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Real Time Object Detection And Measurement

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ABSTRACT –

In these days, real-time object detection and dimensioning of objects is an important issue from many areas of industry. This is a vital topic of computer vision problems. This study presents an enhanced technique for detecting objects and computing their measurements in real time from video streams. We suggested an object measurement and Detection technique for real-time video by utilizing Open CV libraries and includes the canny edge detection, dilation, and erosion algorithms. The suggested technique comprises of four stages: (1) identifying an object to be measured by using canny edge detection algorithm, (2) using morphological operators includes dilation and erosion algorithm to close gaps between edges, (3) find and sort contours, (4) measuring the dimensions of objects. In the implementation of the proposed technique, we designed a system that used Open CV software library.

Key Words: Object Detection, Object Dimension Measurement, Computer Vision, Open CV, Canny Edge Detection.

1. INTRODUCTION

Real-time object detection and measurement systems are very vital tasks in the industrial process. Object detection is often used in product quality stages in the industry. The proposed system can be applied to an industrial quality control system. Likewise, it can be utilized for various industrial systems or for security purposes. Generally, it is identifying objects in public area and measure dimensions of each of them. The competence of the proposed system has been confirmed through utilizing real videos that taken from

a. The execution of this procedure has a high computation rate and it is dependent on the resolution of frames. The achievement of identifying objects and separate these objects from the background is perfect [1-4]. To calculate the size of each object, firstly we need to determine the reference object. After that, the dimensions of the reference objects will be used to calculate the size of other objects. We calibrate the camera according to the reference Object. The reference object always is the left-most object in the image. Also, to calibrate your pixels per metric variable, the reference object can be utilized and from there calculate the size of other objects in all frames [5]. Completely computational procedures are assessed through a operating system using a running with a frequency of 1.3 GHz [6-10]. Every processes utilize the libraries of Open CV [11]. We have found various papers attached to a measurement system. Each measurement applications are utilized for various purposes. Real-Time Object Measurement" is a program that can be used to detect real-time object's dimensions. There are not many real-time object measurement models and this prototype can be used enormously further. This is an essential topic of computer vision problems. As stated, this project presents a technique for computing the measurements in real-time from images. Some advantages of using this methodology are that it is very useful in the industrial field, it simplifies human work, and many more which are noted below in the advantages and disadvantages section. To calculate the size of each object, the prerequisite is that we need to determine the reference object. In this case, it is, plain white paper. After that, the dimension of the objects inside the reference are measured or it will be calculated and hence the size of the object is displayed

I. PROPOSED METHODOLOGY FOR REAL TIME OBJECT DETECTION AND MEASUREMENT

The system consists of two parts which are object detection and object measurement. In the first part, laptop camera used to achieve the frames. In the second

part, computer vision module will be applied to the captured frames to determine the objects, then, we will measure each object. The detected object of the current frame immediately will be processed to extract dimensions of objects. In the proposed system, firstly, we need to preprocess our image. The camera will capture a frame and the frame will convert to grayscale to increase quickness and accuracy. Objects are detected via canny edge detector algorithm. It is used to detect only one object or multiple objects. By the help of canny edge detector, the converted image will be processed. The canny edge algorithm scans the entire image. After that, execute dilation and erosion algorithm to close holes among edges in the edge frame [16-18]. Figure 1, shows that the flow chart for the recommended system.

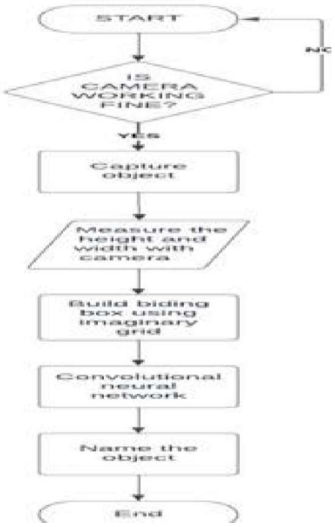

Figure 2, shows the input frame that used for canny edge detection. First stage in canny edge detector algorithm is delete the noise in the frames by applying a Gaussian filter. The frame after converting to gray scale and apply Gaussian filter is appeared in Figure 3

Figure 2. Input frame

Figure 3. Grayscale and Smoothed input frame

In the compute gradient stage, we detect the edge gradient and direction for each pixel. For The define the gradient at every pixel of smoothened frame, Sobel operator utilized.

A complete scan of frame will be done afterward receiving gradient magnitude and direction, to eliminate any undesirable pixels which might not establish the edge. In this stage, just local maxima must be considered as edges through applying Nonmaximum suppression. Non-maximum suppression exchanges the smoothed edges in the frame of the gradient magnitudes to sharp edges. Non-maximum suppression is carried out to keep every local maximum in the gradient picture, and removing the whole thing else. Figure 4, shows that the frame after apply non-maximum suppression.

The final stage of canny edge detector algorithm is hysteresis thresholding. This stage selects which are every edges are surely edges and which aren't edges. The two threshold values are empirically selected and their definition will upon on the content of a given frame. This is achieved via choosing big and small threshold values. If Edge pixels stronger than the big threshold, it is marked such as sturdy. Strong edges will be measured as the last edges. Also, edge pixel will be suppressed If an edge pixels weaker than the small threshold, and it is marked as weak edge if an edge pixel among the big and small thresholds.

To obtain the better result and more accurate object detection, the canny edge detection procedure has been improved with some Morphological operations [19]. These procedures are commonly a combination of nonlinear procedures performed relatively on the preparation of pixels without changing their numeral values. Erosion and dilation are the keys for morphological operations.

In this study, a morphological process is performed such as a mixture of dilation and erosion. The opening is the initial procedure in which erosion is followed through dilation. Closing is the second operation in which dilation is followed through

erosion. As a mixture of these processes we are capable to acquire superior determination for discovery edges in-depth frame. Figure 5 shows that the frame after applying erosion and dilation operation.

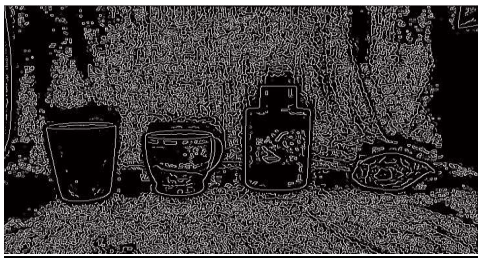

Figure 4. Input frame apply non-maximum suppression.

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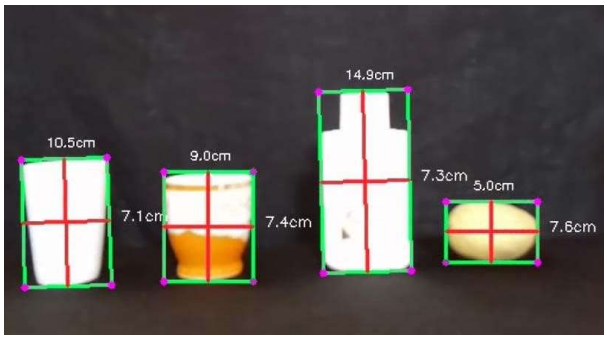
Figure 5. Input frame after apply dilation & erosion operation



To briefly summarize object measurement, after edge detection and close any gaps between edges, we detect contours by using an Open CV function that is cv2.findContours to find the shapes of the objects in the edge map. We arrange contours from left to right. The reference object in the frame is permanently the left one. By depending to the reference object, we calibrate the camera and set the value of parameter. Next, we scan every contours, begin looping above every individual contours. After that, the rectangle around objects will be drawn in green. So, the points of the bounding box rectangle will draw in a small purple rounds. After that, we can get midpoints because the bounding box is ordered. Finally, we calculate pixels Per Metric variable through dependence on reference object. The height-distance in pixels will put on hD (height) variable and width distance will put on wD (width) variable. Then, we calculated the Euclidean distance among sets of center points.

RESULTS EXPERIMENTAL:

We proposed the system to measure objects in a real time video and pictures. We prepared a few experimental setups to test the correctness of the proposed method. The implement the proposed system has made by the help of Python language. Figure. Show that the setup of the prepared system. Except the hardware formation, the software's required has installed.

For the experiment the camera has been effectively capturing the pictures. The proposed system applies four operations such as record frames, find edges, find objects, and measure size for each objects. When we run

the application, the output screen displays on the PC screen as appear in figure 6.

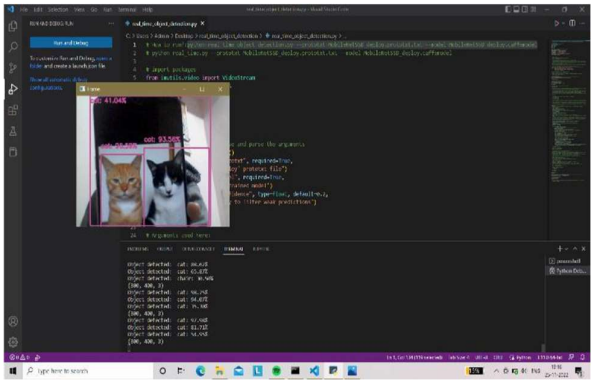
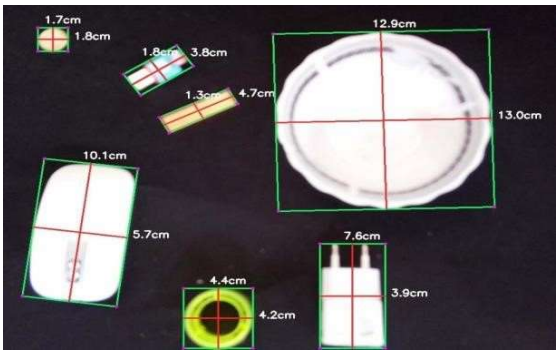
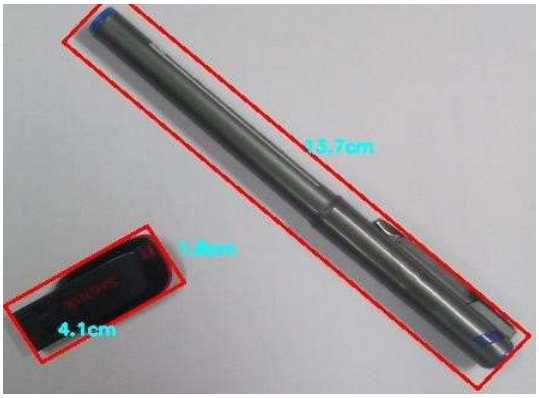


Figure 6. Display output on the screen

Figure 7, illustrates the object detection and measurements. The size of each object in the frame which are calculated.





In the first experiment we measured size of objects such as white glasses, orange cup, bottle, potatoes. Table I Shows the accuracy of proposed object measurement system for these objects. Abbreviations in the table are as follows; AM-H: Actual MeasureHeight, PM-H: Proposed Measure-Height, AM-W: Actual Measure-Width, PM-W: Proposed Measure- Width.

TABLE I. ACCURACY OBJECT MEASUREMENT FOR ONE FRAME

Name Of Object	AM-H (Cm) Actual Measure-Height	PM-H (Cm) Proposed Measure-Height	AM-W (Cm) Actual Measure-Width	PM-W (Cm) Proposed Measure-Width	Accuracy (%)
White Glasses	10.0	10.5	6.8	7.1	%95.45
Orange Cup	8.5	9.0	7.5	7.4	%97.56
Bottle	15.2	14.9	7.4	7.3	%98.23
Potatoes	4.8	5.0	7.4	7.6	%96.82

Nevertheless, not every results are perfect, since this is due to the seeing angle and lens deformation. By calibrate the camera and set good width parameter, accuracy will be increase.

In the second experiment, we set the camera above the objects. Figure 7, shows that the results of the object detection and measurement for another objects. And the Table II, demonstrations the accuracy values among actual measure and system measure.

TABLE II. ACCURACY OBJECT MEASUREMENT

WHEN CAMERA ABOVE THE OBJECTS

Name Of Object	AM-H (Cm) Actual Measure -Height	PM-H (Cm) Proposed Measure -Height	AM-W (Cm) Actual Measure -Width	PM-W (Cm) Proposed Measure -Width	Accuracy (%)
Turk kurus	1.7	1.7	1.7	1.8	%97.14
Mouse	10.0	10.1	5.2	5.7	%96.20
Card reader	3.8	3.8	1.7	1.8	%98.21
Peace of paper	4.6	4.7	1.2	1.3	%96.66
Tray	12.6	12.9	12.6	13.0	%97.29
Charger	7.6	7.6	3.7	3.9	%98.26
Plaster	4.4	4.4	4.4	4.2	%97.72

The result for error column displays very low errors. The error rate is especially smaller when camera above the objects.

CONCLUSION:

In this study, an powerful real time object measurement method is proposed for industrial systems. In the offered system, Computer Vision used to detect and measure objects. The system can detect and measure objects in a real time video. After the object has been detected by using canny edge detector, the size is obtained for each object by using Open CV functions. We enhanced the canny edge detector algorithm through utilizing Morphological operations. This procedure benefits to eliminate extra noises. Furthermore, whereas eliminating the extra noises it likewise smoothens the shape and keeps the outline and size of each object. Thus, the outlines of the different objects in the scene were kept.

FUTURE SCOPE:

Machines are used in every part of human life. Machines work according to us but in today's world, we work according to machines. The rush to soar high is immense. Hence, machines are important and so are the parts of them. If the parts do not fit well a machine cannot work properly. The dimensions of the objects sure make a great impact. This AI ML based project will help in measuring the dimensions in real-time. It is convenient and easy to use. It also gives accuracy and assurance of the manufactured product. As it is a one-time investment it surely has a great future scope. The object recognition system can be applied in the area of surveillance system, face recognition, fault detection, character recognition etc. The objective of this thesis is to develop an object recognition system to recognize the 2D and 3D objects in the image. The performance of the object recognition system depends on the features used and the classifier employed for recognition. In this thesis, an effort has been made to develop an algorithm to provide the base for future applications such as listed below. In this research work, the object Identification and Visual Tracking has been done through the use of ordinary camera. The concept is well extendable in applications like Intelligent Robots, Automatic Guided Vehicles, Enhancement of Security Systems to detect the suspicious behavior along with detection of weapons, identify the suspicious movements of enemies on boarders with the help of night vision cameras and many such applications.

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[7]A.J. Lipton, H. Fujiyoshi and R.S. Patil discussed an algorithm based on frame differencing [8]. The algorithm has no complexities and is fairly accurate for objects that do not change size or color etc. However the error between two frames grows exponentially throughout the video sequences.

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[9]Owensa, Hunterb and Eric [9] proposed an algorithm that tracks moving objects based on morphological char- acteristics. This algorithm provides the solution of object merging while tracking multiple objects however the object recognition through morphological methods is a bit complex process and is repeated continuously [9]

[10] Carlo Tomasi, Takeo Kanade [10] proposed one simple object tracking method which minimizes the sum of squared intensities between two consecutive frames. This method is computationally fast and robust in nature and is recommended for the real time object tracking.