the proposed object detection system, input image given to system from that noise in image is removed. The color image is converted to gray scale to get each pixel value same in overall image.

Edge detection is done to extract corner information and remove the noise over edges. The corner information is extracted from the input image using the Sobel edge detector [9]. Thresholding is the simplest method of image segmentation. From a grayscale image, thresholding can be used to create binary images i.e. image with only black and white colors. Feature detection is done to extract features of object in image. The extracted features histogram is plotted. Histogram is a simple graph that displays where all of the brightness levels contained in the image from the darkest to the brightest. Histogram normalization is a process that changes the range of pixel intensity values. Normalization is sometimes called contrast stretching or histogram stretching. It is also called as dynamic range of expansion in digital signal processing. The purpose of dynamic range expansion in the various applications is usually to bring the image or other type of signal into a range that is normal to the senses.

Further the object training and recognition process is proceeding. In training mode, image feature is given to ANN classifier i.e. BPNN algorithm [10] after training or learning extract object image features is saved to database. In recognition mode, feature is given to ANN and it is compared to database saved. If an object features in image matches feature saved in database. Object name is given in text form and text is verbalised using text to speech synthesizers.

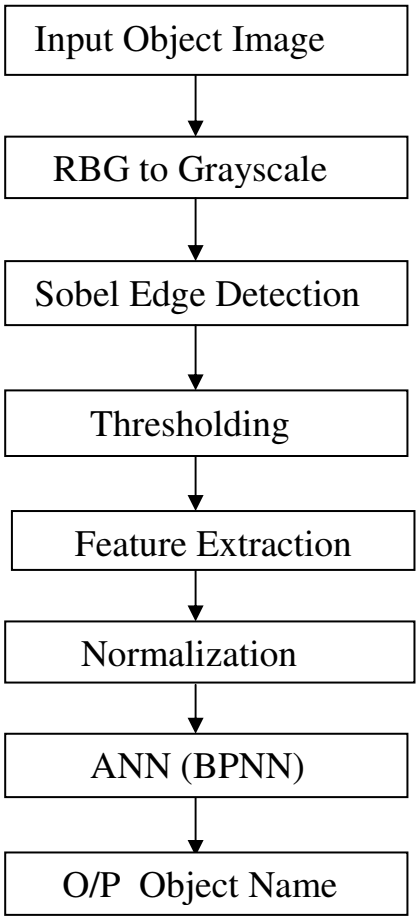

Figure 1:- The block diagram of Proposed System.

A. *Sobel Edge Detection*

In digital image, the edge is a collection of the pixels whose gray value has a step or roof change. It also refers to the part where the brightness of the image local area changes significantly. Edge widely exists between objects and backgrounds, objects to objects. The general method of edge detection [11] is to study the changes of a single image pixel in a gray area. Image edge is the most basic features of the image. When we observe the objects, the clearest part we see

firstly is edge and line. According to the composition of the edge and line, we can know the object structure. Therefore, edge extraction is an important technique in image processing and feature extraction.

Compared to other edge operator, Sobel has two main advantages,

- The introduction of the average factor, it has some smoothing effect to the random noise of the image.
- As it is the differential of two rows or two columns, the element of the edge on both sides has been enhanced, so that the edge seems thick and bright.

Sobel operator is a kind of orthogonal gradient operator. Gradient corresponds to first order derivative, and gradient operator is a derivative operator. For a continuous function f(x, y), in the position (x, y), its gradient can be expressed as a vector. The two components are two first derivatives which are along the X and Y direction respectively.

$$\nabla f\ (x, y) = [Gx\ Gx]^T = [\partial f/\partial x\ ,\ \partial f/\partial y\ ] \quad (1)$$

The magnitude and direction angle of the vector are

$$\text{Mag}\ (\nabla f) = |\nabla f_{(2)}| = [Gx^2\ Gy^2\ ] \quad (2)$$

$$\emptyset\ (x, y) = \arctan\ (Gx / Gx) \quad (3)$$

The partial derivatives of the formulas above need to calculate each pixel location. In practice, we often use small area template convolution to do approximation. Gx and Gy need a template each, so there must be two templates combined into a gradient operator. The two 3x3 templates used by Sobel are shown in figure 2 (a) and (b).

-1	-2	-1
0	0	0
1	2	1

(a) Convolution template S1

-1	0	1
-2	0	2
-1	0	1

(b) Convolution template S2

Figure 2:- Sobel Edge Operator

B. Back Propogation Neural Network

Back propagation was created by generalizing the Widrow-Hoff learning rule to multiple layer network and non linear differentiable transfer function. Input vectors and corresponding target vectors are used to train a network. Until it can approximate a function, associate input vectors with specific output vectors, or classify input vectors in an appropriate way is defined. Networks with biases, input layer, hidden layer and a linear output layer are capable of approximating any function with a finite number of discontinuities. The back propagation algorithm [12] consists of two paths forward path and backward path. Forward path contain creating a feed forward network, initializing weight, simulation and training the network. The network weights and biases are updated in backward path.

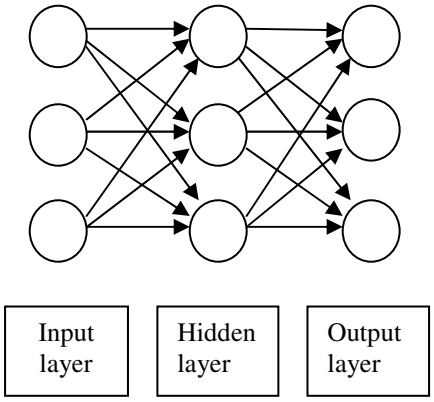

Figure 3:- Back Propagation Neural Network Model

Feed forward networks often have one or more hidden layers of neurons followed by output layer of neurons. Multiple layers of neurons with non linear transfer functions allow the network to learn non linear and linear relationships between input and output vectors. Before training a feed forward network, the weight and biases must be initialized. Once the network weights and biases have been initialized, the network is ready for training. We used random numbers around zero to initialize weights and biases in the network. The training process requires a set of proper inputs and targets as outputs. During training, the weights and biases of the network are iteratively adjusted to minimize the network performance function. The default performance function for feed forward networks is mean square errors, the average squared errors between the network outputs and the target output.

IV. CONCLUSION AND FUTURE SCOPE

This paper has presented the object detection application using image processing algorithm for visually impaired person on android mobile phone. The object detection application is designed only for indoor premises. Future

scope is to study redesign the proposed algorithm using various other image processing algorithms.

REFERENCES

[1] Strumillo P. Electronic navigation systems for the blind and the visually impaired, Lodz University of Technology Publishing House (in polish).

[2] Hersh M, Johnson M. (Eds) Assistive technology for visually impaired and blind people, Springer, London (2008)

[3] Ms. Sonali. B. Maind and Ms. Priyanka Wankar "Research Paper on Basic of Artificial Neural Network" International Journal on Recent and Innovation Trends in Computing and Communication, Vol. 2, Issue-1, January 2014, pp.96 – 100.

[4] Gartner Says Worldwide Sales of Mobile Phone http:/www.gartner.com/newsroom/id/2237315. Accessed 25th February 2013.

[5] Kanghun Jeong and Hyeonjoon Moon "Object Detection using FAST Corner Detector based on Smartphone platforms" 2011 First ACIS/JNU International Conference on Computers, Networks, Systems, and Industrial Engineering, pp.111 – 115.

[6] K. Matusiak, P.Skulimowski and P. Strumillo "Object Recognition in a mobile phone application for visually impaired users" 6th International Conference on Human System Interaction (HSI), 2013 , IEEE, pp. 479 – 484.

[7] Savitha G, Venugopal P S, Dr. Sarojdevi and Dr. Niranjan Chiplunkar "An Approach for Object Detection in Andriod Device" Fifth International Conference on Signal and Image Processing , 2014, pp. 9 – 14.

[8] Ruxandra tapu, Bogdan Mocanu, Andrei Bursuc and Titus Zaharia "A Smartphone-based obstacle detection and classfication system for assisting visually impaired people" Proceedings of the 2013 IEEE International Conference on Computer Vision Workshops, pp. 444-451.

[9] Rashmi, Mukesh Kumar and Rohini Saxena " Algorithm And Technique On Various Edge Detection : A Survey" An International Journal Signal & Image Processing, June 2013, Vol.4, Issue-3, pp.65-75.

[10] Saduf and Mohd Arif Wani "Comparative Study of Back Propagation Learning Algorithms for Neural Networks" International Journal of Advanced Research in Computer Science and Software Engineering, December 2013 Vol.3, Issue-12, pp 1151-1157.

[11] Wenshuo Gao, LeiYang Xiaoguang Zhang and Huizhong Liu , "An Improved Sobel Edge Detection" 2010 3rd IEEE International Conference on Computer Science and Information Technology (ICCSIT), pp. 67 – 71.

[12] Dr. Rama kishore and Taranjit Kaur "Backpropagation Algorithm: An Artificial Neural Network Approach for Pattern Recognition" International Journal of Scientific & Engineering Research, June 2012 , Vol.3, Issue-6, pp.1-4.