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Object Recognition Based on MATLAB

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***Abstract* -This paper describes image processing and its applications using MATLAB. Prime objective of image processing involves extraction of important information from the processed images. By use of this data, description and interpretations can be provided by the machine. Image processing modifies the original image in the desired format (image). And this system provides the users with the hard copy of the image using printer and also allows them to save the file in the desired format with extensions. In our practical life, we find many applications of image processing. One of the best examples in our day to day life is our brain in coordination with our eye which views a lot of images and helps the brain to sense and process information at higher rates and less time. Hence such operations carried out using image processing will help us in greater understanding and vision by development and implementation of image processing. In this paper image processing, object detection, applications of image processing using MATLAB and prospects are discussed.**

***Keywords* -Image processing, Object detection, MATLAB, Extraction, Information.**

I. INTRODUCTION

Computer vision is one of the most desired fields of Artificial Intelligence. It is a methodology by which software's can recognize, analyze, track and detect images and scenes [9]. It has applications in parking detection, object recognition, face detection, area monitoring etc. A lot of object detection methods have been introduced. Most of these methods involve complex mathematical frameworks and algorithms. These methods are further applicable for profound understanding, planning and experimentations. All of these methods can be learned by careful reading, reviewing, researching, observing and expert guidance [5].

Many platforms like C, C++, Open CV, MATLAB etc. are taken into consideration for design and implementation of image processing algorithms. But the application of object detection system in real time requires satisfaction of two conditions. First, execution time should be less which means code should be short. Secondly, effective use of memory needs to be done. For these conditions to be satisfied, it is very time consuming for a programmer to develop such a code for real time application purposes.

Considering all these facts, MATLAB is found to be most efficient and convenient platform for designing and implementing the algorithms. It possesses seventy toolboxes which encompasses all possible fields used in technology. All these toolboxes are provided with predefined functions, objects and Simulink blocks [4]. All of these features together help the programmer to write short and effective code and saves time in logic processing at different stages of the system. Matrix operation is a huge advantage during processing and MATLAB supports this operation. MATLAB coding is easily learned by any new programmer or researcher. Image processing is a type of signal processing which includes input as an image but output may be an image or a characteristic feature related with the image. Image processing is a modern technique and rapidly growing methodology which forms research area within engineering disciplines and provide data as desired[8].
There are three steps towards image processing. They are:

- Getting the image via acquisition tools.
- Anatomize and manipulate the image.
- Output report on image analysis.

There are two methods used for processing of image called analog and digital image processing[3]. Analog digital processing is used for hard copies like printouts and images. This type of image processing uses two dimensional signals only. Images are operated upon by electric signals [6]. These signals are continuous. Digital image processing is used for analyzing images by computer. Images are manipulated by number of software's and algorithms. This technique uses image segmentation which means breaking down of image into segments and then processing each segment one by one. Digital image processing is fast and cost effective as compared to analog image processing[7].

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Three stages all types of data undergo while application of this technique is pre-processing, enhancement and display of extracted data.

II. BLOCK DIAGRAM OF OBJECT DETECTION

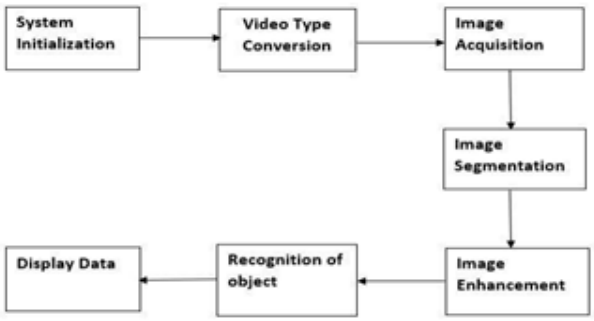

Fig-1: Block Diagram of Object Detection using MATLAB

The block diagram in Fig-1 represents the following processing.

1. **System Initialization-** This is the first step towards object detection. Input in the form of video or image is given in this stage. Real time images and video involve cameracontinuously covering a specific area on time to time basis. The real time videos and images captured are then given to the system for further initialization of processes.
2. **Video Type Conversion-** The input video or image is to be converted to required data type after reading. This takes place in the second stage by the tool CV in the toolbox of MATLAB[1]. The toolbox contains an object CV which converts input image to required output data type which may include single type, double type, int8 type, int16 type or Boolean type.
3. **Image Acquisition-** In this stage the image data is supplied to MATLAB software for further processing to take place for detection of object.
4. **Image Segmentation-** Image segmentation is a method of segmenting the digital image into segments so as to change the representation of the original image into something meaningful which makes it easier to observe and examine the desired data for analysis. This method is mainly used to locate the objects and observe the boundaries in the image [2]. The process assigns a label to every pixel such that same label denotes same characteristic. These characteristics maybe color, intensity and texture. Applications of image segmentation include machine vision, object detection, face detection, iris recognition, and videosurveillance.
5. **Image Enhancement-** Image enhancement is a method by which radial and tangential distortions which are produced as a result of inaccurate calibrations of camera lens are removed by examination of images based on camera calibrations calibrated with IR camera. For example, an image contains noise which is removed by operations such as erosion. The aim of this process is to have an image which is more suitable for specific examination when compared with original image. Functions used for this process are logarithmic transformations, power law transformations, linear transformations, piecewise linear transformations.
6. **Recognition of image-**This stage involves detection of the required object by extraction of features from the image for further analysis. Calculations for eccentricity of image are done in this process.
7. **Display-** The result of the whole process that is the detected object and the desired data is displayed to the user which can be further used for various processes.

II. APPLICATIONS

1. **Image Restoration-** Image restoration is an operation of producing a clean image from a corrupt image. Corruption instances occur when image is taken when object is in motion and this image turns out to be blurred. Corruption also occurs when the camera misses focus. Image restoration is a reverse process of converting the blurred image into original form and is performed by use of point source image commonly called the point spread function to get the image data lost due to blur process.
2. **Image Sharpening-** Image sharpening means increasing the contrast between bright and dark regions that produces features ina better way. Sharpening of images helps the user to easily distinguish the objects and analyse the image accurately.
3. **Medical Field-** Medical imaging is a method of viewing visual representations of inner body for medical analysis and examination. This information can also be used for visual presentation of organ function. It reveals internal structures that cannot be seen externally or are covered by bones. Medical imaging is normally used in anatomy and physiology to identify abnormalities. Applications in medical fields
4. Include gamma ray imaging, PET scan, X-ray imaging, medical CT scan, UV imaging.
5. **Robot Vision-** In today's world with all material removal, handling and automated system, accuracy is very necessary. A robot vision system is a very important field in industry and robotic services. A robotic system is a process of extracting, interpreting and classifying information from images. Robot vision consists of six stages. These six stages are sensing, pre-processing, segmentation, description, recognition, interpretation.
6. **Pattern Recognition-**Pattern recognition is a method of classification of data related to the knowledge and statistics which are already gained from representation of pattern. Pattern consists of features. These features may be continuous, discrete or binary variables. A

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total set of these features together is called as feature vector. Phases of pattern recognition are:

- **Phase 1-** Conversion of images or other inputs to signal data.
- **Phase 2-** Isolation of sensed objects from background.
- **Phase 3-** Measurement of properties of objects useful during classification.
- **Phase 4-** Assignment of sensed object to their categories.
- **Phase 5-** Considerations to be taken for deciding proper action.

III. RESULTS

Image processing in future will involve scanning the heavens for other life out there in space. All the new unique species created by scientist will include advances in image processes and its applications. As a result of all these advances, there could be millions or billions of robots for different task which would transform the management of the world. There will be spoken commands which would anticipate the information required by governments, translate languages, track and recognize people, perform surgeries, diagnose medical health, remove defects in human DNA and have an automatic driving system for transport with the increase in quality of technology and computing, image processing technology would advance and the visual representation of a man could be replicated. The concept of this computation could travel a journey beyond the present limits. The future of remote sensors will change towards improved sensors for capturing the same scenario in various channels. Image processing has already begun to its process of transforming the present world and this technology is very useful and has a bright future towards transformation.

IV. CONCLUSION

Image processing using MATLAB is presented in this paper. This process is faster and cost-effective method of processing. It has varied applications in many fields. Useful MATLAB functions and image processing applications have been explored at various stages. Toolboxes used mainly include image acquisition and processing tools. It shows that implementation is easy and useful when performed in MATLAB. This study would help a student to research and experiment in this field.

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