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HSV VALUE AND OPENCV BASED OBJECT TRACKER

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Abstract: This research shows how colour and motion may be utilised to speed up the surveillance of things. Video tracing is a technique for detecting a huge vehicle over a long distance using a camera. The main goal of video tracking is to link objects in subsequent video frames. When objects move faster than the frames per second, maintaining connection might be difficult. Using Hue saturation space values and OpenCV in separate video frames, this article shows how to follow moving objects in real-time. We begin by finding the HSV value of the object to be tested, and then we understand the steps along. The tracking of the items was shown to be 90 percent accurate.

***Index Terms*. HSV, OpenCV, Object tracking, Video frames, GUI .**

I. INTRODUCTION

Observing is the act of standing back and watching people's actions and/or activities. Security cameras are the most commonly used gadget. Industrial processes, traffic, and reduced crime are all monitored by these cameras. Despite their widespread use, security cameras have a number of drawbacks. Because these cameras are fixed on motorized hinges, they can only monitor from certain angles [1], and the security system can only be penetrated through hidden regions. The presence of human operators [2,] who are responsible for checking several camera inputs is one source of worry. Criminal or other undesirable behaviours may go unchecked since such operators are subjected to tedium, tiredness, and attention.. As a result, a mobile robot might be used to address these issues. A robotic might freely and continuously tour the surveillance zones, making its own decisions and recognising unwanted behaviours or activities, then reacting as needed, for as by sending out messages..

Computer vision is significantly used in robotic surveillance to track things. Object tracking is a technique for keeping track of moving objects in a video feed. This can be accomplished by identifying and analysing a certain attribute, such as the colour of a moving item. After that, the technique may be used to monitor the object's progress over time. The vast majority of colour tracking systems now available are only designed to track a single colour. Due to the shifting circumstances, the tracking colour feature may not be as visible as it should be as the camera travels. In this case, tracking might be used to keep an eye on a false object. As a result, new data-driven approaches for predicting the colour function have evolved.

1.1. . Hue Saturation and Value (HSV):

Compared to RGB and CMYK, HSV is more closely linked to human colour perception. It has three components: hue, saturation, and value. The colour space stores colour colours and optimization (tones or hues) (saturation or quantity of grey). Deny the reality that HSV and HSB seem to be the same, certain colour analyzers, such as those in Adobe Photoshop, utilise the HSB acronym, which substitutes "value" for "brightness." The HSV colour wheel might have the form of a cone or a cylinder, but it always has three sections:

Hue is a measure that describes the colour part of the framework and runs from 0 to 360 degrees.
The colour red has a temperature difference of 0° C to 60° C.
Yellow emerges between 61 and 120 degrees.
The colour green fades from 121 to 180 degrees.
The temp for cyan is 181 to 240 degrees Fahrenheit.
The temp of blue is 241 to 300 degrees Fahrenheit.
Magenta has a temperature range of 301 to 360°C.

Saturation: Saturation refers to the amount of grey in a colour that fluctuates between 0 and 100 percent. When this component is set to 0, the image appears darker and faded. Intensity ranges from 0 to 1, with 0 representing grey and 1 representing the dominant colour.
Value (brightness): On a scale of 0 to 100 percent, value represents the intensity or colour depth of a colour, with 0 being completely black and 100 being the greatest and most vibrant.

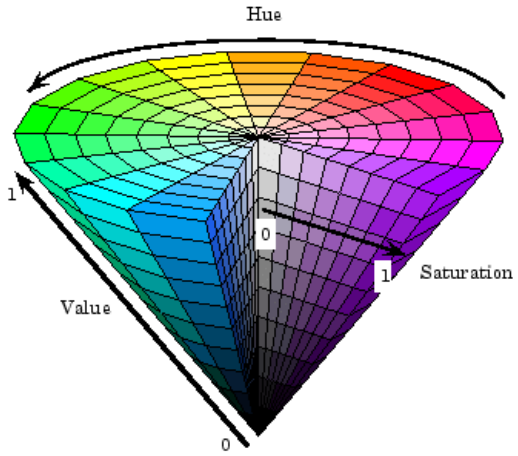

Fig 1: HSV Cylindrical Cone

1.2. OpenCV

OpenCV is a set of software tools mostly used for real-time machine learning. In basic terms, the toolkit is used for picture analysis. It's mostly used for editing photos. This approach might be used to recognise objects, people, or even human handwriting in images and videos. Python can handle the OpenCV analysis array structure when used in conjunction with several programmes like as Numpy. To recognise visual patterns and their many features, we use vector space and arithmetic operations on these attributes.

II. PROBLEM STATEMENT

Monitoring means keeping an eye on someone's decisions and/or behaviour from afar. Security cameras are the most commonly used equipment. Production lines, transit, and criminal security are just a few of the applications for these cameras. Despite their widespread use, security cameras have severe limitations. Because the lens is mounted to metal hinges, it can only view at specific angles, and the safety system might be hacked through all of these concealed areas. Furthermore, a person must be assigned to watch the camera on a regular basis, and if he fails to do so, a variety of issues may occur...
As a result, a mobile robot might be used to address these issues. A robot might traverse the surveillance areas on its own, making personal judgements when it observes possibly lethal behaviours or activities and then taking action, such as issuing warnings. Object tracking is a video editing method that keeps track of where moving objects are in a film. This may be done by detecting and monitoring the property of a moving item, such as its colour. After that, the technique may be used to track the object's movement over time.. The most well-known colour tracking systems track a certain colour feature. However, when the camera moves, the detected colour attribute may disappear as the environment changes. In this case, tracking may be utilised to locate a missing item. As a result, new methods for establishing the colour function depending on the working environment of the camera are required.

III. LITERATURE REVIEW

Users have recently begun to establish large-scale camera networking as a result of the emergence of low-cost lenses. This increasing number of cameras might open the way for new signal conditioning techniques that use a large number of sensors dispersed across a large area. Object tracking is a novel method of recognising moving things in video sequences by following them with the camera continually. Its main goal is to match the target items' shape or attributes in successive video sequences.
Shen et al. suggested a new hierarchical spatial saliency-based moving targeting method (2013). To improve detection results, data on temporal and geographical output was also utilised. Our approach correctly and effectively recognises moving objects in aerial imagery, according to the findings of this test. Furthermore, unlike the HMI technique, this solution has no time delay. This technique, on the other hand, classified item placements as false, unavoidable alarms in all video frames.
To track items, Guo et al. (2012) suggested using an object identification approach in video frames. The simulation results indicate that this method for determining generic class labels is efficient, exact, and long-lasting. Second, enhancing the accuracy of real-time object recognition categorisation must be a top focus...
A text recognition technique based on video frame statistics and texture analysis was suggested by Ben Ayed et al (2015). Ben Ayed and his associates are a collection of people who wish to make a difference in the world. The films are divided into separate segments of differing sizes and analysed using the har wavelet method. Furthermore, a neural network was used to classify text and non-text elements. The study's major focus should, however, be on removing loud places from the surroundings and removing sites such as texts..

Viswanath et al. recommended using panoramic backdrop modelling (2015). This approach was utilised to represent the entire visual element in Gaussian space-time. Moving chemicals may be recognised with fewer false alarms, according to simulation studies. This strategy, however, fails when the section's required capability is not available...

Soundrapandiyan and Mouli were provided a unique approach for adjusting to pedestrian detection (2015). Furthermore, the pixel intensities in the image distinguished the foreground from the distance. To emphasise the front borders, they used a high boost filter. The findings of the subjective appraisal and evaluation demonstrate that the proposed technique is successful, with a high detection rate of about 90% in the pedestrian, when compared to other existing single picture methodologies. They hoped to improve the method's efficacy in the future by boosting detection control and reducing false positives, according to sequence image techniques.

Based on a relationship between blocks in the current and background pictures, Ramya and Rajeswari created an updated frame difference technique that recognises pixels as depth of field. The blocks in the current image that are closely related to the backdrop image are referred to as the background. Based on the pixel-based evaluation, the third block is categorised as either front or bottom. According to these experiments, the frame difference approach increases, especially when accuracy and speed are combined. However, this study needs focus on extra information available on blocks, such as shape and edge, in order to improve detection accuracy.

Based on a relationship between blocks in the current and background pictures, Ramya and Rajeswari created an updated frame difference technique that recognises pixels as depth of field. The blocks in the current image that are closely related to the backing image are referred to as the background. Based on the pixel-based evaluation, the third block is categorised as either front or bottom. According to these experiments, the frame difference approach increases, especially when accuracy and speed are combined. However, in order to improve detection accuracy, this study needs concentrate on other information available on blocks, such as shape and edge.

IV. OBJECTIVES

The goal of the project is to keep an eye on the object. In response, an item's HSV value is calculated, and the same object is then monitored using the HSV values that have previously been generated. We employ two models in our work. One is used to calculate an item's HSV value, while the other is used to maintain track of it. OpenCV is used to maintain track of the object.

V. METHODOLOGY

There are two steps to the approach that I use in my work.

5.1. HSV value detection:

This is done in real time by positioning the object in front of another sensor while the model is running. When the code is run, the image of the object appears on the screen. A colourful image emerges on the screen. After converting this RGB image to an HSV image, the values must be determined. To assist with this, we've created a Graphical User Interface (GUI) paradigm. The six values that must be found are hue (min), hue (max), saturation (min), saturation (max), value(min), and value(max) (max). The usage of a graphical user interface simplifies the process of locating these numbers (GUI). The vertical tabs for all six values must be adjusted to the point where the tracking item turns white and the surrounding area turns black. This method is used to determine the object's HSV value, which is subsequently utilised in the tracking stage that followed. The six matching outcomes are all in the 0 to 255 range. The first step is to select a research area (ROI). There are four steps to it.:

- Background subtraction
- Noise elimination
- Object tracking
- Behaviour analysis

5.1.1. Background Subtraction:

To remove the foreground, the live RGB recordings are first converted to grayscale images. Because grey photos process slower than colour photographs, they have been employed as input variables for the clipping approach [3,4]. The IABMM[6] algorithm then uses white pixels to identify motion parallax as forefront items and displays them in a binary image, while black pixels are used to assign all static objects to backgrounds.

5.1.2. Noise Elimination:

During noise removal, noise reduction is employed to eliminate any noises produced by reflexions or motion flushes. Median filtering and binary structural approaches are used to eliminate noise. While maintaining significant data, the midway filter[6] eliminates and restores "salt-and-pepper" noise. Due to noise caused by a shifting backdrop or lighting environment, foreground features may be misread and classified as background pixels, resulting in gaps or difficulty. In morphological processes, dilatation and erosion[7] are used to reduce noise by connecting likely front-end locations and removing any that are incorrect... The picture pixel is swapped with the maximum value below the anchor after calculating the reference implementation's highest pixel value. Degradation is also an inverted function, which means it operates with the lowest numbers rather than the greatest. Narrowing and erosion are used to produce morphological closeness, causing bright spots to become blobs and increasing foreground detection (represented by white blobs).

5.1.3. Object Tracking*:*

The LTCLA algorithm[8], a rapid labelling technique that simultaneously recognises connected pieces and their outlines, is used to monitor the (if any) splodge of the resultant binary loud sound image, which is tracked using the object-tracking approach**.**

A crucial part of this methodology is a silhouette tracing method that uses a tracer to identify the exterior and interior contours of each element. When an outline point is found, the tracer searches its eight neighbours in a clockwise fashion for more pattern points.

The choice of which blob to follow is the next step in the object tracking stage. The monitoring object is identified as the largest moving blob found in this investigation. Despite the fact that the technique may monitor a large number of targets, the number of observed items has been shown to have a significant impact on the method's effectiveness. This method just chooses and follows the largest blob.

5.1.4. Behaviour Analysis:

After selecting the largest blob, the ROI method's final stage is to analyse the blob's behaviour. It is possible to identify the item's area, centre, and speed, as well as its observable traits. In computing these behaviours in words, a ROI is created by a bounding box that encompasses the target item and is given with the item's greatest width and height. The area of an item is approximated by counting the number of pixels in the tracked blob.

The colour filter will analyse both the ROI and the entire colour space of the picture after the ROI has been located.

HSV is chosen over RGB because it is better at distinguishing things like shadows, shades, and highlights in a variety of lighting circumstances. As a result, there are fewer segments in the filter than in RGB [9, 10]. Furthermore, the RGB colour space combines neighbouring colour items of different colours, resulting in bland results, whereas the HSV colour space separates the intensity from the colour data, resulting in a result that differentiates between both areas bordering colour objects of different colours by sharing the limits and maintaining high degree of precision for each pixel [11]. The colour filter supplied was created to cover the whole HSV colour range. The quantity in HSV space can be affected by system restrictions such as camera resolution and algorithm processor performance.

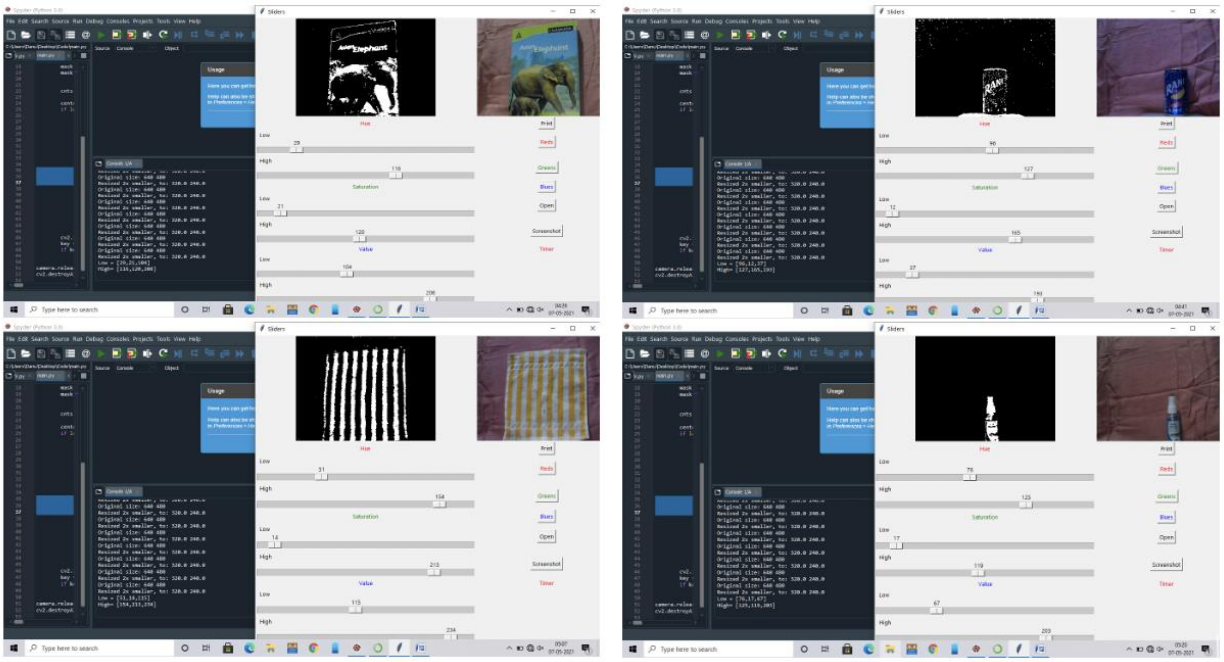

Fig 2: Real Time Gesture Recognition

5.2. Tracking the Object*:*

The HSV computed values from the first stage are utilised to track the object in the second model. For this, we utilise the OpenCV package...

VI. RESULTS AND OBSERVATIONS

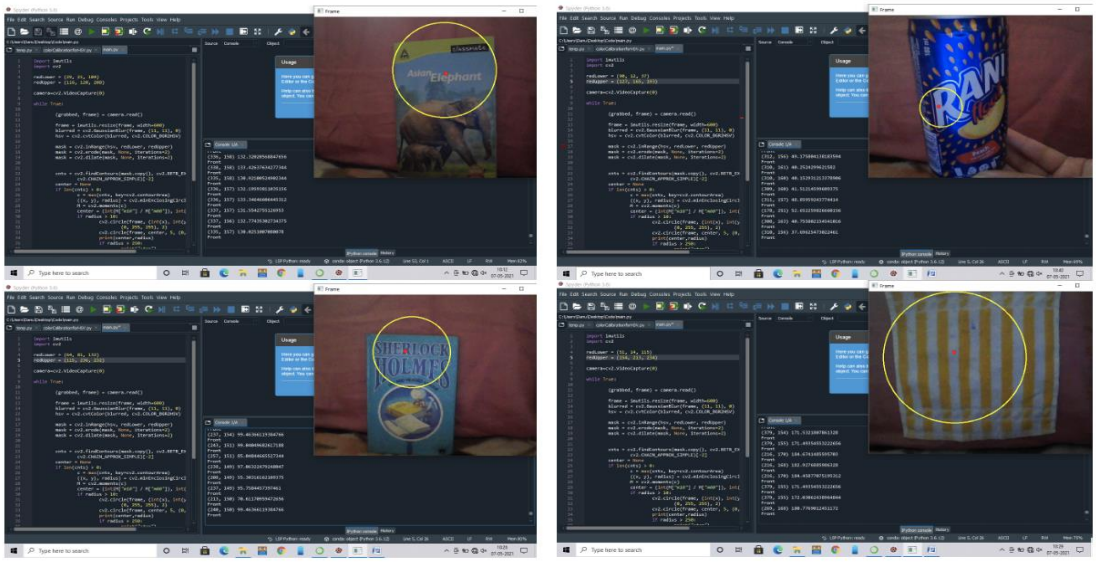

Fig 3: Real Time Object Tracking

The OpenCV library is used to track the entities. The model is ringed by the tracked item, which is positioned in front of the camera. The validity of this approach was found to be 90%.

VII. CONCLUSION

The HSV value of an object was determined in this experiment, and the image was observed. It was discovered that tracking an item using the HSV value is extremely precise and seldom fails. This strategy might be applied in a variety of disciplines, including defence.

VIII. FUTURE WORK

Although my approach effectively tracks the item, seeing many things in a single frame allows for more work to be done.

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