A PROJECT REPORT ON

OBJECT MOTION TRACKING APPLICATION

For the partial fulfillment for the award of the degree of

BACHELOR OF TECHNOLOGY

In

COMPUTER SCIENCE AND ENGINEERING

Submitted By

JYOTSNA GAVER (2001920100133)

Under the Supervision of

G.L. BAJAJ INSTITUTE OF TECHNOLOGY MANAGEMENT, GREATER NOIDA

Affiliated to

DR. APJ ABDUL KALAM TECHNICAL UNIVERSITY,
LUCKNOW

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Declaration

We hereby declare that the project work presented in this report entitled

"OBJECT MOTION TRACKING APPLICATION", in partial fulfillment of the requirement for the award of the degree of Bachelor of Technology in Computer Science & Engineering, submitted to A.P.J. Abdul Kalam Technical

University, Lucknow, is based on my own work carried outat Department of

Computer Science & Engineering, G.L. Bajaj Institute of Technology & Management, Greater Noida. The work contained in the report is original and project work reported in this report has not been submitted by me/us for award of any other degree or diploma.

Signature:

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Date:
Place: Greater Noida

Certificate

This is to certify that the Project report entitled "……. Your Mini Project Title Name ……" done by Student Name (Roll No….) is an original work carried out by them in Department of Computer Science & Engineering, G.L Bajaj Institute of Technology & Management, Greater Noida under my guidance. The matter embodied in this project work has not been submitted earlier for the award of any degree or diploma to the best of my knowledge and belief.

Date:

Dr. Sansar Singh Chauhan

Signature of the Supervisor

Head of theDepartment

Acknowledgement

The merciful guidance bestowed to me by the almighty made me stick out this project to a successful end. I humbly pray with sincere heart for his guidance to continue forever.

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ABSTRACT

Videos can be treated as stack of pictures called frames. Here we are comparing different frames(pictures) to the first frame which should be static (No movements initially).

The Basic Idea Behind “Smart Web Cam Motion Detection Surveillance System” Is to Stop the Intruder to Getting Into The Place Where A High End Security Is Required. This Paper Proposes a Method for Detecting the Motion of A Particular Object Being Observed. The Motion Tracking Surveillance Has Gained a Lot of Interests Over Past Few Years. This System Is Brought into Effect Providing Relief to The Normal Video Surveillance System Which Offers Time-Consuming Reviewing Process. Through The Study and Evaluation of Products, We Propose A Motion Tracking Surveillance System Consisting Of Its Method For Motion Detection AndIts Own Graphic User Interface.

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1 1.1-INTRODUCTION

☯Building a program that detects moving objects.
☯It records the time that the object enters the webcam. After quitting the camera screen (on pressing 'Q'), we get a graph. The Graph will show the time when object entered the frame.
First, capture the background that is static and then use that background as an image so that you can capture other images and python can detect if there is a change between 1st and next frame detected by camera.
☯Then we convert it to gray image, so that the background image at current frame of camera become gray. So, we will store 1st frame of video capture in a variable and then we will convert that frame into gray scale. While loop will go through current frame and this process repeat several times until we press Q (Basically we are applying difference between 2 gray scale images of current iteration loop).
☯For instance, the high intensity values, there is potential motion in that area, while in black areas (where intensity is 0) there will be no motion. Here we will use **threshold frame** in which if we see a difference in **delta frame (fame having more than 100 intensity)** convert that pixel to white pixels and pixels which are below threshold, convert them to black.
☯Once we have calculated threshold frame inside loop, then we will find counters(shape) of white objects in frame in current frame. Then in loop, we will iterate through all counters of current frame and then check area of counters. If area is greater than some fixed pixels then consider that object as a moving object.

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2.1-METHODOLOGY USED TO MODELLONG THE OBJECT MOTION TRACKNING APPLICATION

- COMPUTER VISION-THIS FIELD DEALS WITH ACQUIRING & PROCESSING IMAGES & IT TAKES DECISIONS BASED ON THEM
- WE WILL USE PYTHON TO LOAD AND PROCESS THE IMAGES & DO THINGS LIKE FACE/MOTION DETECTION.
- WE WILL DO COMPUTER VISION WITH PYTHON USING OpenCV
- OPENCV WITH PYTHON IS USED TO DETECT ONE OR MORE FACE FROM AN IMAGE.
- CREATE A CASCADE CLASSIFIER OBJECT(CCO).WE CAN USE THIS CCO OF FACE FEATURE TO SEARCH FOR A FACE IN OUR IMAGE.NOW NEXT IS TO LOAD THAT IMAGE.
- CONVERTING BGR(BLUE,GREEN ,RED) IMAGES TO GRAY IMAGES BECAUSE GRAYSCALE IMAGE HAS HIGH ACCURACY.
- PYTHON WILL SORT FROM ORIGINAL SIZE OF IMAGE & IT WILL CREATE A WINDOW THAT WILL SEARCH FOR FACE IN IMAGE.
- MIN NEIGHBOURS-IT TELLS PYTHON HOW MANY NEIGHBOURS TO SEARCH AROUND THE WINDOW.
- NOW SHOWING A RECTANGLE IN THE FACE.
- VIDEO DETCTION-IMAGE/FRAMES ARE SHOWN ONE AFTER THE OTHER IN A HIGH SPEED & THEN WE CAN SEE THESE IMAGES AS A VIDEO.
- FOR THIS WE NEED TO CREATE A FRAME OBJECT WHICH WILL READ THE IMAGES OF THIS VIDEO CAPTURE OBJECT.
- FOR SHOWING ACTUAL VIDEO,WE WILL USE WHILE LOOP.
- FOR COUNTING THE NUMBER OF ITERATION WE CA N COUNTNUMBER OF FRAMES GENERATED PER SECOND.
- IN WE CLOSE THE CAMERA THEN ALL VALUES IN NUMPY ARRAY WILL BE 0 BECAUSE THEY HAVE SOME INTENSITY.
- NOW CAPTURING THE WEBCAM OBJECTS.
- NOW CAPTURING THE MOTION OBJECTS.

2.2-OTHER METHOD TO MODEL THE OBJECT MOTION TRACKING APPLICATION

When it comes to deep learning-based object detection there are three primary object detection methods that we can use:

ResNet

To train the network model in a more effective manner, we herein adopt the same strategy as that used for DSSD (the performance of the residual network is better than that of the VGG network). The goal is to improve accuracy. However, the first implemented for the modification was the replacement of the VGG network which is used
in the original SSD with ResNet. We will also add a series of convolution feature layers at the end of the underlying network. These feature layers will gradually be reduced in size that allowed prediction of the detection results on multiple scales. When the input size is given as 300 and 320, although the ResNet–101 layer is deeper than the VGG–16 layer, it is experimentally known that it replaces the SSD's underlying convolution network with a residual network, and it does not improve its accuracy but rather decreases it.

Faster R-CNNs

Faster R-CNNs are likely the most "heard of" method for object detection using deep learning; however, the technique can be difficult to understand (especially for beginners in deep learning), hard to implement, and challenging to train.

You Only Look Once (YOLO)

If we are looking for pure speed then we tend to use YOLO as this algorithm is much faster, capable of processing 40-90 FPS on a Titan X GPU.
The super fast variant of YOLO can even get up to 155 FPS.
The problem with YOLO is that it leaves much accuracy to be desired.

Single Shot Detectors (SSDs)

SDs, originally developed by Google, are a balance between the two. The algorithm is more straightforward (and I would argue better explained in the original seminal paper) than Faster R-CNNs. We can also enjoy a much faster FPS throughput than **Ren et al**. at 22-46 FPS depending on which variant of the network we use. SSDs also tend to be more accurate than YOLO.

▪ Deep learning-based object detection with OpenCV- ▪ In this we use the MobileNet SSD + deep neural network (dnn) module in OpenCV to build our object detector.

2.3-VARIOUS OBJECT DETECTION ALGORITHMS IMPLEMENTED IN PYTHON

Haar-like features..>

It is an effective object detection technique which is proposed by Paul Viola and Michael Jones in 2001. It is a machine learning based method for object detection where we train a classifier from a lot of images. This classifier is then used in detecting objects in an image. Initially, the algorithm needs images with faces (positive images) and images without faces (negative images) to train a classifier and then extract features from this classifier. This method introduces a concept cascade of the classifier. Instead of applying all the features at once we group the features into different stages of the classifier and apply one by one. Discard the window if it fails in the first stage. If it passes the stage then continue the process. The window which passes through all the stages will be our desired region.

Circular Hough Transformation..>

Hough transformation was invented by Richard Duda and Peter Hart in 1992, this transformation was initially meant to detect arbitrary shapes from an image. It was later modified to detect circular objects in low-contrast noisy images and referred as Circular Hough Transformation [6]. CHT relies on equations [6] for circles: r 2 = (x-a)2 +(x-b)2 where a and b are the coordinate of the center, and r is the radius of the circle. CHT relies on three parameters, which require larger computation time and memory and it increases the complexity to extract information from the image. For simplicity, CHT programs are provided with a constant value of radius or provided with a range of radius prior to running the application.

2.4-ADVANTAGES OF USING PYTHON CV INSTEAD OF DEEP LEARNING

- The first one is low computation power. As we do not use any neural network or deep learning technique, it is not computationally demanding.
- We can even run it on a CPU. Even a moderately powerful CPU will suffice for employing this detection technique for moving objects.

▪ DISADVANTAGES-

- First of all, we can only detect moving objects. If our goal is that, then it is all fine. But we will not be able to detect static objects using this technique. This also means that we cannot use this technique on images but only on videos.
- It cannot be actually completely real-time as we have to wait at least for a certain number of frames to get the background model. We also have to get a certain number of frames for differencing and summing and then only we can start detection.
- Using this with static cameras works pretty well. But with moving cameras it will not work at all as the ***objects will be just everywhere***. Therefore, it is best suited for surveillance tasks where the camera is stationary.

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3.1-SYSTEM SPECIFICATIONS:

Hardware Requirements :

- 1GB RAM MINIMUM
- 30 MB space required

Software Requirements :

- Visual Studio Code(VS Code)
- **Language**: PYTHON

3.2-PYTHON VS OTHER LANGUAGES FOR OBJECT DETECTION

Object detection is a domain-specific variation of the machine learning prediction problem. Intel‟s OpenCV library that is implemented in C/C++ has its interfaces available in a number of programming environment such as C#, Matlab, Octave, R, Python etc. Some of the benefits of using Python codes over other language codes for object detection are More compact and readable code.

- Python uses zero-based indexing.
- Dictionary (hashes) support is offered.
- Simple and elegant Object-oriented programming.

Free and open.

- Multiple functions can be packaged in one module.

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3.3 -***Libraries/Modules Used***

- CV2
- Datetime
- Pandas
- Bokeh

LIBRARIES USED-

CV2 OpenCV-Python is a library of Python bindings designed to solve computer vision problems. cv2. imread() method loads an image from the specified file. OpenCV is a great tool for image processing and performing computer vision tasks. It is an open-source library that can be used to perform tasks like face detection, objection tracking, landmark detection, and much more. It supports multiple languages including python, java C++. OpenCV-Python makes use of **Numpy**, which is a highly optimized library for numerical operations with a MATLAB- style syntax. All the OpenCV array structures are converted to and from Numpy arrays. This also makes it easier to integrate with other libraries that use Numpy such as SciPy and Matplotlib.

Numeric, the ancestor of NumPy, was developed by Jim Hugunin. Another package Numarray was also developed, having some additional functionalities. In 2005, Travis Oliphant created NumPy package by incorporating the features of Numarray into Numeric package. There are many contributors to this open-source project.

Pandas Pandas has been one of the most popular and favourite data science tools used in Python programming language for data wrangling and analysis. ... And Pandas is seriously a game changer when it comes to cleaning, transforming, manipulating and analyzing data. In simple terms, Pandas helps to clean the mess. Pandas is a widely-used data analysis and manipulation library for Python. It provides numerous functions and methods that expedite the data analysis and preprocessing steps. Due to its popularity, there are lots of articles and tutorials about Pandas.

Bokeh-Bokeh is a Python library for creating interactive visualizations for modern web browsers. It helps you build beautiful graphics, ranging from simple plots to complex dashboards with streaming datasets. With Bokeh, you can create JavaScript-powered visualizations without writing any JavaScript yourself.
Is Bokeh better than Matplotlib?
Matplotlib can create any plot because it is a low-level visualization library. Bokeh can be both used as a high-level or low-level interface; thus, it can create

many sophisticated plots that Matplotlib creates but with fewer lines of code and higher resolution. Bokeh also makes it really easy to link between plots.

DATETIME- DateTime objects represent instants in time and provide interfaces for controlling its representation without affecting the absolute value of the object.

DateTime objects may be created from a wide variety of string or numeric data, or may be computed from other DateTime objects. DateTimes support the ability to convert their representations to many major timezones, as well as the ablility to create a DateT [1]ime object in the context of a given timezone.

DateTime objects provide partial numerical behavior:

- Two date-time objects can be subtracted to obtain a time, in days between the two.
- A date-time object and a positive or negative number may be added to obtain a new date-time object that is the given number of days later than the input date-time object.
- A positive or negative number and a date-time object may be added to obtain a new date-time object that is the given number of days later than the input date-time object.
- A positive or negative number may be subtracted from a date- time object to obtain a new date-time object that is the given number of days earlier than the input date-time object.

4.1-

OUTPUT

Color frame☯ It is original frame where our motion is detected. Initially we have to capture blank frame after that anything that comes in motion in that Frame will get captured.

Color frame☯ It is original frame where our motion is detected. After capturing blank frame, when motion is detected in that frame a green rectangle is marked on that object specifying motion of that object.

Gray frame☯ Reason behind converting color frame into gray frame (after applying Gaussian Blur) is that, it makes image smooth because it removes noise and increases accuracy in calculations of difference of frames.

Delta frame☯ Used to give intensity to the threshold frame to find difference of 2 frames.

Threshold frame☯ We use this frame because if we see a difference in **delta frame (fame having more than 100 intensity)** convert that pixel to white pixels and pixels which are below threshold, convert them to black.

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5.1-APPLICATIONS AND FUTURE SCOPE→

Computer vision is still a developing discipline, it has not been matured to that level where it can be applied directly to real life problems. After few years‟ computer vision and particularly the object detection would not be any more futuristic and will be ubiquitous. For now, we can consider object detection as a sub-branch of machine learning. Some common and widely used application of object detection are: Face Detection

Have you ever wondered how Facebook detects your face when you upload a photo? Not only it detects, it remembers the face too. This is a simple application of object detection that we see in our daily life.

- Counting objects/peoples

Object detection can be also used for counting purpose, it is used for keeping a count of particular or all objects in an image or a frame. For e.g. from a group photograph it can count the number of persons and if implemented smartly you may also find out different people with different dresses. Vehicle detection

Similarly, when the object is a vehicle, object detection along with tracking can be used for finding the type of vehicle, this application may be extended to even make a traffic calculator.

- Industries

  Object detection is also used in industrial processes for the identification of different products. Say you want your machine to only detect objects of a particular shape, you can achieve it very easily. For e.g. Hough circle detection transform can be used for detecting circular objects.
- Security

  Identification of unwanted or suspicious objects in any particular area or more specifically object detection techniques are used for detecting bombs/explosives. It is also even used for personal security purpose. Biometric recognition

  Biometric recognition uses physical or behavioral traits of humans to recognize any individuals for security and authentication purpose. It uses distinct biological traits like fingerprints, hand geometry, retina and iris patterns etc.

5.2-CONCLUSION: By using this thesis and based on experimental results we are able to detect object more precisely and identify the objects individually with exact location of an object.

5. 1-REFERENCE

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