International Journal for Innovative Engineering and Management Research
A Peer Revieved Open Access International Journal
www.ijiemr.org

IJIEMR Transactions, online available on 9th June 2017. Link :
http://www.ijiemr.org/downloads.php?vol=Volume-6&issue=ISSUE-4

Title: Swarm Intelligence for Detecting Interesting Events in Crowded Environments.

Volume 06, Issue 04, Page No: 751-759.

Paper Authors

*** TUMMALA LEELA RANI, CH.NAGA SRINIVASARAO.**

* Dept of ECE , Sri Sunflower College of Engineering and Technology.

International Journal for Innovative Engineering and Management Research
A Peer Revieved Open Access International Journal
www.ijiemr.org

SWARM INTELLIGENCE FOR DETECTING INTERESTING EVENTS IN CROWDED ENVIRONMENTS

[1] TUMMALA LEELA RANI, [2] CH.NAGA SRINIVASARAO.

[1]PG Scholar, Dept of ECE , Sri Sunflower College of Engineering and Technology, Lankapalli , (A.P),INDIA.

[2]Assistant Professor, Dept of ECE, Sri Sunflower College of Engineering and Technology , Lankapalli,(A.P), INDIA.

leelatummala2@gmail.com srinu.ece.425@gmail.com.

ABSTRACT:

This paper focuses on detecting and localizing anomalous events in videos of crowded scenes, i.e., divergences from a dominant pattern. Both motion and appearance information are considered, so as to robustly distinguish different kinds of anomalies, for a wide range of scenarios. A newly introduced concept based on swarm theory, histograms of oriented swarms (HOS), is applied to capture the dynamics of crowded environments. HOS, together with the well-known histograms of oriented gradients, are combined to build a descriptor that effectively characterizes each scene. These appearance and motion features are only extracted within spatiotemporal volumes of moving pixels to ensure robustness to local noise, increase accuracy in the detection of local, nondominant anomalies, and achieve a lower computational cost. Experiments on benchmark data sets containing various situations with human crowds, as well as on traffic data, led to results that surpassed the current state of the art (SoA), confirming the method's efficacy and generality. Finally, the experiments show that our approach achieves significantly higher accuracy, especially for pixel-level event detection compared to SoA methods, at a low computational cost.

Keywords: Swarm intelligence, crowd, anomaly, traffic.

I INTRODUCTION

THE widespread use of surveillance systems in roads, stations, airports or malls has led to a huge amount of data that needs to be analyzed for safety, retrieval or even commercial reasons. The task of automatically detecting frames with anomalous or interesting events from long duration video sequences has concerned the research community in the last decade. Event, and especially anomaly detection in crowded scenes is very important, e.g. for security applications, where it is difficult even for trained personnel to reliably monitor scenes with dense crowds or videos of long duration. Numerous methods have been proposed to assist in this direction. The analysis of motions and behaviors in crowded scenes constitutes a challenging task for traditional computer vision methods, as barriers like occlusions, varying crowd densities and the complex stochastic nature of their motions are difficult to overcome. Computational cost is one more complicating factor, as it has to be kept within reasonable limits. In many practical situations,

it is crucial to analyze crowded scenes in real time, or at least as fast as possible, considering the fact that security personnel should act quickly if something seems to be "not as usual." Furthermore, the ambiguity of the term "anomaly" sets its own limitations in our effort to identify it, as there is no commonly accepted definition, and it varies significantly depending on the given scenario. This means that an "anomaly" pattern in one video sequence may often be part of the "normal" pattern of another. In order to address these issues, we define as "anomalies" the events that display a low probability of occurring based on earlier observations. We deal with the challenging problem of detecting abnormal patterns in videos of crowded scenes that emerge as spatiotemporal changes, both in motion and appearance. An appearancerelated anomaly would be, e.g. a bicycle passing through a crowd. Moreover, sudden changes in velocity, like an abrupt increase of its magnitude and the dispersion of individuals in the crowd are detected, indicating that something unusual and potentially dangerous may have occurred. In this work we propose a novel method for anomaly detection and localization that incorporates both motion and appearance information. We introduce a descriptor created from Histograms of Oriented Gradients (HOG) to capture appearance, and the newly introduced Histograms of Oriented Swarms (HOS), to capture frame dynamics. Swarm intelligence has been used in the past only in the framework of Particle Swarm Optimization (PSO) in [1], where PSO optimizes a fitness function minimizing the interaction force derived from the Social Force Model (SFM). However, in our work, swarms are used in a very different way: the core idea is to construct a prey based on optical flow values over a specific time window and deploy a compact swarm flying over it to acquire accurate and discriminative information of the underlying motion. The agents' motion is determined by forces acting on the swarm (Sec. IV), which, unlike [1], do not correspond to the SFM, but are used to determine the swarm motion and location. Thus, this work introduces an innovative deployment of swarm intelligence, which, together with the HOG descriptor, forms a new feature capable of successfully determining a region's "normality" in an SVM framework. In order to capture "anomalies" appearing in a small part of the frame, our algorithm is applied only on regions of interest, and temporal information is incorporated to improve accuracy. Even though benchmark datasets of human crowds were mainly used for the algorithm's validation, results on other kinds of videos of crowded scenes, e.g. traffic, reveal that the proposed method can be extended and generalized to different scenarios. The experimental section shows that our algorithm outperforms state of the art (SoA) algorithms in accuracy and at a low computational cost. Our contribution can be summarized as
follows:

1) Swarms are used in an original way, via Histograms of Oriented Swarms (HOS) that are introduced to characterize crowd motion for anomaly detection. They lead to credibly filtered flow in videos of crowds, resulting to very few noisy flow values. Thus, swarm intelligence captures the motion of crowded scenes in an efficient way that can be extended to other types of videos.
2) The method can be efficiently applied even when the motion in the crowded scene is non-

International Journal for Innovative Engineering and Management Research
A Peer Revieved Open Access International Journal
www.ijiemr.org

uniform in space and time, and "anomalies" appear locally in a changing context. This is shown in the experiments of Sec. VI on the complete UCSD dataset, where our method's accuracy for pixel level anomaly detection surpasses the SoA.

II.LITERATURE SURVEY

Recently Dhall et al. reported higher performance ofLocal Phase Quantization (LPQ) in facial expression recognition.In Local Directional Pattern Variance (LDPv) isproposed which encodes contrast information using localvariance of directional responses. However, Shan et al. found LBP features to be robust for analysis of low resolutionimages. Therefore, we used the LBP histograms asappearance features. PCA and LDA are used as atool for dimensionality reduction as well as classification inexpression recognition. In authors reported the higherMajumder, A.; Behera, L.; Subramanian, V.K. et al. have presented an appearance feature based facial expression recognition system using Kohonen Self-Organizing Map (KSOM). Appearance features are extracted using uniform Local binary patterns (LBPs) from equally sub-divided blocks applied over face image. The dimensionality of theLBP feature vector was reduced using principal component analysis (PCA) to remove the redundant data that leads to unnecessary computation cost. Jizheng Yi; Xia Mao; Lijiang Chen; YuliXue; Compare, A. et al. have proposed a novel FER algorithm by exploiting the structural characteristics and the texture information hiding in the image space. Firstly, the feature points were marked by an active appearance model. Secondly, three facial features, which are feature point distance ratio coefficient, connection angle ratio coefficient and skin deformation energy parameter, were proposed to eliminate the differences among the individuals. Finally, a radial basis function neural network was utilized as the classifier for the FER. Kai-Tai Song; Chao-Yu Lin et al, presented a temporalreinforced approach to enhancing emotion recognition from facial images. Shape and texture models of facial images were computed by using active appearance model (AAM), from which facial feature points and geometrical feature values were extracted. The extracted features were used by relevance vector machine (RVM) to recognize emotional states. they have proposed a temporal analysis approach to recognizing likelihood of emotional categories, such that more subtle emotion, such as degree and ratio of basic emotional states can be obtained.

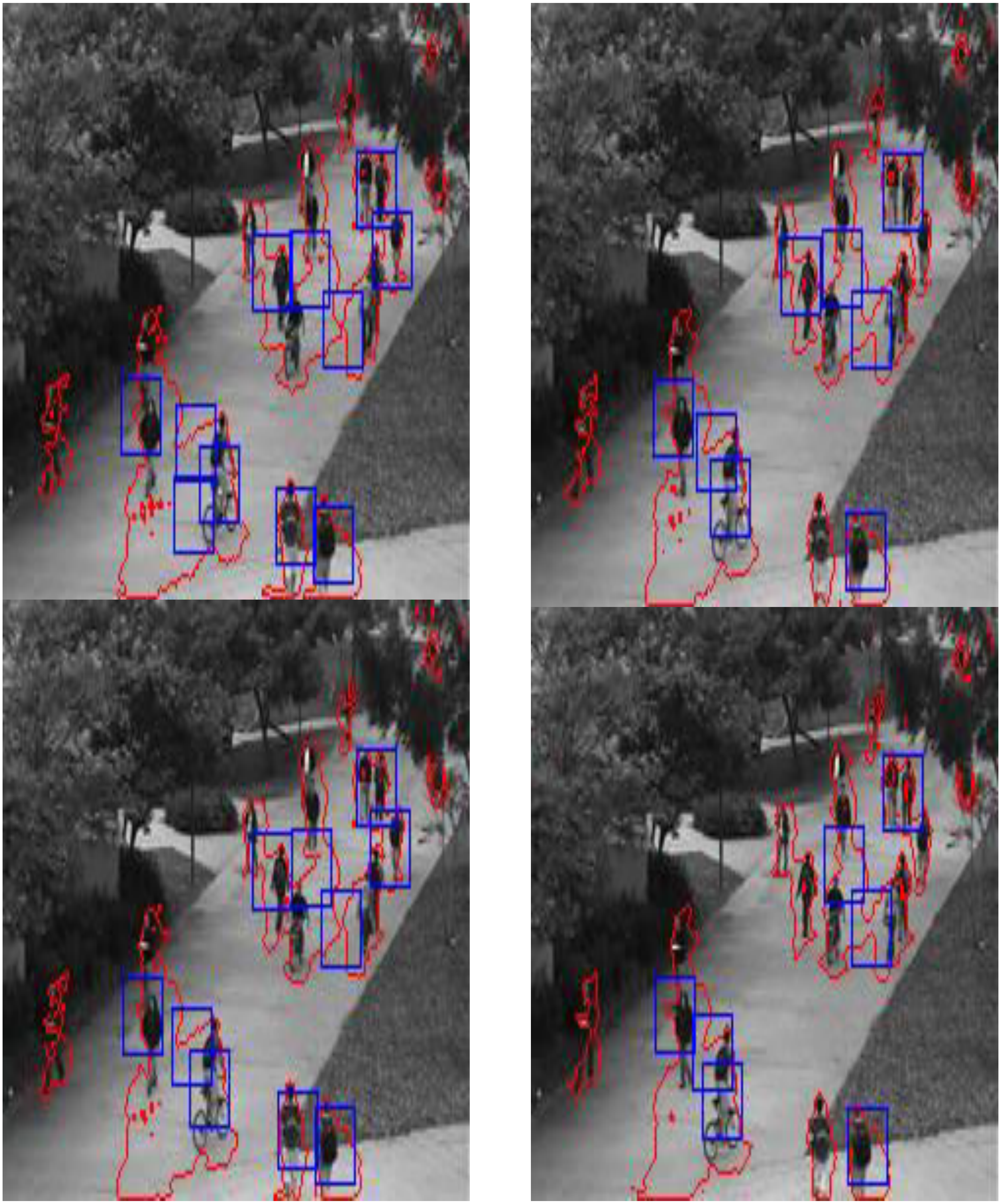
III. PROBLEM OUTLINE

In this work, we address the problem of detecting dynamically changing anomalies in both space and time in videos with crowds of varying densities. In order to effectively capture these anomalies for a wide range of situations, we incorporate both motion and appearance features. Our algorithm uses data derived from automatically extracted regions of interest (ROIs) instead of entire video frames, so as to only process pixels containing information relevant to the event taking place, while at the same time achieving a lower computational cost, fewer false alarms, greater precision and successful spatiotemporal localization of anomalies, both on a global and local scale. In order to extract the ROIs, we apply background subtraction using weighted moving mean [28], as it has been shown to be robust and reliable, however other SoA background subtraction

International Journal for Innovative Engineering and Management Research
A Peer Revieved Open Access International Journal
www.ijiemr.org

methods like Gaussian Mixture Models (GMMs) could also be used, leading to equivalent results. We define interest points on a dense grid in the resulting foreground and ROIs are described as rectangular areas of fixed size around each interest point. The size of the ROIs is determined at the beginning of each set of experiments, and depends on the camera viewpoint for each dataset. Due to the static nature of surveillance cameras, the block size needs to be set only once for each camera, or in our case for each dataset, and thus does not affect our algorithm's generality. For the UCSD dataset, a ROI of 20×20 pixels is used, as it is large enough to capture activity/appearance related details, but is not too large, so as to include noisy information in the descriptor. Once ROIs are extracted, the interest points in them are tracked until the next frames using the KLT tracker, while the foreground grid is continuously updated, with new interest points defined in each new frame's foreground area. The resulting ROIs and the interest points in them are considered informative and are retained if at least 60% of that ROI contains motion, otherwise that interest point and its ROI are considered to be noisy and are ignored. The ROI needs to contain at least 60% moving pixels in order to be as informative as possible; if a ROI contains fewer moving pixels, noisy (motionless) data will also be taken into account, while if it is required to contain more moving pixels, potentially informative interest points may be ignored. Spatiotemporal feature extraction from ROIs follows for a particular time window, to acquire descriptors that effectively describe the video dynamics, and help identify both local and global abnormalities. We consider both motion and appearance features, as their combined use allows the detection of anomalies, i.e. deviations of motion and/or appearance from usual patterns, leading to a generally applicable method. An overview of the procedure for extracting the descriptor is depicted in Fig.1(a). The stages for modelling appearance and motion are discussed in more detail in the sequel.

IV.RESULTS



International Journal for Innovative Engineering and Management Research
A Peer Revieved Open Access International Journal
www.ijiemr.org

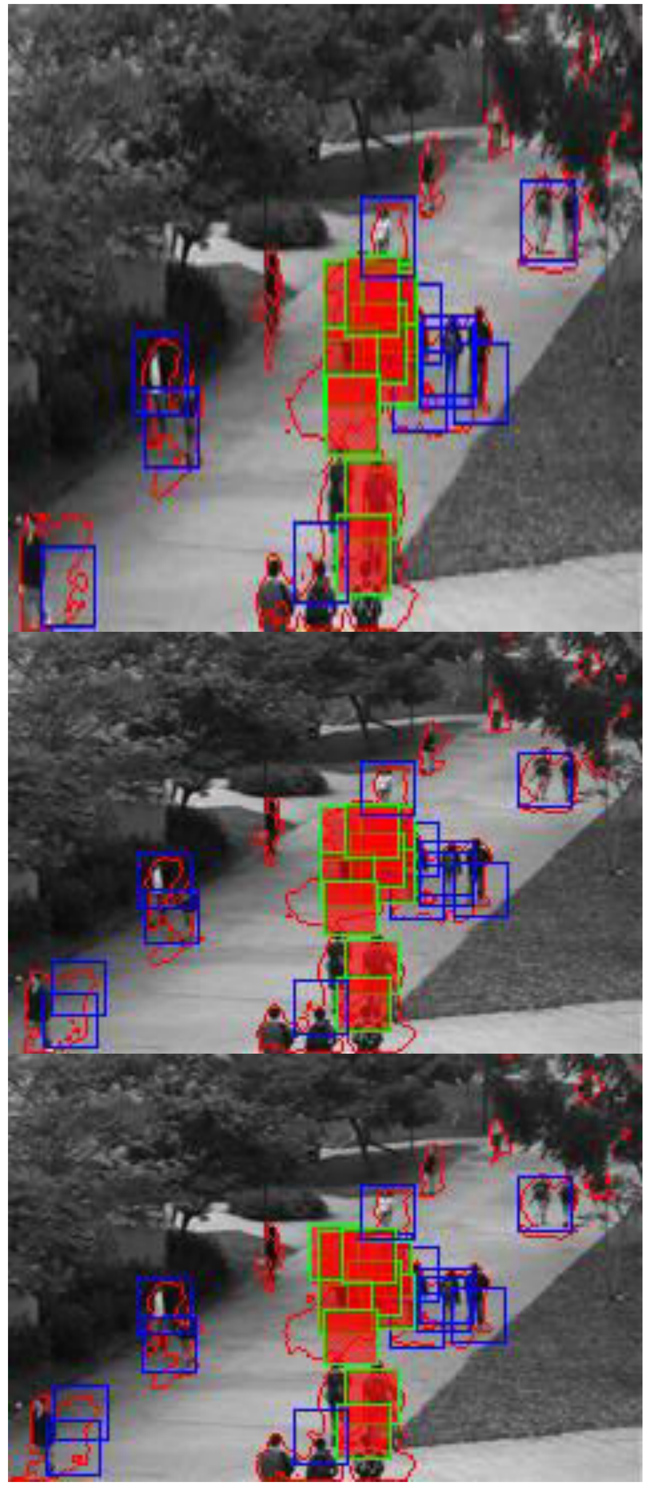
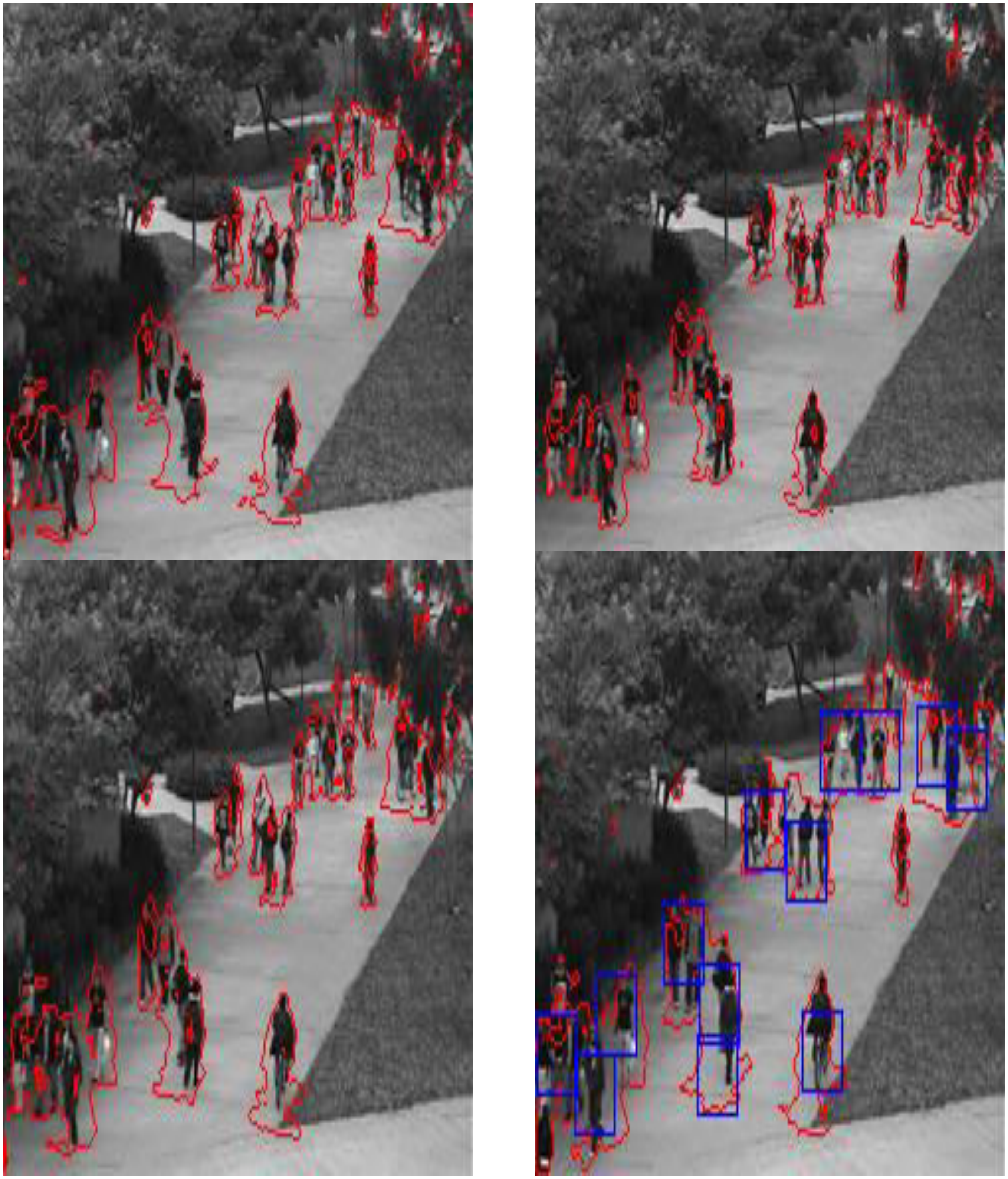


Fig 1: Different kind of anomalies (shown in red blocks) were detected in Ped1 dataset

International Journal for Innovative Engineering and Management Research
A Peer Revieved Open Access International Journal
www.ijiemr.org



International Journal for Innovative Engineering and Management Research
A Peer Revieved Open Access International Journal
www.ijiemr.org

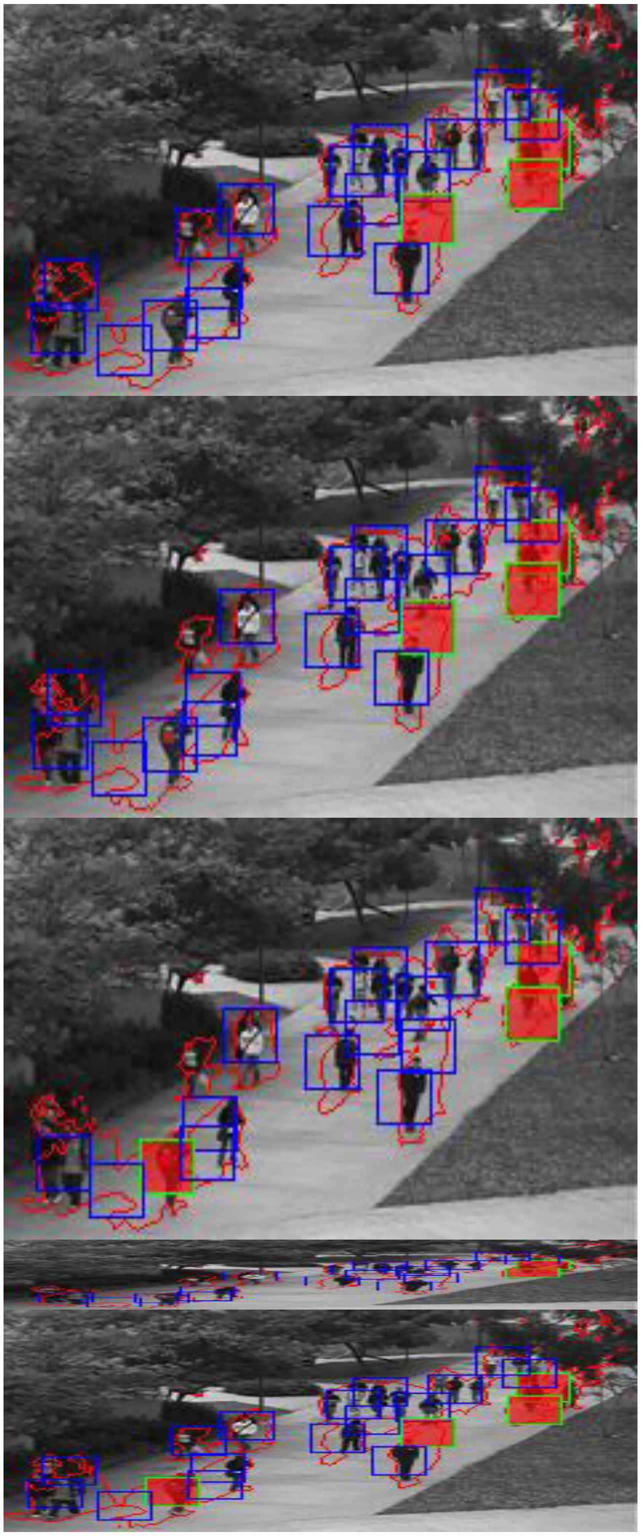


Fig 2: Different kind of anomalies (shown in red blocks) were detected in
Ped2 dataset

V.CONCLUSION

In this work, we propose a novel framework for anomaly detection in different scenarios, recorded from static surveillance cameras. Swarm intelligence is exploited for the extraction of robust motion characteristics and together, with appearance features, form a descriptor capable of effectively describing each scene. Its remarkable performance in 4 completely different kinds of datasets proves the method's generality and its applicability in real life situations. The high detection rate in the UCSD dataset, that greatly outperforms various state-of-the-art approaches, especially on the most challenging pixel level criterion, demonstrates that the proposed algorithm can be effectively used for challenging crowd videos with many occlusions, local noise and local scale variations. This fact in combination with its low computational cost and its effectiveness in different environments, make our algorithm very appropriate for a variety of surveillance

Applications .

VI. REFERENCES

[1] R. Raghavendra, A. Del Bue, M. Cristani, and V. Murino, "Optimizing interaction force for global anomaly detection in crowded scenes," in *Proc. IEEE Int. Conf. Comput. Vis. Workshops (ICCVW)*, Nov. 2011, pp. 136–143.
[2] N. P. Cuntoor, B. Yegnanarayana, and R. Chellappa, "Activity modeling using event

International Journal for Innovative Engineering and Management Research
A Peer Revieved Open Access International Journal
www.ijiemr.org

probability sequences," *IEEE Trans. Image Process.*, vol. 17, no. 4, pp. 594–607, Apr. 2008.
[3] L. Wang, Y. Qiao, and X. Tang, "Latent hierarchical model of temporal structure for complex activity classification," *IEEE Trans. Image Process.*, vol. 23, no. 2, pp. 810–822, Feb. 2014.
[4] W. Hu, X. Zhou, W. Li, W. Luo, X. Zhang, and S. Maybank, "Active contour-based visual tracking by integrating colors, shapes, and motions," *IEEE Trans. Image Process.*, vol. 22, no. 5, pp. 1778–1792, May 2013.
[5] A. Basharat, A. Gritai, and M. Shah, "Learning object motion patterns for anomaly detection and improved object detection," in *Proc. IEEE Conf. Comput. Vis. Pattern Recognit. (CVPR)*, Jun. 2008, pp. 1–8.
[6] C. Piciarelli, C. Micheloni, and G. L. Foresti, "Trajectory-based anomalous event detection," *IEEE Trans. Circuits Syst. Video Technol.*, vol. 18, no. 11, pp. 1544–1554, Nov. 2008.
[7] D. Tran, J. Yuan, and D. Forsyth, "Video event detection: From subvolume localization to spatiotemporal path search," *IEEE Trans. Pattern Anal. Mach. Intell.*, vol. 36, no. 2, pp. 404–416, Feb. 2014.

AUTHORS

CH.NAGA SRINIVASARAO, M.Tech
Assistant professor, Sri Sun Flower College of Engineering & Technology, Lankapalli.

T.LEELA RANI, PG Scholar, Dept of ECE , Sri Sunflower College of Engineering and Technology, Lankapalli. B.Tech degree in Electronics and Communication Engineering at Sri Sunflower College of Engineering and Technology.