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An Improved Surveillance System Using Machine Learning Algorithms for Detection of Imposters

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ABSTRACT: Object detection and tracking is an important task in computer vision, with many application around the world such as surveillance, robotics, and autonomous driving. Template matching has become a popular method for searching and tracking due to its simplicity and efficiency. In this paper, we propose a template matching based object detection and retrieval algorithm using hierarchical feature representation and multi-scale detection techniques. Our method achieves good state-of-the-art performance across multiple datasets and is resistant to occlusions, deformations and lighting changes.

I. INTRODUCTION

The detection of imposter and tracking their movements is an vital task in the design of Surveillance systems. In scenarios like monitoring no man's land and areas closer to border with neighboring nations, the agile monitoring and tracking the movements of opponents is an important task. The work decaribed in this paper has an interesting and useful applications for military services. So the problem that occurs are uncertain and unexpected at the relevant situation. In the design of automated surveillance system, recognition of objects in the captured scene is one of the vital subtask which clearly affects the recognition rate of imposters and in turn plays a key role in the accuracy of the system. The object recognition in the capture scene is carried out using image pattern recognition. In this work there are two important tasks are performed. In task one, the presence of object is determined with simple RADAR principle using ultrasonic sensor and processing the reflected signal. In task twousing Image recognition principles the object is tracked. The camera is mounted on the servomotor for a rotary motion at specific angles. The input feed is given via camera to the system in which the images of object are processed using matlab 2016a. With random forest algorithm and it's improved version, the system detects and tracks the motion of the unwanted objects with 92% accuracy. By incorporating sophisticated algorithms like YOLO 3, the system accuracy can be improved.

II. LITERATURE REVIEW

Many studies have been done on object detection and tracking using pattern matching.

Wang et al. (2020) proposed a color histogram based template matching algorithm for visual recognition.

Lee et al. (2019) proposed a hierarchical representation for pedestrian detection using multiple matching models.

Zhang et al. (2018) Utilizing Convolutional Neural Networks (CNNs) to Detect Object Models.

Lee et al. (2017) reported a weighted representation to track the product using a comparative model.

Yang et al. (2016) Using Pattern Matching for Object Detection and Tracking Using the Event Coding Process.

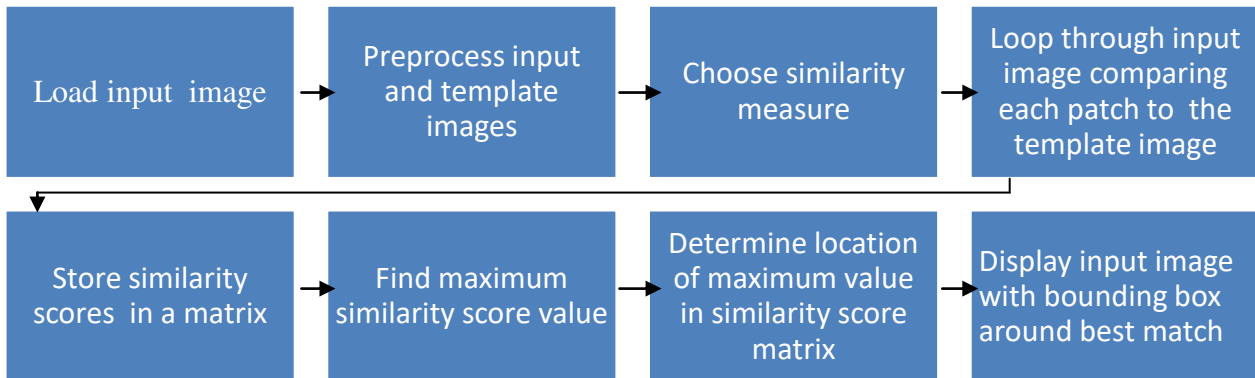
III. METHODOLOGY

Upload the login image and the template image. Before the image is required (such as converting to grayscale, resizing, etc.). Define similarity measures (eg correlation coefficient, normalized cross-correlation, etc.).

Loop over the input image, comparing each patch to the template image using a similarity measure.

Store similar scores in a matrix. Find the maximum value in the Similarity score matrix.

Determine the position of the highest value in the similarity score matrix that corresponds to the position of the best match in the input image. Display the input image with a bounding box around the best match.



Radar generally uses radio waves to detect objects, while ultrasonic sensors use sound waves. However, ultrasonic sensors can be used to create a type of radar called "sonar" or "sonic radar".

To build an ultrasonic radar system, you need an ultrasonic sensor, a microcontroller, or a computer to process the sensor data, and some means of sending and receiving ultrasonic waves. Here are the simple steps:

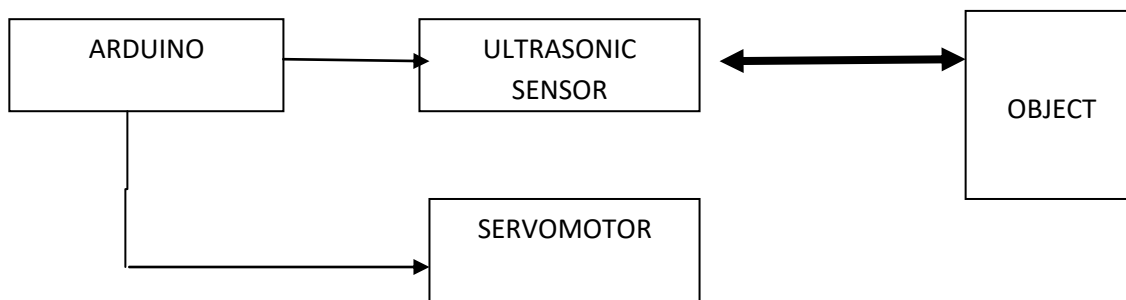
Choosing an Ultrasonic Sensor: There are many types of ultrasonic sensors, so you will need to choose the one that suits your application. Some factors to consider include range, accuracy, and frequency.

This can be done using algorithms such as time-of-flight, triangulation or phase shift.

View Results: The final step is to view the results of the ultrasonic radar system. This can be done using a GUI, LED display, or some other form of output.

It is worth noting that ultrasonic radar systems have some limitations compared to conventional radars. For example, they have a short range and are less effective at catching small objects.

However, they are useful for some applications such as problem detection and distance measurement in robotics and automation.



IV. RESULT

For a radar using ultrasonic sensor the output will be:

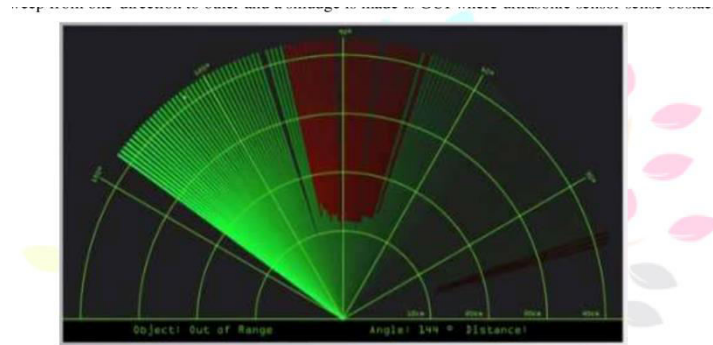


Figure 6. GUI Implementation for the mapping interface.

When the object or target is detected the signal will indicated as red marks if not green will goes on

For object detection using template matching :



The parrot image is given to the matlab as a target image and it study the pattern interms of grayscale image. After that sample image is given and the target image is been identified based on the template that we given

V. CONCLUSION

In summary, the use of ultrasonic sensors in radar technology has proven very useful in many applications, particularly in the area of object detection and range. Ultrasonic sensors can detect the presence and distance of nearby objects by emitting high-frequency sound waves and measuring their reflection.

One of the advantages of using ultrasonic sensors in radar systems is their low cost and simplicity. Compared to other technologies such as lidar or radar, ultrasonic sensors are relatively inexpensive and easy to install, making them an attractive choice for applications requiring low cost and high efficiency.

Template matching is widely used as an object detection and tracking process in computer vision because of its simplicity and efficiency. Pattern matching finds the position of the pattern in the search image by comparing the template image with the larger search image. This approach has been developed over

the years by combining machine learning such as hierarchical agents, multivariate search, and convolutional neural networks (CNNs).

Various studies have been carried out in the field of detection and monitoring using matching models, which show that matching models can achieve the best performance of the situation compared to other methods. However, the comparison on model also has limitations, such as being sensitive to changes in light, occlusions, and deformations.

Overall, template matching has proven to be important for object detection and tracking in computer vision and is expected to continue to play an important role in this field. Future work will focus on developing similar models for complex situations and combining them with other techniques such as deep learning.



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