Detection And Tracking Of Moving Object

Amrita A. Manjrekar[1], P.P. Halkarnikar[2]

ABSTRACT

Motion detection and object tracking algorithms are an important research area of computer vision and comprise building blocks of various high-level techniques in video analysis that include tracking and classification of trajectories. Detecting moving objects is very important in many application contexts such as people detection, visual surveillance and so on. We present a system for event detection and analysis from video streams. Our approach is based on a detection and tracking module which extracts moving objects trajectories from a video stream. These trajectories, together with a rough description of the scene, are then used by the behavior inference module in order to recognize and classify object motion. The hierarchical tasks are performed on a buffered set of frames in order to provide accurate results by taking into account the temporal coherence of moving objects.

Keywords : Video Stream, Tracking, Motion Detection.

I. INTRODUCTION

In recent years, motion analysis has become essential in many vision systems related to time requiring examination. The rising interest in this research is in conjunction with the immense attentions of employing real time application to control complex real world systems such as in the case of traffic monitoring, airport surveillance and face verification for ATM security. Real Time Computer Vision (C.V) system can track multiple non rigid/ rigid objects, such as buildings, people, moving objects, obstacle [13]. Real-time object detection system is challenging field in Computer Vision (C.V), Robotics and Surveillance system. In [8] applications of motion detection are basically divided into two categories which are as follows:

1. Control Applications
   - Obstacle Detection
   - Auto Navigation System
   - Head Tracking for Video Conferencing
2. Surveillance/Monitoring Applications
   - Security Cameras
   - Traffic Monitoring
   - People Counting

It was first necessary to determine the community's video surveillance needs. This was accomplished through the development of a survey to which state and local law enforcement agencies responded. The survey focused on uncovering the kinds of video surveillance assignments required of a typical police department. Those assignments (and the particular users' needs to accomplish the assignments) would lead naturally to the specifications for equipment [3]. The critical locations that were placed in the spotlight of surveillance were:

[1]Department of Computer Science and Tech, Shivaji University, Kolhapur. e-mail : amrita_manjrekar2004@yahoo.com,

[2] Assistant Professor, Dept of CSE, D. Y. Patil College of Engineering, Kolhapur. e-mail : pp_halkarnikar@rediffmail.com

- Airports
- Train stations
- Military compounds and airbases
- Public "hotspots"

Each of the above-mentioned locations can be a potential to threats and requires situational awareness to the possible effective response of the relevant enforcement agencies. Digital technology emerged as the ultimate facilitator for surveillance needs, which enables flexible, real-time, highly manageable and tunable solution [11].

2. System Architecture

We propose architecture of system as depicted in Fig. 1. The main modules of system, from left to right, are: the frame grabbing module, the object detection module, the object tracking module, the motion analysis module, and finally the output module. Operation and description of each module in the system is as follows:

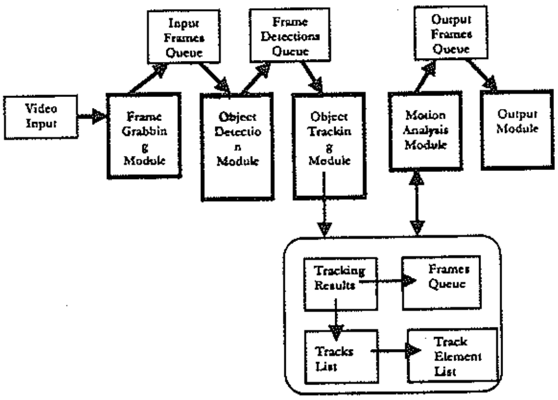

Figure 1: System Architecture

- **Frame Grabbing Module**

The frame grabbing module is responsible for dealing with the input device. The input device can be a digital video camera connected to the computer, or a storage device on which a video file or individual video frames are stored. This module abstracts the nature of the input device away from the rest of the system so that changing the input device does not affect the rest of the system.

- **Object Detection Module**

This module is responsible for invoking the detection algorithm. Ideally, the detection algorithm is to be run on each input frame. However, this will inhibit the system from meeting its real time requirements. To speed up the process, the detection algorithm does not look for object in the entire frame. Instead, it looks for independently moving object in the regions determined to be foreground regions. To determine the foreground regions, a stabilization algorithm is used to align the current frame with a preceding frame and with a succeeding frame. After alignment, the current frame is subtracted from the two other frames. The result of each subtraction is thresholded to form a binary image that represents the locations of foreground objects in the two subtracted frames. To know the locations of the foreground objects in the current frame, the results of the two subtractions are combined by an AND operation.

- **Object Tracking Module**

This module processes frames and detections received from the object detection module, and retain information about all the existing tracks. When a new frame is received, the already existing tracks are extended by locating the new bounding boxes locations for each track in this frame. If the frame is received accompanied with new detections, the new detections are compared to the already existing tracks. If a new detection significantly overlaps with one of the existing tracks, it is ignored. Otherwise, a new track is created for this new detection [10].

- **Motion Analysis Module**

When the length of a track exceeds some specific length, the motion analysis module is invoked. The motion analysis module analyzes the periodicity encountered in the track. Based on the result of this analysis, it decides whether the tracked object is moving or not. This way, the detection results are double checked by the motion analysis.

- **Output Module**

When each track in a frame has been either analyzed by the motion analysis module, or removed because of being too short to be analyzed, this frame is ready for output and passed to the output module. The output module marks the detected human locations in the frame and sends it to the output device, which can be the display monitor or a storage device.

3. Experimental Result

The main tasks of the software is to read the video stream which is stored on disk or capture live video data using web-camera and then process that video stream to detect and track the moving object.

Following are the steps to be performed:

1. Grab the frame
2. Model the background and subtract to obtain object mask
3. Filter to remove noise
4. Group adjacent pixels to obtain objects
5. Track objects between frames to develop trajectories

Our implementation of background subtraction algorithm is partially inspired by the study presented in [12] and works on gray scale video imagery from static camera. Background subtraction method initializes a reference background with the first few frames of video input. Then it subtracts the intensity value of each pixel in the current image from the corresponding value in the reference background image. Temporal differencing makes use of the pixel-wise difference between two or three consecutive frames in video imagery to extract moving regions. It is a highly adaptive approach to dynamic scene changes. We implemented a two-frame temporal differencing method in our system. Let $I_n(x)$ represents the gray-level intensity value at pixel position (x) and at time instance n of video image sequence I which is in the range [0, 255]. The two frames temporal differencing scheme suggests that a pixel is moving if it satisfies the following:

$$|I_n(x) - I_{n-1}(x)| > T_n(x) \tag{3.1}$$

The per-pixel threshold, T, is initially set to a pre-determined value and later updated.

Our system was experimented on a set of video sequences. It has succeeded to demonstrate robustness and close to real time performance in low quality video sequence. In this section, we will present the results of sequences. In the figures presented, bounding green line is the output of the detection algorithm.

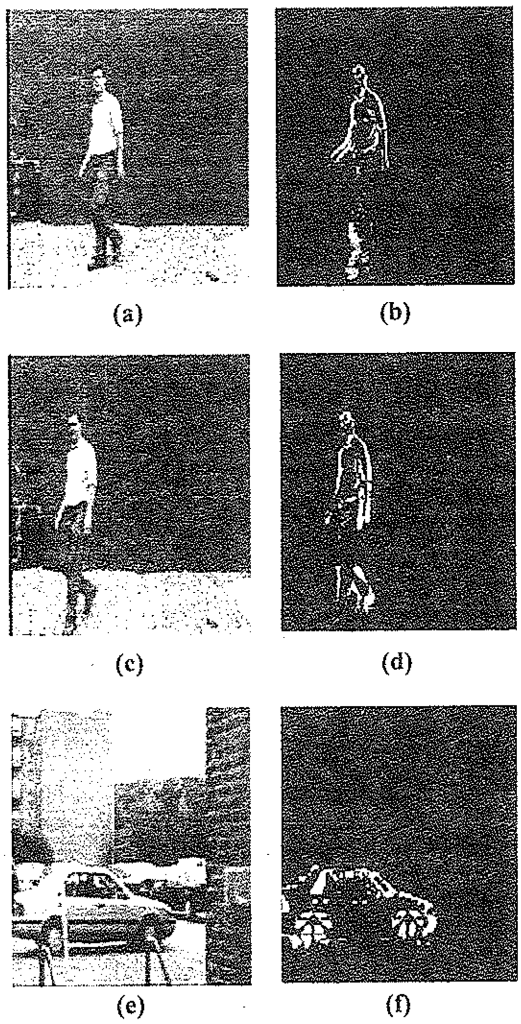

Figure 2: **(a), (c), (e)** - Original Image in Video Sequence
(b), (d), (f) - Detected & Tracked Gray Scale Image with Bounding Box

4. Conclusion

In this paper, a system for object Detection and tracking has been presented. The method will be based on the integration of detection and tracking module and a behavior inference module, and can handle noisy data and inaccurate detections. This is single moving object detection with stationary background. Further research will extend the system to detect multiple moving objects with stationary background. Improving the reliability of the behavior inference module will increase its stability with regard to false and non-detection of the moving objects. Handling these types of situations, which are likely to occur in processing real video streams, requires an automatic tuning of the scenario recognition methods. Further research is planned to model and recognize more complex scenarios. Issues like robustness of recognition and validation can be handled through intensive testing.

References

[1] Cast Shadows, Highlights and Ghosts Duarte Duque, Henrique Santos and Paulo Cortez, *"Moving Object Detection Unaffected"*, Information Systems Department University of Minho, 4800-058 Guimarães, Portugal {duarteduque, hsantos, pcortez}@dsi.uminho.pt, 0-7803-9134-9/05/$20.00 ©2005 IEEE

[2] David Moore, *"A real-world system for human motion detection and tracking"* California Institute of Technology,dcm@acm.org, June 5, 2003

[3] D.J. Atkinson, V.J. Pietrasiewicz, K.E. Junker *"Video Surveillance Equipment Selection and Application Guide"* NIJ Guide 201-99, Institute for Telecommunication Sciences Boulder, CO 80303. Prepared for: National Institute of Justice, Office of Science and Technology, U.S. Department of Justice Washington, DC 20531.

[4] Fabian Campbell-West and Paul Milleri, *"Evaluation of a robust least squares motion detection algorithm for projective sensor motions parallel to a plane"*, Institute of Electronics, Communications and Information Technology (ECIT) Queen's University Belfast Belfast, BT3 9DT.

[5] G´erard Medioni Ram Nevatia Isaac Cohen, *"Event Detection and Analysis from Video Streams"*, University of Southern California Institute for Robotics and Intelligent Systems, Los Angeles, CA, 90089-0273 fmedionijnevatiajicoheng@iris.usc.edu, This research is supported by the defense Advanced Research, Projects Agency (DARPA) under contract DAAB007-97-C-J023, monitored by US Army, Fort Monmouth, NJ.

[6] Mohamed F. Abdelkader, Rama Chellappa ,Qinfen Zheng, *"Integrated Motion Detection and Tracking for Visual Surveillance"*, Center for Automation Research (CfAR) University of Maryland, College Park, MD 20742 Alex L. ChanU. S. Army Research Laboratory (ARL) Adelphi, MD, Proceedings of the Fourth IEEE International Conference on Computer Vision Systems (ICVS 2006) , 0-7695-2506-7/06 $20.00 © 2006 IEEE

[7] Nianjun Liu and Brian C. Lovell, *"MMX-Accelerated Real-Time Hand Tracking System"*, Intelligent Real-Time Imaging and Sensing (IRIS) Group School of Computer Science and Electrical Engineering, The University of Queensland, Brisbane, Australia 4072 Email: {nianjun,

[8] Ronan Fablet, Patrick Bouthemy, Marc Gelgon, *"Moving Object Detection In Color Image Sequences Using Region-level Graph Labeling"*, Campus Universitaire de Beaulieu, 35042 Rennes Cedex, France e-mail : rfablet@irisa.fr, Proc. 6th IEEE Int. Conf. on Image Processing, ICIP'99, Kobe, October 1999

[9] Shaokang Chen and Brian Lovell, *"Real- Time MMX Accelerated Image Stabilization System"*, Intelligent Real Time Imaging and Sensing(IRIS) Group, The School Of Computer Science and Electrical Engineering, The University of Queensland, Australia.

[10] Wai Ho Li and Lindsay Kleeman, *"Real Time Object Tracking using Reflectional Symmetry and Motion"*, Intelligent Robotics Research Centre Department of Electrical and Computer Systems Engineering Monash University, Clayton, Victoria 3800, Australia { Wai.Li, Lindsay.Kleeman } @eng.monash.edu.au, Proceedings of the 2006 IEEE/RSJ, International Conference on Intelligent Robots and Systems, Beijing, China. October 9 - 15, 2006,

[11] Yong Wang, Tong Zhang, Daniel Tretter *"Real Time Motion Analysis toward Semantic Understanding of Video Content"*, Imaging Systems Laboratory HP Laboratories Palo Alto, HPL-2005-93, May 16, 2005. Presented at and published in the Conference on Visual Communications and Image Processing, PP 12-15, Beijing, July 2005

[12] R. T. Collins et al. *"A system for video surveillance and monitoring: VSAM final report"*, Technical report CMU-RI-TR-00-12, Robotics Institute, Carnegie Mellon University, May 2000.

Author's Biography

Pratap P. Halkarnikar received B.E. from Government College of engineering, Pune in 1986. M.E. from Walchand College of engineering, Sangli in 1993. Presently he is working as Assistant Professor in Department of Computer Science and Engineering at D.Y.Patil College of engineering, Kolhapur. Visiting professor at P.G center, Shivaji University, Kolhapur. He is consultant to many industries for development of microcontroller based products. His interest lies in microcontroller based instrumentation, computer vision and web technology.

Miss. Amrita Arvind Manjrekar is pursuing M.Tech (Computer Science & Technology) from Shivaji University. She received the B.E (Computer Science & Engineering) from D. Y. Patil College of Engineering, Kolhapur in 2004. She worked as a Lecturer, Dept of Computer Science & Engineering, in D. Y. Patil College of Engineering & Technology. Her area of interest is including Computer Vision, Video Stream Processing & Web Technology.

Processing of Medical Records from Unstructured Medical Transcripts

Vinod Chandra S. S.[1]

ABSTRACT

The work looks at the problem of creating a framework that identifies information in the free text medical records and maps that information into a structured representation containing clinical terms. The content of the medical records are relatively stereotyped sentence types based on its specialized word usage. This regularity makes it possible to determine a set of sublanguage-specific word classes, which correlate with the types of information conveyed in the subfield; these word classes form the bridge between the structure (syntax) of the sublanguage text and their information content (semantics). We can define sublanguages as the part of the English language used in body of the texts dealing with a particular domain. A parser acts between the medical record and the sublanguage, which extracts the medical data from the input document

Keywords : Medical records, Medical data, Medical parser, NLP, Rule base systems

1. INTRODUCTION

Clinical medical record contains a wealth of information, largely in free-text form. Information extraction in structured format from free-text records is an important research endeavor [1]. A medical document in free text format contains information that is useful for various purposes like medical coding. But keeping track of such lengthy documents is a tedious process. This approach is to observe a large number of medical documents and find a common pattern of reporting diagnosis procedures and symptoms. The information contained in the key phrases is represented in a table like structure whose columns corresponds to the major sublanguage word classes. Different column combinations are possible in a basic sub-language sentence type. The idea is to organize the sub-language sentence into compact tabular representation so that the content of the document can be quickly inspected. In order to represent the information uniformly, the syntactically conveyed connections are translated into the occurrences of particular combinations of column entries in the format.

The growing interest in automated and integrated medical records has spurred intense research into indexing, abstraction and understanding clinical text. Several applications are enabled with Natural Language Processing (NLP) technology, but all are essentially text mining operations in terms of source documentation [2] specificity and depth of information required. The required information can range from a desire to determine which course of treatment are effective for particular conditions per patient group to wanting to know where the latest outbreak of community acquired diseases is taking shape so that a sales force can be first to market. Similarly, Demographic information is important first to identify and individual patients across multiple medical encounters.

[1]Department of Computer Science & Engineering,
College of Engineering, Thiruvananthapuram, India
e-mail:vinodchandrass@gmail.com

Some of the interesting works related to medical information processing is discussed here. The ARBITER (Arterial Biology for the Investigation of the Treatment Effects of Reducing Cholesterol) is the application developed, and used MEDLINE citations [11] for information extraction. Medical Language Processing (MLP) and tagging of the medical text [4, 5] discusses statistically significant POS n-gram type overlaps of newspaper language and medical sublanguage, which has not been recognized before. A Dialogue-Based System for Identifying Parts for Medical Systems [6] describes a system that provides customer service by allowing users to retrieve identification numbers of parts for medical systems using spoken natural language dialogue. They showed a results of extremely encouraging with the system being able to successfully process approximately 80% of the requests from users with diverse accents. The use of clinical data present in the medical record to determine the relevance of research evidence from literature databases [3, 7] discussed. Here they used conventional information retrieval system for analysis of the patient's data record. Three algorithms are discussed in the above work.

Medical information processing from an unstructured text is highly related to NLP. This work deals with set of sub-languages and a parser. The parser interacts between the sub-languages and input document. A natural language processing tool for analysis the medical text and the information is extracted in a specified format using a parser.

2. Parser Design

Document Analysis

Medical document analysis that occurs in clinical documents and their associated lexical attributes are shown in Figure 1. We can observe that the lexical attributes appearing in the medical documents are the lexicon or semantic classes which we have to develop in order to arrive at the detailed analysis of the clinical documents. The statement of a medical fact is composed of a subject and a predicate (SUBJECT and PREDICATE) each of which has associated an atomic attributes or lexicons. The SUBJECT may be physically absent in the statement being modeled, but if so, it is implicit. The Medical Fact can be divided into subtypes like Clinical Fact, Treatment Fact and Response Fact [8]. Clinical Fact subtypes are distinguished by the paragraph they occur in: Examination, Diagnosis, Lab Test, History etc. The Treatment Fact subtype is subdivided into general medical management (GEN), Surgery (SURG), medications (MEDS) and all other therapies (Comp). The idea of classifying the medical document into various fact classes is the use of different lexicons in each class. The Laboratory Fact will be characterized by the description of a test (Text box) with its associated attributes shown in the box attached to the test box. These attributes are the set of lexical or semantic classes which distinguishes the Laboratory statements from the others. The Treatment Fact is likewise distinguished from other statement types by the lexical classes shown in the box attached to the Treatment Fact box, and similarly for the Response Fact. An instance of treatment fact is often coupled to a Response fact via a response relation.

The extracted information is grouped under several medical classes like treatment fact, medical fact, test fact etc. Some information may have associated contents like affected body parts, test/procedure performed, extent of damage etc. The output must clearly state the patient state, diagnosis and procedures. The input document statements are expected to follow simple grammar rules