Warzone Analyser

ABSTRACT

The recognition and classification of objects in images is an emerging trend within the discipline of computer vision community. Template is primarily a sub part of an object that is to be matched amongst entirely different objects.The techniques of template matching are flexible and generally easy to make use of, that makes it one amongst the most famous strategies of object localisation. Template matching is carried out in versatile fields like image process- ing, signal processing, video compression and pat- tern recognition. The war-zone analyser is a great tool in demand for the security of the nation's and for identifying the suspicious elements in the war prone areas. The information extracted from this could be used for identifying the risks and threats to the nation, it could also help in alarming the army and internal security forces toward the threats.

INTRODUCTION

Template Matching may be a high-level machine vision method which determines the components of a figure which matches a predefined template. Template Matching could be a methodology in digital image processing to identify little components of a figure which match a template image. We tend to match a template to an image wherever the template is a sub image which contains the form which we want to find out.

Template Matching is a strategy for discovering zones of an image which matches (are indistinguishable) a template image (patch). ee require 2 crucial segments.

Source image (I): The picture inside which we are hoping to find out a match to the template image. Template image (T): The patch image that can be compared to the template image and our objective is to discover the most effective technique for the best matching region.

War-zone Analyser is the most interesting and challenging research topic from past few years. It is shown that the areas could be of different size and also have different pattern and textures in different countries. In war-zone analyzer the most common is the army base analyzer. In this project we have taken

the number of images and trained our model to match the templates provided by us to detect the suspected areas in the image This presents an approach based on simple and efficient morphological operation and template matching. We also presents a simple approach to segmented all the letters and numbers used in the number plate. After reducing noise from the input image we try to enhance the contrast of the binarized image using histogram equalization. Analysis of the war-zone based on template matching. The simulation result shows that the location is more efficient and effective.

The war-zone analyser is a great tool in demand for the security of the nation's and for identifying the suspicious elements in the war prone areas. The information extracted from this could be used for identifying the risks and threats to the nation, it could also help in alarming the army and internal security forces toward the threats. The recognition problem is generally sub-divided into 5 parts:

(1) image acquisition i.e. capturing the image of the suspected area
(2) pre-processing the image i.e. normalization, adjusting the brightness, skewness and contrast of the image

(3) localizing the image
(4) character segmentation i.e. locating & identify- ing the image with the templates
(5) character recognition using edge detection & template matching. There may be further refinements over these (like matching the
suspected area with a particular database to
track suspected activities etc) but the basic structure remains the same. If the area is very similar to background it's difficult to identify the location. Brightness and contrast is changes as light fall changes to it. The morphological operations are used to extract the contrast feature within the image.

LITERATURE SURVEY

An important feature of template matching locations that would be difficult to enforce and even to express, in the traditional non-hierarchical framework.

[1] Lewis, J. P. (1995, May). Fast template match- ing. In *Vision interface* (Vol. 95, No. 120123, pp. 15-19).

An approach for embedding a digital watermark into an image using the Fourier transform.

[2] Pereira, S., & Pun, T. (2000). Robust template matching for affine resistant image watermarks. *IEEE transactions on image Processing*, *9*(6), 1123- 1129.

The normalized form of cross correlation preferred for template matching applications does not have a simple frequency domain expression.

[3] Lewis, J. P. (1995, May). Fast template match- ing. In *Vision interface* (Vol. 95, No. 120123, pp. 15-19).

A fast coarse-to-fine template matching algorithm for finding the exact best match, i.e., the match that may be found by a full search.

[4] Gharavi-Alkhansari, M. (2001). A fast globally optimal algorithm for template matching using low-resolution pruning. *IEEE Transactions on Image Processing*, *10*(4), 526-533.

An anti-aliased, or gray-edged, image is characterized by comparing the image to a number of loose-templates having a plurality of elements and at least one element having a range greater than zero.

[5] Loce, R. P., & Cuciurean-Zapan, C. (2005). *U.S. Patent No. 6,944,341*. Washington, DC: U.S. Patent and Trademark Office.

Background colors of a plate are extracted from an input car image. A neural network is used for more stable extraction. To find a plate region, a fixed ratio of horizontal and vertical length of a plate is used. To recognize characters in a plate, template matching and post-processing techniques are used.

[6] Lee, E. R., Kim, P. K., & Kim, H. J. (1994, November). Automatic recognition of a car license plate using color image processing. In *Image Processing, 1994. Proceedings. ICIP-94., IEEE International Conference* (Vol. 2, pp. 301-305). IEEE.

An analytic camera model is used to predict the location and appearance of landmarks in the image, generating a projection for an assumed viewpoint.

[7] Barrow, H. G., Tenenbaum, J. M., Bolles, R. C., & eolf, H. C. (1977). *Parametric correspondence and chamfer matching: Two new techniques for image matching* (No. TN-153). SRI INTERNATIONAL MENLO PARK CA ARTIFICIAL INTELLIGENCE CENTER.

The correlation is calculated for each basis function instead of the whole template. The result of the correlation of the template and the image is obtained as

the weighted sum of the correlation functions of the basis functions.

[8] Briechle, K., & Hanebeck, U. D. (2001, March). Template matching using fast normalized cross correlation. In *Optical Pattern Recognition XII* (Vol. 4387, pp. 95-103). International Society for Optics and Photonics.

The two approaches are tested against a database of 40 images of various visual quality and retinal pigmentation, as well as of normal and small pupils. An average error of 7% on OD center positioning is reached with no false detection.

[9] Lalonde, M., Beaulieu, M., & Gagnon, L. (2001). Fast and robust optic disc detection using pyramidal decomposition and Hausdorf-based template matching. *IEEE transactions on medical imaging*, *20*(11), 1193-1200.

Template can be used as a tool for asserting the presence of a watermark. We also systematically evaluate the algorithm and present results which demonstrate the robustness of the method against some common image processing operations such as

compression, rotation, scaling and aspect ratio changes.

[10] Pereira, S., & Pun, T. (1999, September). Fast robust template matching for affine resistant image watermarks. In *International Workshop on Information Hiding* (pp. 199-210). Springer, Berlin, Heidelberg.

Two new algorithms for computer recognition of human faces, one based on the computation of a set of geometrical features, such as nose width and length, mouth position, and chin shape, and the second based on almost-gray-level template matching.

[11] Brunelli, R., & Poggio, T. (1993). Face recognition: Features versus templates. *IEEE trans- actions on pattern analysis and machine intelligence*, *15*(10), 1042-1052.

Template matching provides a new dimension into the image-processing capabilities, although there have been many attempts to resolve different issues in this field there have always been newer concepts emerging in this ever challenging field.

[12] Mahalakshmi, T. Muthaiah, R., & Swami- nathan, P. (2012). An overview of template matching technique

in image processing. *Research Journal of Applied Sciences, Engineering and Technology*, *4*(24), 5469-5473.

A conventional template matching was employed to detect nodules existing on the lung wall area, lung wall template matching (LeTM), where semicircular models were used as reference patterns; the semicircular models were rotated according to the angle of the target point on the contour of the lung wall.

[13] Lee, Y., Hara, T., Fujita, H., Itoh, S., & Ishigaki, T. (2001). Automated detection of pulmonary nodules in helical CT images based on an improved template-matching technique. *IEEE Transactions on medical imaging*, *20*(7), 595-604.

Distance between deformations defined through a metric given the cost of infinitesimal deformations. [14] Trouvé, A. (1998). Diffeomorphisms groups and pattern matching in image analysis. *International journal of computer vision*, *28*(3), 213-221.

A region that has a plurality of normalized reference template images as vertex template images in a space of a template-pixel-size dimension is considered, and the vertex template images are linearly interpolated by a parameter w to provide a normalized

interpolated template image of a magnitude 1 in the space.

[15] Tanaka, K., Sano, M., Ohara, S., & Okudaira, M. (1999). *U.S. Patent No. 5,943,442*. Washington, DC: U.S. Patent and Trademark Office.

Template can be considered a sub-image from the reference image, and the image can be considered as a sensed image.

[16] Sarvaiya, J. N., Patnaik, S., & Bombaywala, S. (2009, December). Image registration by template matching using normalized cross-correlation. In *2009 International Conference on Advances in Computing, Control, and Telecommunication Technologies* (pp. 819-822). IEEE.

This technique was selected because of its speed and its ability to include additional knowledge--two characteristics which are required for real-time, on-board vehicle applications.

[17] Kenue, S. K. (1990, March). LANELOK: Detection of lane boundaries and vehicle tracking using image-processing techniques-part II: Template matching algorithms. In *Mobile Robots IV* (Vol. 1195, pp. 234-246). International Society for Optics and Photonics.

A vision-based real-time driver fatigue detection system is proposed for driving safely. The driver's face is located, from color images captured in a car, by using the characteristic of skin colors.

[18] Horng, e. B., Chen, C. Y., Chang, Y., & Fan, C. H. (2004, March). Driver fatigue detection based on eye tracking and dynamk, template matching. In *Networking, Sensing and Control, 2004 IEEE International Conference on* (Vol. 1, pp. 7-12). IEEE.

Conventional cross-correlation type algorithms are computationally expensive. Furthermore, when the object in the image is rotated, the conventional algorithms cannot be used for practical purposes.

[19]Choi, M. S., & Kim, e. Y. (2002). A novel two stage template matching method for rotation and illumination invariance. *Pattern recognition*, *35*(1), 119-129.

Classical linear signal processing techniques tend to oversmooth the image and result in noticeable color artifacts along edges and sharp features.

[20]Kimmel, R. (1999). Demosaicing: image reconstruction from color CCD samples. *IEEE Transactions on image processing*, *8*(9), 1221-1228.

Variations are those which are also due to differences in acquisition, but cannot be modelled easily such as lighting and atmospheric conditions.

[21]Brown, L. G. (1992). A survey of image registration techniques. *ACM computing surveys (CSUR)*, *24*(4), 325-376.

A License plate recognition (LPR) system can be divided into the following steps: preprocessing, plate region extraction, plate region thresholding, character segmentation, character recognition and post-processing.

[22]Shi, X., Zhao, e., & Shen, Y. (2005, May). Automatic license plate recognition system based on color image processing. In *International Conference on Computational Science and Its Applications* (pp. 1159-1168). Springer, Berlin, Heidelberg.

Face detection is a necessary first-step in face recognition systems, with the purpose of localizing and extracting the face region from the back- ground.

[23] Hjelmås, E., & Low, B. K. (2001). Face detection: A survey. *Computer vision and image under- standing*, *83*(3), 236-274.

A class of algorithms enabling efficient and exhaustive matching of a template into an image based on the Zero mean Normalized Cross-Correlation function (ZNCC). The approach consists in checking at each image position two sufficient conditions obtained at a reduced computational cost.

[24] Goshtasby, A. (1985). Template matching in rotated images. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, (3), 338-344.

A speedup technique based on the idea of two-stage template matching is also described.The degree of matching achieved and the elastic deformation energy spent by the sketch to achieve such a match are used to derive a measure of similarity between the sketch and the images in the database and to rank images to be displayed.

[25] Del Bimbo, A., & Pala, P. (1997). Visual image retrieval by elastic matching of user sketches. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, *19*(2), 121-132.

The template matching method comprising calculating a difference between a corresponding point of the reference point in the second image and

an estimated point of the reference point which is calculated by the template matching method.

[26] Kaneko, T., & Hori, O. (2006). *U.S. Patent No. 7,085,418*. Washington, DC: U.S. Patent and Trademark Office.

Variations in neural circuitry, inherited or acquired, may underlie important individual differences in thought, feeling, and action patterns.

[27] Seeley, e. e., Menon, V., Schatzberg, A. F., Keller, J., Glover, G. H., Kenna, H., ... & Greicius, M. D. (2007). Dissociable intrinsic connectivity net- works for salience processing and executive control. *Journal of Neuroscience*, *27*(9), 2349-2356.

A countermeasure for relieving traffic congestion is to employ a priority signal control system at the intersection, and in order to effect this signal control, it is essential to identifying public transport vehicles.

[28] Yamaguchi, K., Nagaya, Y., Ueda, K., Nemoto, H., & Nakagawa, M. (1999). A method for identify- ing specific vehicles using template matching. In *Intelligent Transportation Systems, 1999. Proceed*ings. 1999 IEEE/IEEJ/JSAI International Conference on (pp. 8-13). IEEE.

Existing methods use both local features and global layout information. In this paper, we propose a novel algorithm based on the global matching of Component Block Projections (CBP), which are the concatenated directional projection vectors of the component blocks of a document image.

[29] Peng, H., Long, F., & Chi, Z. (2003). Document image recognition based on template matching of component block projections. *IEEE Transactions on Pattern Analysis & Machine Intelligence*, (9), 1188- 1192.

Interpretation

The recognition and classification of objects in images is an emerging trend within the discipline of computer vision community. Template is primarily a sub part of an object that is to be matched amongst entirely different objects.The techniques of template matching are flexible and generally easy to make use of, that makes it one amongst the most famous strategies of object localization. Template matching is carried out in versatile fields like image processing, signal

processing, video compression and pattern recognition.

Merits

Estimates become quite good with enough data.Template matching is the most efficient technique to be used in pattern recognition machines which read numbers and letters that are available in standardized, constrained contexts (means scanners which reads your financial credit number from machines, checks that read postal zip codes of from envelopes).

Demerits

Following are the limitations of template matching: ·

- Templates are not rotation or scale invariant
- Slight change in size or orientation variations can cause problems.
- It often use several templates to represent one object.
- Templates may be of different sizes.
- Rotations of the same template.

- Particularly if you search the entire image or if you use several templates in that case template matching is a very expensive operation.
- Template matching is easily “parallelized”
- Template Matching requires high computational power because the detection of large pat- terns of an image is very time taking.

Proposed Methodology

General categorisations of template or image matching approaches are Featured-based approach and Template or Area based approach.

A. The flow of the architecture

We have taken the image grayscale templates and we run it over our data sets and it tries to match it with input image and where ever it gets a hit it encircles the

object in the image and gives a prompt to the user about what suspicious elements that are present in the image. Our data set comprises of all the image that could be found in the war-zone areas like tanks, airships, signets, explosions.

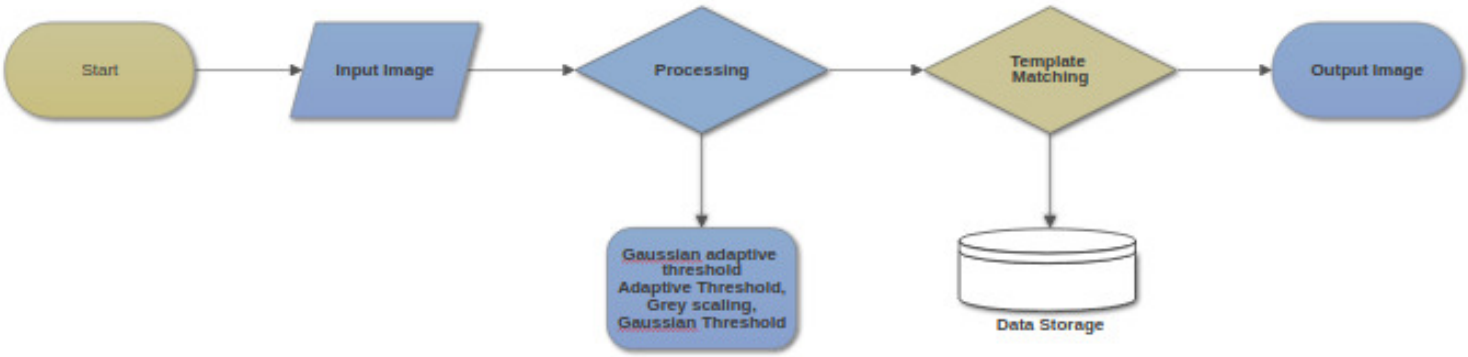

Figure 1 - Flowchart of architecture

B. Detailed explanation of the methods

a. Featured-based approach

The Featured-based method is appropriate while both reference and template images have more connection with regards to features and control points. The features comprises of points, a surface model which needs to be matched, and curves.

b. Area-based approach

The Area-based methods are typically referred to as correlation like methods or template matching methods, that is the blend of feature matching, feature detection, motion tracking, occlusion handling etc. Area-based methods merge the matching part with the feature detection step.

c. Template-based approach

Template-based template matching approach could probably require sampling of a huge quantity of points, it"s possible to cut back the amount of sampling points via diminishing the resolution of the search and template images via the same fact or and performs operation on resulting downsized images (multi-resolution, or Pyramid (image process- ing)) , providing a search window of data points in- side the search image in order

that the template doesn't have to be compelled to look for each possible data point and the mixture of the two.

d. Template matching

Correlation of a small "template" array with a large image array is an operation commonly used in image analysis. Edge detection, line and corner finding are some applications of the technique. Two problems with template matching are its computational cost and its sensitivity to noise.

e. A fast globally optimal algorithm for template matching using low-resolution pruning

Template matching has many applications in signal processing, image processing, pattern recognition, and video compression. This paper proposes a fast coarse-to-fine template matching algorithm for finding the exact best match, i.e., the match that may be found by a full search. This is obtained by pruning the number of candidates in the full search using the results of a coarse search.

f. An Overview of Various Template Matching

The recognition and classification of objects in images is an emerging trend within the discipline of computer vision community. A general image processing problem is to decide the vicinity of an object by means of a template once the scale and rotation of the true target are unknown.

Results

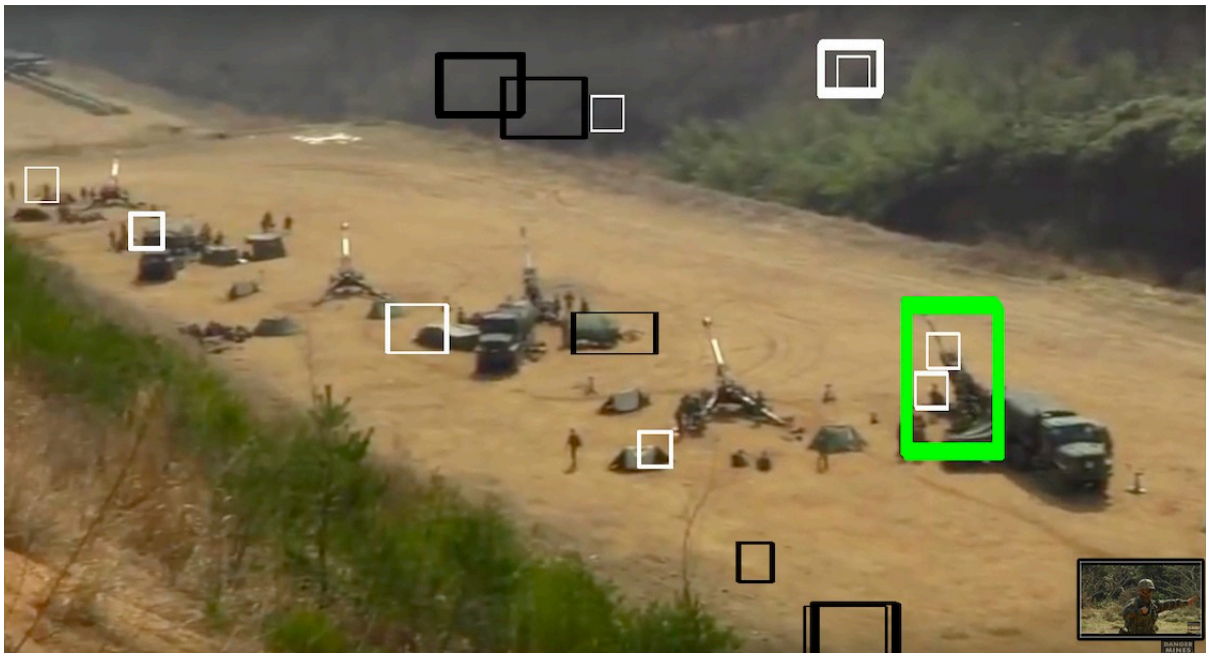

Image 1: Army Base
Green color: Tanks
Black color: Explosion and Disaster

White color: signit

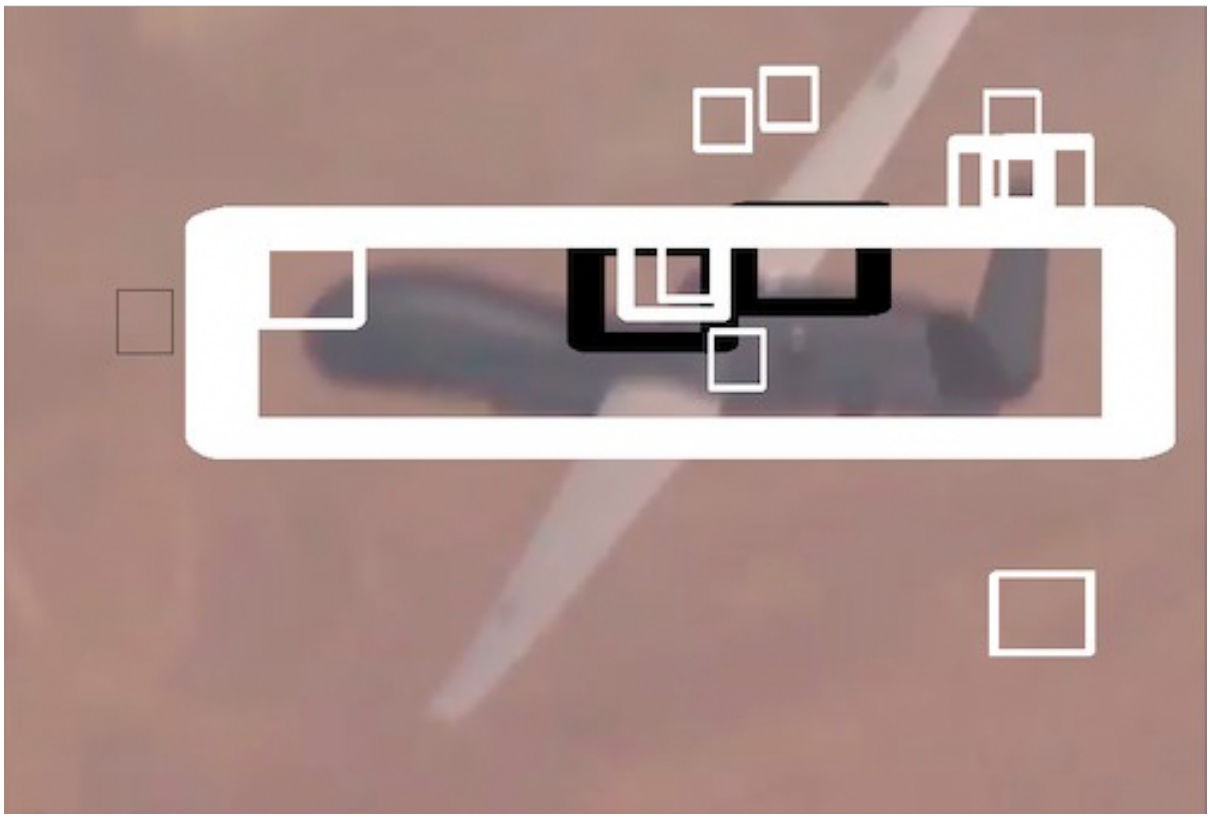

Image 2: US Navy Drone
Black color: Explosion and disaster

White color: Drone

Image 3: Aerial View

Green color: tank

White color: signit

Image 4: Signal Intelligence base

White color : Satellite dishes and interception dome

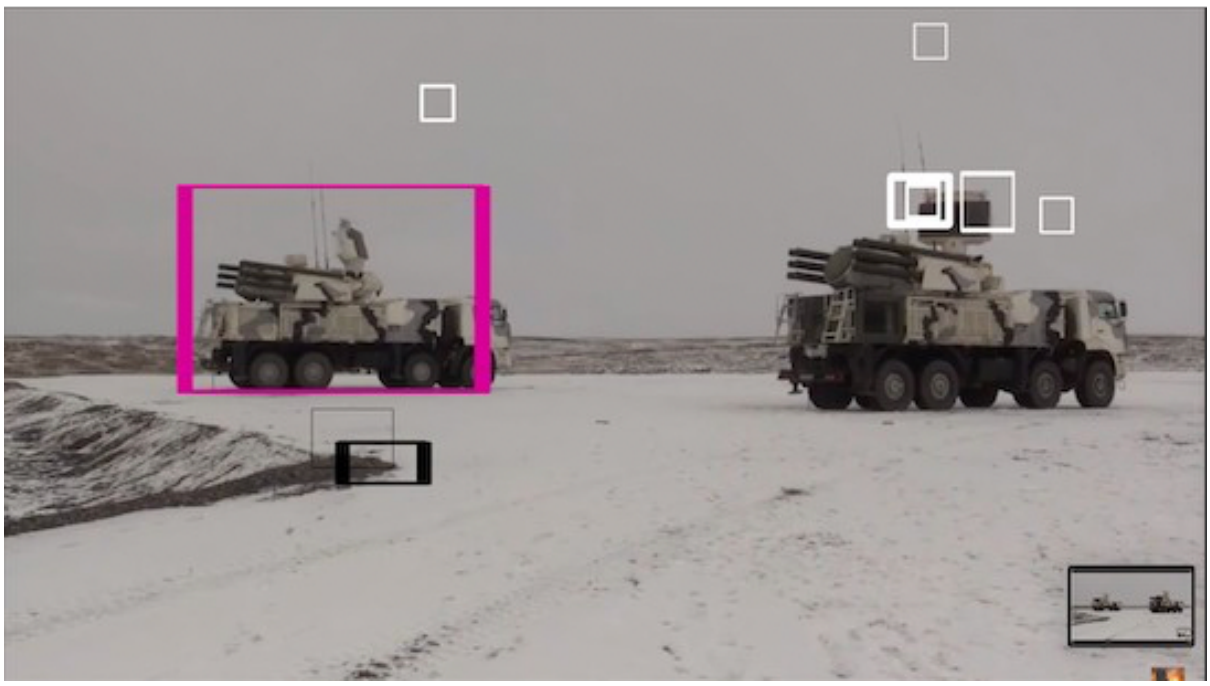

Image 5: Cold war areas
Pink color: Missiles
Black color: Explosion and Disaster

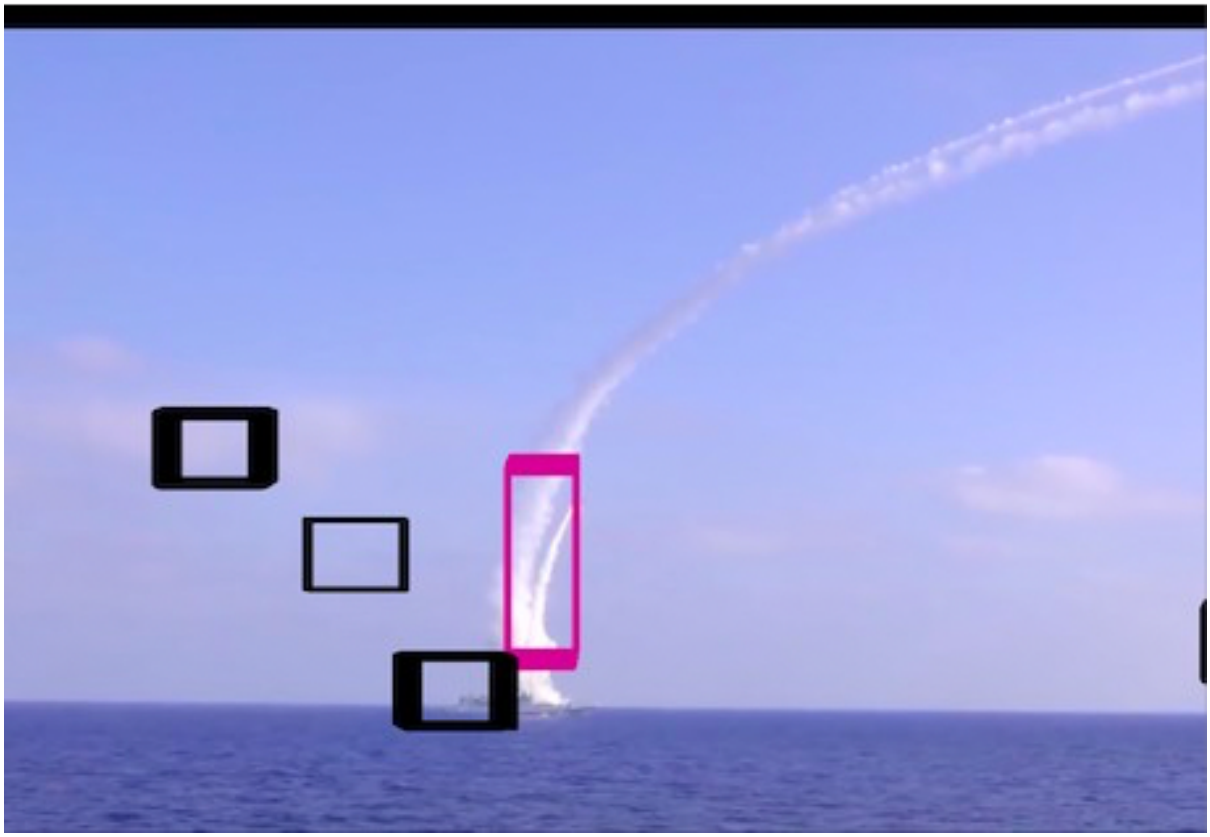

Image 6: Missile launch
Pink color: Missiles
Black color: Explosion and Disaster

Results analysis

Many images were analyzed and it was concluded that the project can easily identify the suspicious activities in the suspected area and prompt about the activities which could be happening in that area. It shows very accurate image results and it is capable of detecting all type of terrains and textures. If some civilian areas are detected

it shows no suspicion, stating that it could be used anywhere.

CONCLUSION

Template matching encompasses a wide scope in enormous devastating regions. Various effective techniques that have been by now executed and has excellent application rate in several fields with their consequences have been identified.

From review of various paper we conclude that there are different techniques are available for recognition of template. Sobel edge detection method,

If proper means to get image of suspected areas could be gathered, then this project could be a milestone in the field of security. Therefore at this stage use of efficient edge detection & template matching to reduce effort required for recognizing the captured image. Try to Calculate improve result as compare to conventional method in turn of time require for convergence.

Further works and prospects

The current predicament in which template matching has been used represents useful but limited use of the application. Neural networks are natural extension to this methodology, though powerful, they have their own downsides when used directly on objects. Generative Adversarial Networks(https://papers.nips.cc/paper/5423-generative-adversarial-nets.pdf) and carefully crafted noise can make them work worse than a coin flip. Another option is machine learning. Machine learning have statistical model which may be good for number crunching but certainly not for image classification because an image classification action requires vast multitude of features and deep learning methodologies at its core. Using neural networks, we can use Convolutional neural networks along with YOLO(https://pjreddie.com/darknet/yolo/) technology to achieve high end results.

To overcome the shortcomings, we can combine the accuracy of template matching and the classification power of CNN. A supervised learning model with huge amount of datasets can facilitate great accuracy and better results.

METHODOLOGY

1. Collect huge amount of labeled dataset.

2. Create training and test sets randomly. An 90:10 percent ratio is fine for a huge dataset(over 10 million labeled records).

3. Pass the training set and test set from a template matching script to generate artificial labels.

4. The templates set must contain a wide variety of images so as to increase the quality and range of initial assertion.

5. Then the labeled images, initial images, original labels, generated labels should be passed through the CNN(with a warm start).

The CNN will adapt to the given images and labels and improve the accuracy and efficiency of the system to great extent and allow real time analysis.

As we are analysing high risk situations, the false negatives should have a high penalty as compared to false positives.

GAN - http://blog.aylien.com/introduction-generative-adversarial-networks-code-tensorflow/

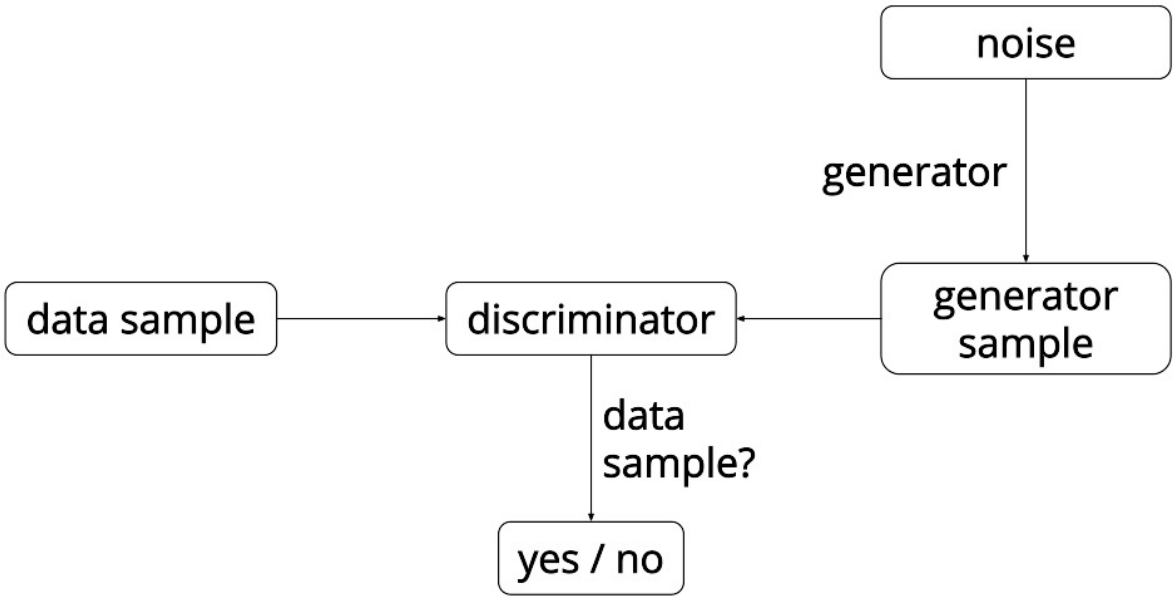

Figure 2 - Flow of Generative Adversarial networks

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[2] Pereira, S., & Pun, T. (2000). Robust template matching for affine resistant image watermarks. *IEEE transactions on image Processing*, *9*(6), 1123- 1129.

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[6] Lee, E. R., Kim, P. K., & Kim, H. J. (1994, November). Automatic recognition of a car license plate using color image processing. In *Image Processing, 1994. Proceedings. ICIP-94., IEEE International Conference* (Vol. 2, pp. 301-305). IEEE.

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[18] Horng, e. B., Chen, C. Y., Chang, Y., & Fan, C. H. (2004, March). Driver fatigue detection based on eye

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[21] Brown, L. G. (1992). A survey of image registration techniques. *ACM computing surveys (CSUR)*, *24*(4), 325-376.

[22] Shi, X., Zhao, e., & Shen, Y. (2005, May). Automatic license plate recognition system based on color image processing. In *International Conference on Computational Science and Its Applications* (pp. 1159-1168). Springer, Berlin, Heidelberg.

[23] Hjelmås, E., & Low, B. K. (2001). Face detection: A survey. *Computer vision and image under- standing*, *83*(3), 236-274.

[24] Goshtasby, A. (1985). Template matching in rotated images. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, (3), 338-344.

[25]Del Bimbo, A., & Pala, P. (1997). Visual image retrieval by elastic matching of user sketches. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, *19*(2), 121-132.

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[28] Yamaguchi, K., Nagaya, Y., Ueda, K., Nemoto, H., & Nakagawa, M. (1999). A method for identifying specific vehicles using template matching. In *Intelligent Transportation Systems, 1999. Proceedings. 1999 IEEE/IEEJ/JSAI International Conference on* (pp. 8-13). IEEE.

[29] Peng, H., Long, F., & Chi, Z. (2003). Document image recognition based on template matching of component block projections. *IEEE Transactions on Pattern Analysis & Machine Intelligence*, (9), 1188-1192.