Automated Monitoring System for Cow Detection using Gaussian Mixture and Optical Flow method

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***Abstract*—This Automated Monitoring system takes us to video level processing techniques to identify the cows from farms video. Many developed countries as well as developing countries are using system so that they can prevent damage control to its crop fields. In this thesis we are taking some of the videos from farm and from that we detect cows and as the camera detects cows, alarm will ring. This can be useful to protect the farm from crop hazard by cows. In this thesis there is a brief survey of different object detection techniques as well as many background subtraction techniques like frame differencing, Kalman filter, single and mixture of Gaussian model, Optical Flow method and Combination of Gaussian mixture and Optical flow methods. Further for identifying object as cows there are different techniques like template matching, contour based technique, skeleton extraction, edge based technique, etc. But after survey of different methods and combining best feature of them, the system is proposed for cow detection. We use normalized cross correlation method for template matching to identify an object as cow. Proposed system uses the combination of Gaussian mixture model and Optical flow method for background subtraction.**

Keywords*— *crop-raiding; GMM; optical flow

I. INTRODUCTION

Object Detection are widely used these days for a number of applications. Automated monitoring system are used in detection of cows like nilgai antelopes (*Boselaphus tragocamelus*) which has been widely reported in many parts of the country. And its major issue in the saurashtra gujrat. Security surveillance system including CCTV is used due to increase of terrors and crimes. Video Monitoring systems are also used in many places for monitoring inappropriate behavior. Following are the places where this system are used:

1. Monitoring of banks, department stores, airports, museums, stations, private properties and parking lots for crime prevention and detection.
2. Patrolling of highways and railways for accident detection.
3. Detecting people, their activities, and related events such as over staying.
4. Measuring speed of vehicles.
5. Patrolling national borders.

Definition

The definition for the project is "Automated Monitoring System for Cow Detection using template matching method ". The main goal of the proposed definition is to develop a prototype consisting of two cameras, placed in opposite direction, having different/overlapping FOV for real time detection and tracking the motion of cow and generate an alarm automatically when it enters any prohibited area.

Description

Video-based monitoring system started with analog CCTV systems that supported black and white feeds from remote cameras connected to a central monitoring station. Human operators were entirely responsible for the processing of visual information streaming in from often multiple sources. Although there has been massive improvement in these systems, there still

remains the complete dependence on human operators. Third generation Object Detection(3GSS, 2000-) provide end-to-end digital systems. Image acquisition and processing at the sensor level, communication through mobile and fixed heterogeneous broadband networks and image storage at the central servers benefit from low cost digital infrastructure. The ultimate goal of 3GSS is to allow video data to be used for online alarm generation to assist human operators and for offline inspection effectively. To achieve this goal, 3GSS will provide smart systems that are able to generate real-time alarms defined on complex events and handle distributed storage and content-based retrieval of video data. 'Automated Monitoring Systems' requires fast, robust and reliable algorithms for object detection and tracking. The proposed definition aims to achieve the performance of the automated monitoring system to detect and track the motion of an cows in a prohibited area and automatically generate an alarm which will enable the human operators to take action quickly.

Scope of Work

- Cameras would be stationary(static).
- There will not be more than three cameras.
- Direction of motion of cow can be detected.
- System would produce results for videos taken during day time.

Need for the System

On express highways, the vehicles move at a very high speed. The boundaries of these highways are very low due to which there is a possibility of animals crossing the boundary and coming on the highway. This may result in major accident. In such a scenario the proposed framework would be helpful as it can detect the unwanted object and generate an alarm when it enters the area. Also in a huge campus like a college campus, residential area, office building or any other campus this framework will be beneficial.

II. COMPONENTS OF AUTOMATED MONITORING SYSTEM

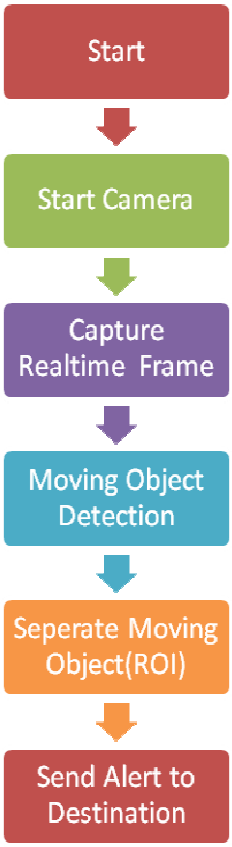


Fig.1: Working of Automated Monitoring System

In AMS, there are six components. These components are listed below. Fig.1 shows working of it.

A. Acquisition

This component is essentially used for acquiring the images. There is a complete array of camera models so that we can meet different reviewing needs. They are analogue and digital, and can be power-operated or not. Solar cameras can also be used in many applications.

B. Transmission

The video captured by system cameras must be sent to the recording, processing and viewing systems. We can do this transmission by cable (fiber optic or coaxial cables or copper wire) or by air (infrared signals).

C. Compression

Digitized video represents a huge amount of data to be transmitted and archived. So that, we must have to compress preprocessed video using codec, algorithms to reduce the amount of data by deleting repetition , by image or between footage frames, as well as details that cannot be seen by a human eye.

D. Processing

Video management systems process system images, such as managing different video flow, and screening, recording, analyzing and searching recorded footage. There are four major types of video management systems, Digital Video Recorder (DVR), Hybrid Digital Video Recorder (HDVR), Network Video Recorder (NVR), IP video surveillance software.

E. Archiving

The video footage archiving time varies depending on observation needs, ranging from few days to few years. There are two types of archiving strategy, internal and attached.

F. Display

Video Monitoring System can be viewed on different devices. In small facilities, the video can be viewed directly on the recorder, as the image is to be recorded. Images are generally viewed distantly on computer or on a mobile device such as a telephone.

III. PROPOSED SYSTEM

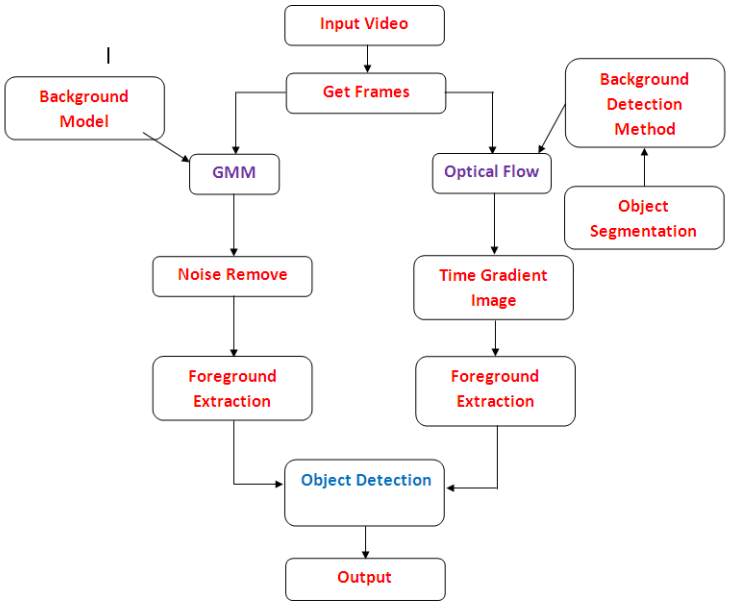


Fig.2: Proposed system block diagram

In the proposed system, it first fetches the current image from the stored video, then by using the background subtraction methods; the common background of farm trees or other objects are subtracted. Then from that image the object, for our purpose

the cow can be detected and then cow tracking is taking place and at last alarm will be generated so that crops can refrain from damaging.

IV. IMPLEMENTATION

1st Video

Existing System Output

Proposed System Output

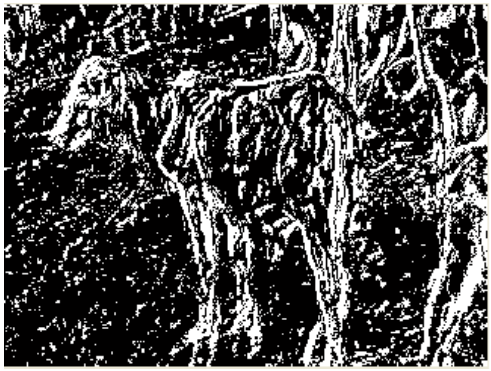
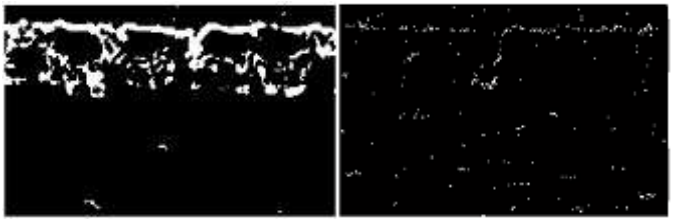


Figure 3: Comparison of output for existing and proposed system

2nd Video

Existing System Output

(a) (b)

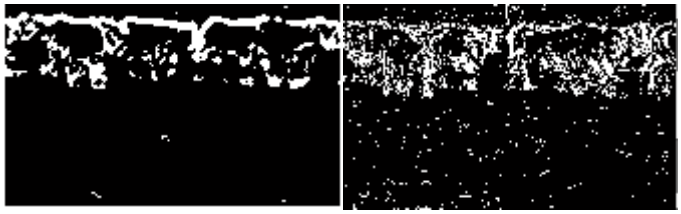


(c) (d)

Fig. 4: Comparison of output for existing and proposed system
(a) Original Video (b) Motion Vector (c) Threshold (d) Results

Proposed System Output

(a) (b)



(c) (d)

Fig. 5: Comparison of output for existing and proposed system - (a) Original Video (b) Motion Vector (c) Threshold (d) Results

3rd Video

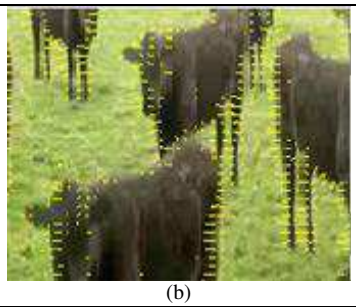
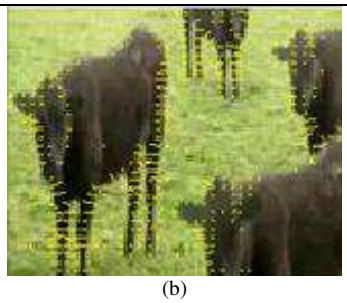
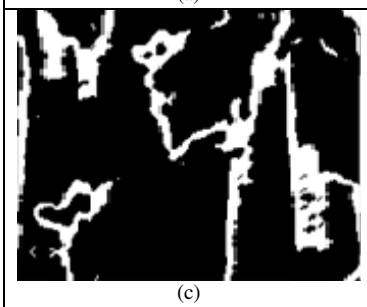
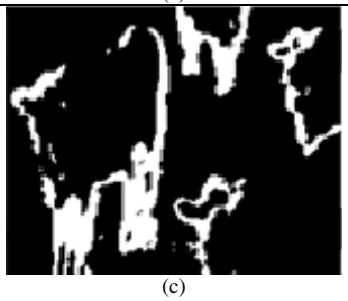
Existing System Output		**Proposed System Output**	
 (a)	 (b)	 (a)	 (b)
 (c)	 (d)	 (c)	 (d)

Fig. 6: Comparison of output for existing and proposed system - Original Video (b) Motion Vector (c) Threshold (d) Result

V. RESULTS AND ANALYSIS

Table 1: Comparison of Proposed System frames with Main frame

Frame	Mean Square Error	Peak Signal to Noise Ratio	Average Difference
12	1.7701e+04	5.6507	58.4109
17	1.8457e+04	5.4692	64.7512
21	1.8480e+04	5.4638	83.7007
22	1.8513e+04	5.4560	102.0697
24	1.8410e+04	5.4803	75.0364
30	1.8034e+04	5.5698	47.2410
32	1.7722e+04	5.6457	65.9469
38	1.8057e+04	5.5537	57.3417
39	1.8281e+04	5.4338	101.7005
40	1.8517e+04	5.5460	84.0696

Table 2: Comparison of Existing System frames with Main frame

Frame	Mean Square Error	Peak Signal to Noise Ratio	Average Difference
12	1.8860e+04	5.3754	120.2972
17	1.8631e+04	5.4751	121.2331
21	1.8582e+04	5.4402	122.7332
22	1.8752e+04	5.3358	122.3173
24	1.8638e+04	5.1758	122.6330
30	1.8351e+04	5.5478	126.7138
32	1.8572e+04	5.4301	122.7332
38	1.7713e+04	5.3652	122.3173
39	1.7631e+04	5.3728	122.6330
40	1.8456e+04	5.2448	126.7138

Table 3: Comparison of Proposed System frames with Existing System frame

Frame	Mean Square Error	Peak Signal to Noise Ratio	Average Difference
12	1.8216e+04	5.5263	31.8862
17	5.7846e+03	10.5081	21.3404
21	6.6683e+03	9.8906	19.8842
22	6.8850e+03	9.7518	16.4168
24	2.1424e+04	4.8218	44.4921
30	6.2846e+03	5.5082	17.3408
32	6.2583e+03	7.6900	20.8241
38	6.8451e+03	7.7518	18.2148
39	3.3424e+04	7.8213	33.2921
40	7.5681e+03	8.3905	19.8842

VI. Conclusion

From all the figures and tables we can see the difference between Existing and Proposed System Outputs. We can note here that results of our proposed system are improved than in existing system. If we compare two results then directly visually we can tell that output is positive here so our proposed work is increasing the quality of an algorithm. Also if we compare table 1 and table 2 then we can see that Average Difference is less in table 1 that is for Proposed System. Also from table 3 we can check that average difference is less so it increases the quality in proposed system.

VII. Future Enhancement

Presently we are working on improving the result of Optical flow and Gaussian Mixture Method. In future we can improve this detection result. and We can add it to a neural network so that we can decide whether detected object is cow or not.

References

[1] Dulari Bhatt, Chirag Patel, Prof. Priyanka Sharma, Intelligent Farm Surveillance System for Bird Detection , 2012

[2] C. SrinivasRao, P. Darwin, “Frame Difference And Kalman Filter Techniques For Detection Of Moving Vehicles In Video Surveillance”, International Journal of Engineering Research and Applications, Vol. 2, Issue 6, November- December 2012, pp.1168-1170

[3] Dee, H. M., Velastin, S. A. How close are we to solving the problem of automated visual surveillance? A review of real-world surveillance, scienti_c progress and evaluative mechanisms. Machine Vision and Applications, 19 (5-6). Septembre 2008. pp. 329-343

[4] J. P. Lewis, “Fast Normalized Cross-Correlation”, Interval Research, Palo Alto CA, This is an expanded version of a paper from Vision Interface, 1995

[5] C. Saravanan, M. Surender, “ Algorithm for Face Matching Using Normalized Cross-Correlation”, International Journal of Engineering and Advanced Technology (IJEAT) ISSN: 2249 – 8958, Volume-2, Issue-4, April 2013

[6] Abhishek Kumar Chauhan, Prashant Krishan Moving Object Tracking using Gaussian Mixture Model and Optical Flow, IJARCSSE, Volume 3, Issue 4, April 2013

[7] Object Tracking: A Survey, Alper Yilmaz, Omar Javed, Mubarak Shah.

[8] Technological and Commercial Intelligence Report,Aude-Emmanuelle Fleurant CRIM, TechnopleDefence and Security,April 8, 2009,"Intelligent Video Surveillance: Promises and Challenges"

[9] M. Hedayati, Wan Mimi Diyana Wan Zaki, Aini Hussain, “A Qualitative and Quantitative Comparison of Real-time Back-ground Subtraction Algorithms for Video Surveillance Applications”, Journal of Computational Information Systems 8: 2 (2012)

[10] Massimo Piccardi , "Background subtraction techniques: a review", 2004 IEEE International Conference on Systems, Man and Cybernetics

[11] Jae Kyu Suhr, Ho Gi Jung, Gen Li, and Jaihie Kim, "Mixture of Gaussians-based Background Subtraction for Bayer-Pattern Image Sequences", Copyright (c) 2010 IEEE

[12] Marcus Baum, Florian Faion, and Uwe D. Hanebeck "Tracking Ground Moving Extended Objects Using RGBD Data" 2012, IEEE International Conference on Multisensor Fusion and Integration for Intelligent Systems (MFI), September 13-15, 2012. Hamburg, Germany

[13] T. Bouwmans, F. El Baf, B. Vachon "Background Modeling using Mixture of Gaussians for Foreground Detection - A Survey", Laboratoire MIA, Université de La Rochelle, Avenue M. Crépeau, 17000 La Rochelle, France

[14] Thierry Bouwmans, "Recent Advanced Statistical Background Modeling for Foreground Detection - A Systematic Survey", Laboratoire MIA, Université de La Rochelle, Avenue M. Crépeau, 17000 La Rochelle, France

[15] Chauhan, N.P.S "Agricultural crop depredation by nilgai antelope (*Boselaphus tragocamelus*) and mitigation strategies: challenges in India" . 8th European Vertebrate Pest Management Conference Wildlife Institute of India, P.O. Box 18, Chandrabani, Dehradun 248001, India, npsc@wii.gov.in

[16] M.P. Huijser, P.T. McGowen, W. Camel, A. Hardy, P. Wright, A.P. Clevenger, L. Salsman and T. Wilson, "Animal vehicle crash mitigation using advanced technology phase i: review, design and implementation", *Oregon Department of Transportation Research Unit*, Oregon, August 2006.

