Design of Robust Infrared Image Sequence (IR-Video) Target Tracking Model

Vivek Chamoli

Abstract: As regards protection, monitoring a certain objective has become a primary goal and thus has helped to incorporate the video technology into the industry. However, owing to its zigzag trajectory or shifts of position, it is often difficult to trace the imprevisible existence of the goal. This article therefore proposed the use of infrared cameras as sensors to monitor the object. The infrared camera is effective when the object changes its direction, like its contemporaries. Therefore, a pattern mapping technique was used for infrarouge goal monitoring. Ultimately, there was a distinction among the traditional Mean Absolute Difference (MAD) algorithm and the evolved V-SQ -track model used here. The findings show that the method of V-SQ -track model performs stronger than the MAD algorithm. Even if the modern algorithm is unable to do so, the artifacts can be monitored

Keywords: Infrared image sequence, Infrared cameras, MAD (Mean Absolute Difference) algorithm, Object Detection, SSD (Sum Square Difference), (Sum Absolute Difference), Tracking, Tracking algorithm,

I. INTRODUCTION

Now, between India and Pakistan there are numerous invasion agreements worldwide. Our brazen firewall, personally but not by others, is using the vast majority of these deals, resulting in an enormous disaster for our nation, like Uri, Pathankot and many others borders areas. The surveillance is relevant, but people are vulnerable to mistake. Exploiting that, in the evenings or during floods or foggy weather, the militias reach our side of the border to inflict chaos. For now, along these lines, the sensors are being used to track these invasions. In any case, the sensors that are actually being used with infrared cameras are extremely inefficient. The reason behind this is, they became useless when the object began to move, or they can not specifically distinguish the different objects. In order to conquer this further estimation ' V-SQ -track model**'** is shown in this article which is more than suitable for the follow-up and follow-up of the customer-specific objective. At the same time, the advantage of using this equation is that, once the goal is captured, it is not lost inferable from the creation of the objective. This is a significant point to the core as it is the location where its roots fall flat. The problem in recompense of the way an object travels in a scene on the picture plane is defined as follows. The following steps [1]-[7] may be used to monitor objects through:

- Object Location
- Tracking
- Research.

The positioning of motions, accompanied by edge-to-edge points and analysis of the tracks of object to interpret their behavior is still a particularly intriguing subject for researchers [8]–[15]. The scheduled follow-up of various articles is still available in a number of applications, including teamwork format [9], [14], follow-up, vehicle observation [12], highlight / design coordination [15]. In the following picture arrangements, there may be different difficulties in the object [8].

1) The absence of coherence in the variation of control over the goal.
2) Crosswise control variations on the adjacent boundaries.
3) Exposure Changes due to camera movement.
4) Switch goal scale, course, etc.
5) Incomplete or complete impediment.

Template-based matching monitoring algorithm [3], [4], [10]. Object matching algorithm are SAD (Sum Absolute Difference), SSD (Sum Square Difference), MAD (Mean Absolute Difference) algorithm

For the following, all over three calculations were used and they all have an alternative situation to follow the item. We produced a video with an IR camera for our work. In this video there is a child running in a cross-movement in the field and many others. The kid was our object. As we used each of the three measurements, Distraught gives great follow-up findings in comparison to others, but does not obey the report when the aim scale is changing, e.g. the object goes a long way from the frame. So, in order to overcome this issue, we need another calculation that was designed to follow the objective. And we built up a V-SQ -track model that produces better results.

Revised Manuscript Received on January 24, 2020.

***** Correspondence Author
Vivek Chamoli*, Department of Electronics and Communication Engineering, Graphic Era Deemed to be University, Dehradun, India. vivekchamoli08@gmail.com

II. V-SQ -TRACK MODEL

An important parameter is a purpose of using the template to guide the function of estimation. Eq.1 supplies the V-SQ algorithm calculation's approximation capacity:

$$r(l,m)=\sum_{v=0}^{zt-1}\sum_{c=0}^{yt-1}\left[\frac{im(m+c,l+v)^2}{temp(c+yt,v+zt)^2}\right] \quad (1)$$

Where, *im (c, v)* = is the initial frame that extracted from the videotape and temp *(c, v)* is the prototype extract from initial frame image.

The weighted distance factor function is given after Eq 2 and the weighted similarity metric is proposed

$$D(g,h)=\sqrt{\sum_{l=1}^{g}\sum_{m=1}^{h}\left(\frac{g}{2}-l\right)^2-\left(\frac{h}{2}-m\right)^2} \quad (2)$$

This is known as weighted factor function:

$$w(l,m)=\frac{1-0.05\times(Dv)^2}{Dv_{\max}} \quad (3)$$

where, $Dv = D(g,h)_{im} - D(g,h)_{temp}$.

The value of the exceeded weight = center of the corresponding field is given by eq. 3

Lower weight = corner weight.

The weighted factor further multiplied with the eq. 1 as shown in eq.

$$r(l,m)=\sum_{v=0}^{zt-1}\sum_{c=0}^{yt-1}\left[\frac{im(m+c,l+v)^2}{temp(c+yt,v+zt)^2}\right]\times w(l,m) \quad (4)$$

$$V-Sq(l,m)=\frac{r(l,m)}{2\times r_{\max}} \quad (5)$$

Eq 5 provides a V-SQ -track model for tracking for final measurement function.

A. *Tracking objects with the V-SQ -track model*

Stages for the tracking the object:

Stage 1: Initially read the video and check the quantity of the casing in the video on the off chance that
tmax> t [t is the casing number of ongoing picture, tmax = greatest estimation of t]
goto stage 2
else
goto stage 9
Stage 2: Subsequent to perusing the video, the reference outlines remove from the video.
Stage 3: Presently select the item or a layout.
Stage 4: In the wake of choosing the item we conjecture the inquiry territory around the article.
Stage 5: Gap into squares pixel by pixel by pixel development for looking through the item on the casing.
Stage 6: Presently figure the contrast among squares and the format.
Stage 7: Applying V-SQ following calculation on the casing and update it
Stage 8: For the following casing go to stage 5
Stage 9: When tmax=t [tmax =t; shows that the present casing is the end frame]
End the procedure.

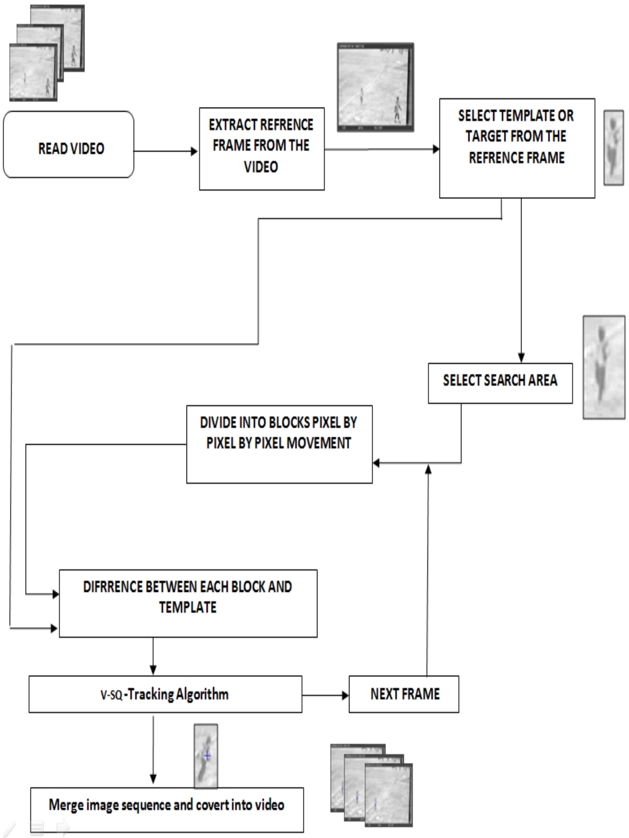
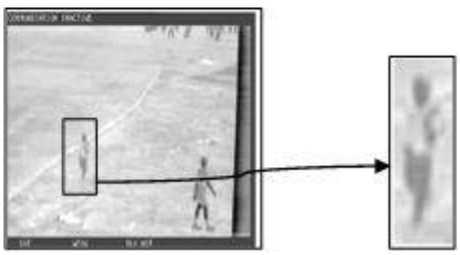


Fig.1 flowchart for the V-SQ-track model

III. RESULT

Several tests were produced to test the algorithm for monitoring. First of all, we remove frame 1 (fig 2a), then pick a prototype and then three template scenarios balanced in order to track the entity are performed in the picture series (fig.2(b)): The following are:

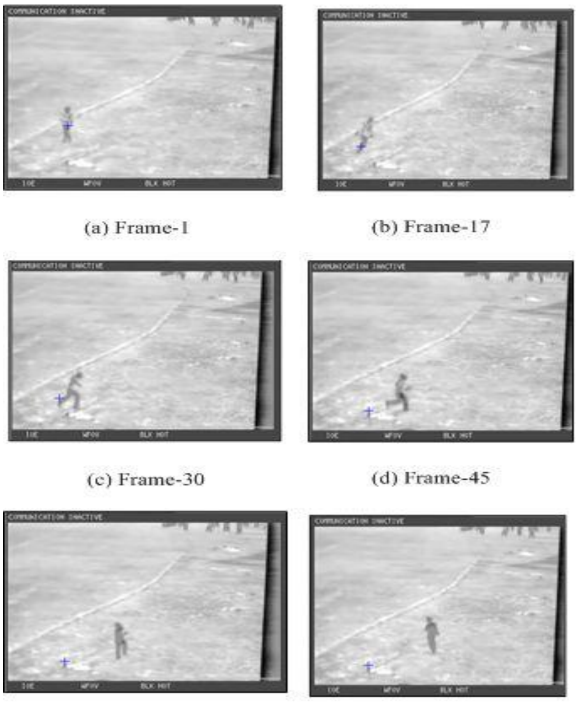
1. In the first scenarios we don't update any prototype in the frames.
2. In second scenarios we updated frames with Mean Absolute Difference algorithm.
3. In third scenarios we used our model 'V-SQ -track model for updating in the frames.



(a) (b)

Fig. 2 (a) initial frame from the videotape (b) tracking object (prototype)

A. Results for first scenarios we don't update any prototype in the frames



(a) Frame-1 (b) Frame-17

(c) Frame-30 (d) Frame-45

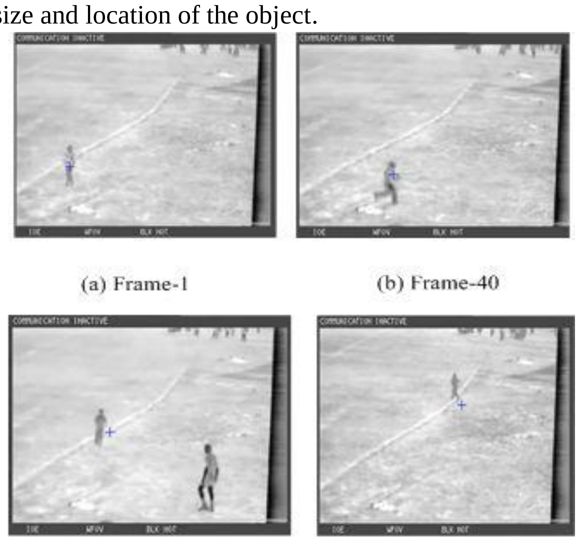
(e) Frame-60 (f) Frame-75

Fig. 3 Results for first scenarios we don't update any prototype in the frames

In Figure 3 above, the indicator missed the object (frame 45) when no template update was used because in that form, the aim contrasts the prototype in every frame taken from the frame of reference 1.

B. Results for second scenarios we updated frames with Mean Absolute Difference algorithm.

The findings above fig. 4 see that when utilizing prototype modifications with standard formulas, the indicator watches the object when the object shifts its location. And it preserves the template's new position and further changes. Currently, as seen in frame 145, the pointer is starting to lose the object and see frame 285 & 332 indicator is losing the object. Therefore, in order to solve this problem, we must update the prototype by size and location of the object.



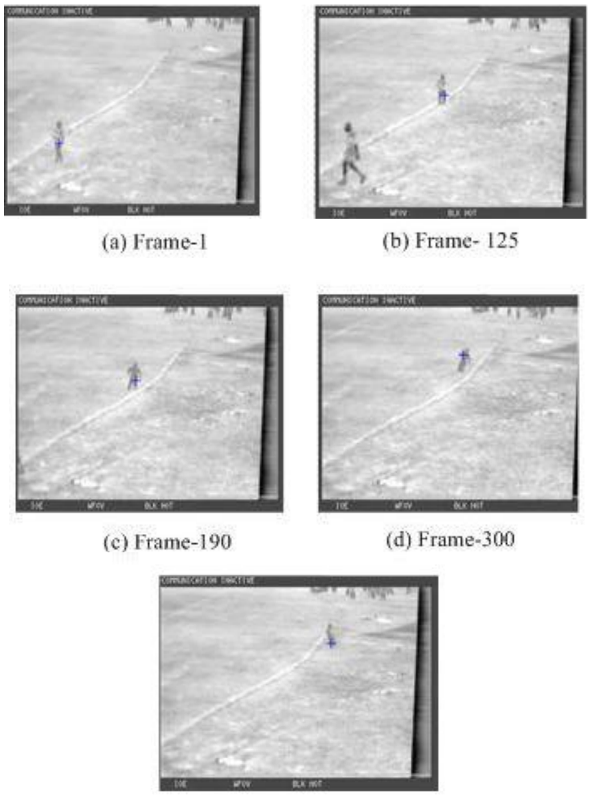
(a) Frame-1 (b) Frame-40

(c) Frame-90 (d) Frame-145

(e) Frame- 285 (f) Frame- 332

Fig. 4 Results for second scenarios we updated frames with Mean Absolute Difference algorithm.

C. Results for third scenarios we used our model 'V-SQ -track model for updating in the frames



(a) Frame-1 (b) Frame- 125

(c) Frame-190 (d) Frame-300

(e) Frame- 360

Fig. 5 Results for third scenarios we used our model 'V-SQ -track model for updating in the frames

The result statistic above fig. 5, the new V-SQ -track model gives the improved result and even changes its position and dimensions, as shown in the frame 300 and 360.

IV. CONCLUSION

This article explores the difference between video processing and object tracking sensors. Between current algorithms, software matching and upgrade was included to create a new V-SQ platform of infrarouge cameras instead of traditional cameras. The findings of Section III show that the' V-SQ monitor model' provides significantly better tracking performance of an entity in motion compared with its predecessors (traditional algorithm), and that it shifts its course, too. The world resistance organization can be analyzed using a latest model.

REFERENCES

1. W. L. Choia, S. Chuna, C. Parka , S. Choia, “A Novel Template Update Method for IR Seeker,” IEEE, 2009
2. K. Zhang, D. Zhong, J.Yan, Ji. Wang, “Research on the Image Matching and Tracking Algorithm for the End of Infrared Object Tracking,” *IEEE*, 2008.
3. V. Chamoli, & A. Bhatia, “A Literature Review– Robust Object Tracking Algorithms for Infrared Image Sequences”, *International Journal of Emerging Technology and Advanced Engineering*, Volume 5(1), (ISSN 2250-2459), April, 2015.
4. Zhuojin Pan, Xiujuan Wang, “Correlation Tracking Algorithm Based on Adaptive Template Update,” 3rd International Congress on Image and Signal Processing, 2010.
5. T. Misu, M. Naemura, W. Zheng, Y. Izumi, and R. Fukui, “Robust Tracking of Soccer Players Based on Data Fusion” *In International Conference on Pattern Recognition* ,pp. 556–561, 2002.
6. H. B. Srivastaval, Y.B. Limbu, R. Saran,, A. Kumar “Airborne Infrared Search and Track Systems” *Defence Science Journal*, Vol. 57, No. 5, , pp. 739-753, September 2007
7. Rafael C. Gonzalez, Richard E. Woods “Digital Image Processing”, Wiley publication.
8. S. S. xu, Z. Qi-lun, H. Han, “A Fast Algorithm for Real-time Video Tracking”, *IEEE*,2007.
9. A. Loza, M. Patricio, J. Garc´ıa, M. Molina, “Advanced Algorithms for Real-Time Video Tracking with Multiple Objects”, 10th Intl. Conf. on Control, *Automation, Robotics and Vision Hanoi*, Vietnam, 17–20 December 2008.
10. J. An, J. Liu and Y. Xiao, “Correlation-based tracking algorithm based on adaptive reference template”, Computer Engineeringand Applications, , 39(14), pp. 103-104, 2003.
11. L. Yu-hui, Y. Qian-qian, L Wei, Y. Huai, Z. Guang-yuan , “ An effective object tracking algorithm in infrared image video”,*IEEE*,2010.
12. A. YilmY. O. Javed, M. Shah “Object Tracking: A Survey”*ACM Computing Surveys*, Vol. 38, No. 4, Article 13, Publication date: December 2006.
13. G. Jia, X. Wang, S. Zhang, “Object tracking algorithm based on adaptive template update in complex background”, *Acta Optica Sinica*, 01. 29, No. 3, , pp. 659-663, March 2009.
14. D. Koller, J. Weber, and Malik, “Robust Multiple Car Tracking with Occlusion Reasoning” *In European Conference on Computer Vision* pp. 186–196, 1994.
15. M. Black,and A. Jepson, “EigenTracking: Robust Matching and Tracking of Articulated Objects Using a View-Based Representation” *International Journal of Computer Vision* 26, 1, pp-63–84, 1998.

AUTHOR PROFILE

Vivek Chamoli pursuing his PhD in Electronics and Communication from Graphic Era Deemed to be University, Dehradun, India. His research focuses on image processing, video processing, signal processing and remote sensing.