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Object Detection in a Fixed Frame

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Abstract. This paper presents an approach to the detection of objects in a fixed frame. In this approach, an acoustic sensor is used for detecting any change in the surrounding of a fixed frame, i.e. detecting the entry of a foreign object. If it so happens, then the sensor sends a signal to the system which is processed. If the sampling result crosses the fixed threshold then the camera is switched on. It clicks a snapshot and then again is switched off. With this snapshot, we operate frame difference against an initially stored snapshot of the fixed frame. Based on the difference, we determine the nature and type of the foreign object.

Keywords: Image Processing , Object Detection .

1 Introduction

Image processing is the most challenging field in recent days, where information is extracted from an image through different techniques. There are different fields in image processing where pattern recognition is an important phase of this field .Here different patterns are identified and various purposes are served such as OBJECT RECOGNITION. Object can be recognized in different ways from either satellite images or from a fixed frame. We are proposing an idea where we can identify an object in a fixed frame by generating signals to appropriate devices either for storing the movement of the particular object or to identify the particular object and generate an alarm for avoiding an undesirable situation. Many researches have been done in this field such as an Unified Approach to Moving Object Detection in 2D & 3D Scenes [1] This problem can be broadly divided into two classes: 2D algorithms which apply when the scene can be approximated by a flat surface and/or when the camera is only undergoing rotations and zooms, and 3D algorithms which work well only when significant depth variations are present in the scene and the camera is translating. An unified approach is described in handling moving object detection in both 2D and 3D scenes, with a strategy to gracefully bridge the gap between those two extremes. The approach is based on a stratification of the moving object detection problem into scenarios which gradually increase in their complexity. The set of techniques which match this stratification progressively increase in their complexity, ranging from 2D techniques to more complex 3D techniques. Moreover, the computations required for the solution to the problem at one complexity level become the initial processing step for the solution at the next complexity level. Another approach to this problem is an algorithm for segmentation of traffic scenes [5] that distinguishes moving objects from their moving cast shadows. A fading memory estimator calculates mean and variance of all three-color components for each background pixel. Given the statistics for a background pixel, simple rules for calculating its statistics when covered by a shadow are used. Then, MAP classification decisions are made for each pixel. In addition to the color features, we examine the use of neighborhood information to produce smoother classification. We also propose the use of temporal information by modifying class a priori probabilities based on predictions from the previous frame.A PDE-based Level Set Approach for Detection & Tracking of Moving Objects [6] is another way where a statistical approach is represented for tracking & detecting moving objects in a sequence of images. Using the level set formulation of Osher & Sethian complex curves can be detected & tracked & topological changes for the evolving curves are managed. But to reduce the computational cost of direct implementation of this approach a new approach is proposed, where the various aspects will be exploited from the classical narrow band & fast marching method. The CPU time can be reduced further by a multi-scale approach. This approach can be improvised as the results of already done experiments in this regard are promising. In the next approach we present. The next type of approach was Detecting Moving Shadows Algorithm & Evaluation [7] where Accurate object detection in video streams was done by clearly separating shadow points from object points. Thus, making moving shadow detection less critical.

Though many moving shadows detection approaches are proposed but a comparative evaluation of these approaches are lacking. In another way which is 3-D recognition via 2 stage associative memory[8] is based on two stage use of a general purpose associative memory and a principal views representation. The basic idea implemented is to make use of semi-invariant objects called *keys*. A key is any robustly extractable feature that has sufficient information content to specify a 2-D configuration of an associated object (location, scale, orientation) plus sufficient additional parameters to provide efficient indexing and meaningful verification. The recognition system utilizes an associative memory organized so that access via a key feature evokes associated hypotheses for the identity and configuration of all objects that could have produced it. These hypothesis are fed into a second stage associative memory, which maintains a probabilistic estimate of the likelihood of each hypothesis based on statistics about the occurrence of the keys in the primary database. Because it is based on a merged percept of local features rather than global properties, the method is robust to occlusion and background clutter, and does not require prior segmentation. Entry of objects into the memory is an active, automatic procedure. Implementation of a version of the system that allows arbitrary definitions for key features. Experiments using keys based on perceptual groups of line segments are reported. Good results were obtained on a database derived from of approximately 150 images representing different views of 7 polyhedral objects. The last approach is Memory-based object recognition methods[9] In this method an object is compared against many representations stored in a memory to finding the closest match. However matches are generally made to representations of complete objects, hence such methods tend to be sensitive to clutter and occlusion and require good global segmentation for success. a method that combines an associative memory with a Hough-like evidence combination technique, allowing local segmentation to be used. This resolves the clutter and occlusion sensitivity of traditional memory-based methods, without encountering the space problems that plague voting methods for high DOF problems. The method is based on the two stage use of a general purpose associative memory and semi-invariant local objects called *keys*. Experiments using keys based on a curve segmentation process are reported, using both polyhedral and curved objects.

Methodology

An acoustic sensor along with the camera is fixed on a frame. With the help of the camera we have taken a picture of a blank frame. This picture is stored in the memory for our use Whenever the acoustic sensor senses some change in the surrounding it sends a signal. The sampled signal which is in analog form is send to ADC circuit for conversion into digital. Now the received signal is sent back to a processing board(inclusive of motherboard , processor , RAM) through a RS232 port. Since the sensor circuit uses TTL logic whereas the processing board receives RS232 signals, we have used MAX232 IC for the purpose of interfacing. When a MAX232 IC receives a TTL level to convert, it changes a TTL Logic 0 to between +3 and +15 V, and changes TTL Logic 1 to between -3 to -15 V. Our processing board then generates a command to the camera and accordingly the camera is switched on to take a picture and then again is switched off after few second. The image thus taken is stored and is compared with the our initial image. The comparison is done by using the Frame Difference Algorithm. When we subtract the two frames the part of image which does not change (background) gets subtracted to give zero intensity (black). Only the part of image moved (moving object) don't get reduced to zero as intensity of pixels of two subsequent frames are different. So we get non zero intensity for pixels corresponding to moved object. Then we convert the image into binary and can tell whether an object has entered the frame or not. Frame Difference algorithm goes as follows. Initially, an image is obtained from the sensor and stored. This image acts as the blank frame against which motion of objects will be detected. Now this image is transformed to a matrix based on the RGB values of its individual pixels. Whenever the acoustic sensor triggers an alarm, a signal is sent to the circuit which, in turn, switches on the camera. The image fed to the camera is stored and is converted to a matrix using procedures similar to that used on the blank frame. Then a pixelwise difference is calculated simply by computing the difference between the matrices derived from the images. If all the elements of the resultant matrix are 0 (RGB equivalent of Black), then no movement has occurred. Otherwise movement has been detected.

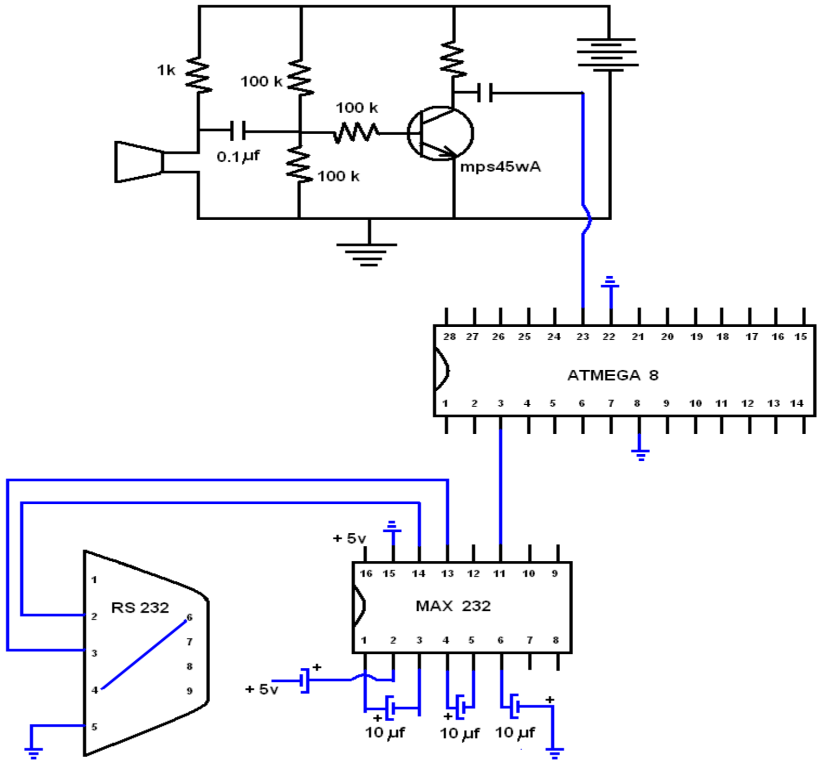


Figure 1

The circuit in Figure 1 is used to convert the analog signal into digital signal. It has 3 levels. In the first level with the help of a circuit consisting of transistor, capacitors and resistors we catch the analog signal from the sensor and perform a pre filtering of the signal. Then this signal is send to ATMEGA 8 IC which converts the analog signal into digital signal. The digital signal is obtained by using TTL logic. So in the next step we use a MAX 232 IC for interfacing since the processing board receives RS232 signals. The TTL Logic 0 is changed to a range in between +3 and +15 V, and

TTL Logic 1 is changed to a range in between -3 to -15 V. Then this signal is feed into the processing board through the RS232 port.

Result and Conclusion

In order to execute Object Detection Algorithm in MATLAB, the following steps are operated. At first, the initial frame is stored as a raster graphics image in secondary memory. If the resolution of this image is m x n, then imread function converts it to a matrix of dimension m x n. Similarly, the frames are captured and converted to matrices. Then a pixel wise difference between the initial frame and the later frames is computed by using the imabsdiff function. If the resultant matrix is a null matrix, then no change in frame has occurred. Else there has been a change in the frame. However due to sensor noise, the difference can never be a null matrix. The following example may be considered:

The following frame is a blank frame:

Suppose it is saved in the path X:\ as snapblank.png.

Then the command line to transform it to a matrix A is A = imread ('X:\snapblank.png')

Suppose, at a later time, another frame is captured in X:\ as snapcurr1.png.

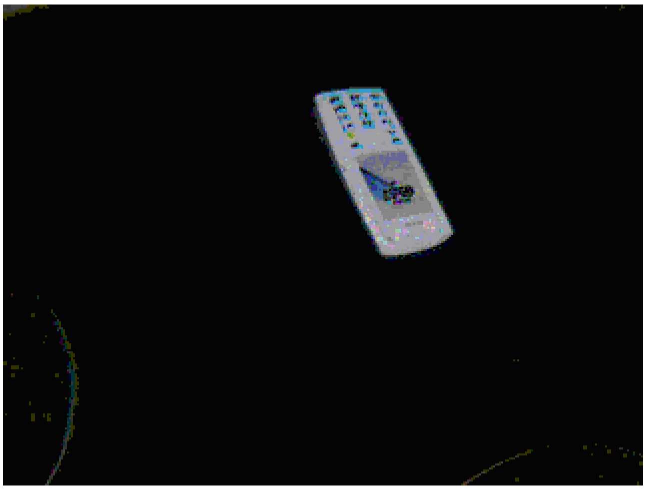
It is similarly translated into a matrix B1 using command line B1 = imread ('X:\snapcurr1.png').

Now, the difference between these two images are calculated by C1 = imabsdiff (A, B1)

C1 is a matrix that should ideally be a null matrix. But due to sensor noise, it is a near-null matrix. imshow (C1) will display the image corresponding to the matrix C1.

Now, suppose another image is captured and stored as X:\snapcurr2.png.

Using similar processes, it is saved as matrix B2. The difference between this image and the initial image is calculated likewise and is saved as matrix C2.
imshow (C2) will reveal the pictorial representation of the image.



Hence we conclude that an object has entered the frame.

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References

1. Irani, M. , Anandan, P., : A unified approach to moving object detection in 2D and 3D scenes . IEEE Transactions on Pattern Analysis and Machine Intelligence, Vol. 20 Issue:6 pp 577 – 589 (06 August 2002)

2. Irving, R., McKeown, D., : Methods for Exploiting the Relationship between Buildings and Their Shadows in Aerial Imagery. IEEE Trans. Systems, Man, and Cybernetics, vol. 19, no. 6, pp. 1564-1575, (Nov./Dec. 1989)

3. Liow, Y., Pavlidis, T., : Use of Shadows for Extracting Buildings in Aerial Images . Computer Vision, Graphics, and Image Processing, vol. 49, no. 2, pp. 242-277 (Feb. 1990).

4. Medioni, G., : Obtaining 3-D from Shadows in Aerial Images . Proc. IEEE Int'l Conf. Computer Vision and Pattern Recognition, pp. 73-76 (1983)

5. Mikic, I., Cosman, P.C., Kogut , G.T., Trivedi, M.M., : Moving Shadow and Object Detection in Traffic Scenes. 15th International Conference on Pattern Recognition (ICPR'00),Volume 1, pp. 1321 (2000)

6. Paragios, N.K., Deriche, R., : A PDE-based level-set approach for detection and tracking of moving objects. Sixth International Conference on Computer Vision, pp. 1139 – 1145 (1998)

7. Prati, A., Mikic, I., Trivedi, M.M., Cucchiara, R., : Detecting Moving Shadows: Algorithms and Evaluation . IEEE Transactions on Pattern Analysis And Machine Intelligence , vol. 25 no. 7 pp. 918 – 923 (July 2003)

8. Randal, C. N., : 3-D Recognition Via 2-stage Associative Memory. University of Rochester, Dept of Computer Science TR 565 (January 1995)

9. Randal, C. N., : Memory-Based Recognition for 3-D Objects. Proc. ARPA Image Understanding Workshop, Palm Springs CA, pp. 1305-1310 (February 1996)