

Suspicious activity detection in hospital

1. Mayur Sambhaji Kharmate
B.E. (Computer Engineering)
Indira College Of Engineering
and Management, Pune - 410506
mayur.kharmate@indiraicem.ac.in

2. Aniket Rajesh Uttekar
B.E. (Computer Engineering)
Indira College Of Engineering
and Management, Pune - 410506
aniketuttekar@indiraicem.ac.in

3. Shreyas Ajay Kulkarni
B.E. (Computer Engineering)
Indira College Of Engineering
and Management, Pune - 410506
shreyas.kulkarni@indiraicem.ac.in

4. Kunal Anil Desai
B.E. (Computer Engineering)
Indira College Of Engineering
and Management, Pune - 410506
Kunal.Desai@indiraicem.ac.in

5. Prof. Deepali Dagale
Project Guide
Indira College Of Engineering
and Management, Pune - 410506
deepali.dagale@indiraicem.ac.in

Abstract—Suspicious activities can pose a potential risk to humans in a number of ways. Suspicious activities can also make people feel unsafe and uneasy, even if no harm actually comes to them. In the past, suspicious activities were less common than usual activities because there were fewer people and less complex societies. However, with the growth of cities, the increase in population, and the expansion of technology, there are now more opportunities for suspicious activities to occur. With the arrival of intelligent surveillance systems, various approaches were introduced in surveillance. A significant field of research and development focuses on sophisticated machine learning methods for the detection of suspicious human behaviour to lower monitoring costs while increasing safety. We require a real-time intelligent human activity detection system that can recognize suspicious actions in hospitals because it is challenging for personnel to continuously watch in hospitals. The complicated low-accuracy algorithms and approaches used by current systems make them less dependable. By integrating a Convolutional Neural Network and using the 2D posture estimation approach to the system, this study

suggests a real-time suspicious human activity recognition method with high accuracy. This system is suitable for usage in hospitals, homes, and other surveillance areas. Here, we use 2D pose estimation to extract skeleton pictures of people from the input video frames in order to determine their pose.

Index Terms—Suspicious, Hospital, Deep Learning, Computer, Security, Machine Learning.

I. INTRODUCTION

The technique of image processing and computer vision known as Suspicious Human Activity Recognition from Video Surveillance recognizes human activity and classifies it into normal/general and abnormal/uncommon activities. Abnormal behaviors are the uncommon or suspicious actions that people infrequently take when in a hospital, including vomiting and falling. Normal activities are the regular tasks carried out by people, such as slipping, when they are in a hospital. Video surveillance is increasingly used today to keep an eye

on people's movements and stop suspicious behavior among patients in hospitals. It is also necessary to have intelligent video surveillance to automatically detect falls among elderly hospital patients. For fall detection, the market mostly offers worn-sensor based systems (Willems et al. 2009; Nguyen et al. 2009). These devices are primarily electronic devices that force elderly people to either put them in their pockets or wear them on their wrists. These wearable fall detectors often contain an accelerometer or manual help button to detect a fall. These wearable fall detectors do have certain limitations, though. One of the drawbacks of fall detectors is that older individuals sometimes dis-remember to wear them, and the help buttons are ineffective for those who pass out after falling. Modern developments in computer vision have produced fresh approaches to get beyond these limitations. One of the key benefits of a visual-based fall detection system is that it doesn't require the user to wear anything, making it less obtrusive than a wearable sensor. In addition, computer vision systems offer greater insight into a person's behavior than typical wearable sensors do. This enables a visual-based home monitoring system to collect data on falls as well as other aspects of daily life that are important for health care monitoring, like mealtimes and sleep length. An image of a Human Fall detection that was taken by a sophisticated vision surveillance system. There are two different kinds of surveillance systems: the first is semi-autonomous, which records video and sends it for human expert analysis. In order to stop suspicious human activity in hospitals, non-intelligent video surveillance requires constant human monitoring, which is very expensive, problematic, and also very time consuming and challenging to do. In order to conduct low level tasks like motion detection, tracking, categorization, and abnormal event identification, a second fully autonomous surveillance system is needed.

II. MOTIVATION

1 We believe that this Project will be very Effective in hospital system.

2 It is beneficial for patients care.

3 Behaviour analysis of patients is a significant issue, where good supervision can reduce the risk of injury to hospital personal, property, and patients themselves.

III. LITERATURE SURVEY

Description: When it comes to the potential risk it poses to people, suspicious activity is a problem. It is essential to detect criminal activity given the rise in it in urban and suburban areas in order to reduce such occurrences. In the early days, surveillance was carried out manually by humans, which was a taxing task because suspicious activity was rare compared to everyday activity. Different methods of surveillance were introduced with the introduction of intelligent surveillance systems. We concentrate on examining two situations where, if ignored, there is a high risk to human lives: identifying potential crimes involving firearms and identifying abandoned luggage on surveillance footage. citation : <https://ieeexplore.ieee.org/document/8959600>[1]

Description: Automated teller machines (ATMs) are frequently used to conduct financial transactions and are quickly evolving into a necessity of daily life. Money can be withdrawn, deposited, and transferred between accounts whenever needed with the use of ATMs. However, this convenience is tainted by criminal activity, which is rapidly compromising bank clients' security, such as money theft and assaults on consumers. In this research, we provide a video-based framework that can quickly spot suspicious activity at ATM installations and sound an alarm in the event of any suspicious occurrence. The suggested method uses Hu moments and motion history images (MHI) to extract pertinent features from video. citation: <https://www.hindawi.com/journals/jece/2015/502737/>[2]

Description: This publication takes into account original works that expand the field of knowledge. Even if no novel information or ideas are given, original reviews and surveys are accepted. The article's results shouldn't have been submitted to or published elsewhere. It is possible to submit expanded versions of conference publications. The language used to write articles must be standard English and be understandable. citation: <https://ieeexplore.ieee.org/xpl/issues?punumber=76isnumber=9130983> [3]

Description: The computer analysis of visual data is the main topic of this publication. The journal Computer Vision and Image Understanding publishes papers on all facets of image analysis, from early vision's low-level, iconic processes to recognition and interpretation's high-level, symbolic processes. The domain of image understanding is addressed over a wide range of topics, with papers providing perspectives that diverge from prevailing viewpoints.

citation: <https://www.sciencedirect.com/journal/computer-vision-and-image-understanding> [4]

Description: The most recent technological advancements have resulted in automation and digitization in practically every field, which has had an impact on a wide range of applications. This has led to a massive flow of data from all industries, with the information included in that data serving as a crucial component for the advancement of each individual, group, state, nation, and so on. Depending on who handles it, these data with vital information might be seen in a constructive or negative way. Therefore, taking precautions becomes absolutely necessary to secure the data from unauthorized access. This opens the door for the creation of a system to detect suspicious activity in sensitive locations like hospitals, financial institutions, and military regimes. citation: <https://www.dhs.gov/report-suspicious-activity> [5]

Description: Sensor-based human activity recognition has received a lot of attention in artificial intelligence and ubiquitous computing due to the accessibility of inexpensive sensors and sensor networks. In this study, using wireless sensors linked to a person's body, we describe a novel two-phase method for identifying aberrant actions. Among many other applications of sensor networks, detecting anomalous behaviours is a particularly crucial duty in security monitoring and healthcare. Traditional solutions to this issue have a significant false positive rate, especially when sensor data collection is biased toward normal data and aberrant events are few. As a result, it is difficult to apply many traditional data mining techniques because there is a lack of training data. citation: <https://ieeexplore.ieee.org/document/4358934> [6]

Description: Due to an increase in immoral or anti-social behaviours that have been occurring often, security has become a crucial aspect of the modern society. Many organisations have installed CCTV to continuously watch over people, their interactions, and movements. Continuously produced video data is substantial. Humans cannot continuously analyse data to determine whether occurrences are anomalous because doing so would need a large workforce and continual attention. This makes automating the same process necessary. In order to quickly determine whether an unusual activity is abnormal, it is also necessary to notice which frames and portions of them include the strange activity. citation: <https://arxiv.org/pdf/2302.11027> [7]

Description: The detection of suspicious human activity in surveillance footage is a current field of study for image processing and computer vision. In order to stop terrorism, theft, accidents and illegal parking, vandalism, fighting, chain snatching, crime and other suspicious activities, human activities can be observed through visual surveillance in sensitive and public areas like bus, train, airport, banks, shopping malls, schools, and colleges. Since it is very challenging to constantly monitor public spaces,

it is necessary to install intelligent video surveillance that can track people's movements in real-time, classify them as routine or unusual, and issue alerts. There have been a lot of publications in the last ten years about using visual surveillance to spot unusual activity. citation: <https://dl.acm.org/doi/10.1007/s10462-017-9545-7> [8]

Description: Everyone desires to be in good health. To prevent any future dramatic changes, it is equally crucial to regularly check on a person's health. Long hospital lines and ambulatory monitoring are both well known in this fast-paced, modern world. Simple health status monitoring for older people is also essential. These problems necessitate the creation of a fundamental health monitoring system that can be used in homes or other settings with basic health parameters. We are aware that the internet of things and numerous wireless devices are products of advanced technology. citation: <https://ieeexplore.ieee.org/document/9441874> [9]

Description: In the past ten years, automated patient monitoring has drawn more attention in hospital settings. Behavior analysis of psychiatric patients is a significant issue, where good oversight can reduce the risk of injury to hospital personnel, property, and patients themselves. We do a preliminary analysis on visual patient monitoring utilising security cameras for this assignment. The suggested method identifies potentially harmful behaviour using statistics of optical flow vectors that were collected from patient motions. To extract the shape and temporal features of blobs, the approach additionally carries out foreground segmentation followed by blob tracking. citation: <https://pubmed.ncbi.nlm.nih.gov/21893907> [10]

Description: In several nations, the population of seniors is always growing. The majority of these folks like living on their own. Falls can result in critical injuries or even fatalities. It is crucial to create a fall detection system in order to address this issue. This project's goal is to recognise and spot any strange conduct in an elderly person. People spend the majority of their time at home or at work, and many consider these areas to be their spiritual havens. The individual's details are kept in a database. Therefore, the neighbour can review the affected person's details in an emergency and refer to all of the information about the affected person. citation: <https://www.mdpi.com/1424-8220/19/10/2264> [11]

Description: The field's key subfield is computer vision. a branch of computer science that enables machines to simply observing and studying digital images and movies, one can become smart and intelligent. Activity recognition, which automatically categorises the actions being carried out by an agent, is an important use of this. The goal of human activity recognition is to understand a person's actions through a series of observations while taking into account different difficult contextual conditions. This paper examines the many methodologies used, the problems found, and the uses for this field of study. citation: <https://arxiv.org/pdf/1906.05074>

[12]

Description: Research on sleeping habits and the prevention of bedsores, among other biomedical topics, can benefit greatly from monitoring human sleeping postures throughout time. In this article, we present a vision-based tracking system for widespread yet undetectable long-term monitoring of in-bed postures in various contexts. Once trained, our system uses a hierarchical inference model on the top view movies gathered from any common off-the-shelf camera to produce an in-bed posture tracking history (iPoTH) report. Our model can be learned offline, applied to new users without further training, and is person-independent despite being based on a supervised learning structure. citation: <https://ieeexplore.ieee.org/document/8265373> [13]

Description: The effectiveness of conventional pattern recognition systems has significantly increased recently. Utilizing deep learning algorithms to comprehend human behaviour in mobile and wearable computing contexts has garnered a lot of interest due to its rising popularity and success. This study suggests a deep neural network that combines long short term memory (LSTM) and convolutional layers. This model could automatically separate out activity features and analyze them with just a few model parameters. The proposed architecture used a two-layer LSTM followed by convolutional layers to process the raw data collected by the sensors. citation: <https://ieeexplore.ieee.org/document/9588719> [14]

Description: A growing need for cheap wellness monitoring is giving patient monitoring systems (PMS) more significance. Due to their low cost and passive sensing capabilities, CMOS cameras are being used more and more for vision-based PMS applications. This thesis proposes integrated architecture for a vision-based PMS as well as computationally effective methods for extracting facial features including the eyes, lips, and brow furrows. citation: <https://dr.ntu.edu.sg/handle/10356/72179?mode=simple> [15]

IV. EXISTING SYSTEM

Hospitals In addition, video surveillance can be utilised in hospitals to keep an eye on elderly or young patients. It is even used in ambulances to remotely monitor patients. In hospitals, video surveillance can keep an eye on patient activity and spot any questionable behaviour, such as vomiting, dizziness, or other strange behaviour. The hospital of image processing and computer vision known as Suspicious Human Activity Recognition from Video Surveillance recognises human activity and classifies it into normal and abnormal activities. The Falling patient is engaging in abnormal behaviour. The human at the hospital is slipping while performing normal duties.

ACKNOWLEDGMENT

With immense pleasure, we are presenting this Project Report (stage 1) as a part of the curriculum of B.E Computer. We wish to thank all the people who gave us endless support

right from the stage the idea was conceived. We are heartily thankful to **Prof. Deepali Dagale (Project Guide)** whose encouragement, guidance and support from the initial to the final level enabled us to develop an understanding of the subject. We would also like to thank **Dr. Soumitra Das (HOD, Computer Department)**, **Prof. Manjusha Tatiya (Project Coordinator)** and **Dr. Sunil Ingle (Principal, ICEM)**, for giving us the opportunity to make a project on this fascinating topic. This project would not be possible without the help of the library department who helped us gather the information from various sources. Lastly, we offer our regards to all those who supported us in any respect during the completion of the stage-1 of our project.

CONCLUSION

- We have presented a framework for a video analysis tool for suspicious event identification in the aforementioned project.
- This programme is made to make it less difficult to manually sift through hours of surveillance footage in order to determine whether any suspicious activity has taken place.
- Without resorting to physical force, this research might assist authorities conducting surveillance in a variety of fields to spot suspect activity such as robberies, people wearing masks, and others carrying guns.
- The authority's work may be completed much more quickly and with less effort if the task is automated.
- improving the hospital's security as a result

REFERENCES

- [1] S. Loganathan, G. Kariyawasam and P. Sumathipala, "Suspicious Activity Detection in Surveillance Footage," 2019 International Conference on Electrical and Computing Technologies and Applications (ICECTA), 2019
- [2] Dimitropoulos K, Barmoutis P, Grammalidis N., "Trans Circuit System Video Technology" Proposed a method for real time fire detection to model behavior of fire by using spatio-temporal features like color probability, spatiotemporal energy, pp. 28-40 July 2015
- [3] Tripathi V, Gangodkar D, Latta V, Mittal A, "Robust abnormal event recognition via motion and shape analysis at ATM installations" For reducing dimensions PCA was used and for classification SVM was used, pp. 20-34 June 2015
- [4] Willem A, Madasu V, Boles W, Yarlagadda P, "Computer Vision and Image Understanding", A suspicious behaviour detection using a context space model for smart surveillance systems, pp. 33-44 March 2012
- [5] Joy Iong Zong Chen "Smart Security System for Suspicious Activity Detection in Volatile Areas", Smart Security, Suspicious Activity, Volatile Areas, Motion Sensors, Facial Identification, pp. 21-33 March 2020
- [6] Jie Yin, Qiang Yang, "Sensor-Based Abnormal Human-Activity Detection", Activity recognition, outlier detection, sensor networks, data mining, pp. 31-42 May 2008
- [7] 1P. Rajasekhar Reddy, 2B. Nirupa, 3Preetham Kumar, 4S. Vaishnavi, "SUSPICIOUS ACTIVITIES DETECTION USING VIDEO ANALYSIS", Security, automate, machine learning, deep learning, pp. 19-25 May 2021
- [8] Rajesh Kumar, "Suspicious human activity recognition: a review", Abandoned object • Theft detection • Fall detection • Accidents, pp. 23-34 May 2018
- [9] Narasimha Rao Jasti Madhu, "IoT based Remote Patient Health Monitoring System" Remote , Health Monitoring, pp. 31-44 April 2010
- [10] Paulo Vinicius Koerich Borges., "Vision-Based Detection of Unusual Patient Activity" Patient Monitoring, Computer Vision, pp. 20-33 March 2018
- [11] Liz George M, "Activity Monitoring and Unusual Activity Detection for Elderly Homes" Activities of Daily Living (ADL), Support Vector Machine (SVM), Red Green Blue (RGB), Hidden Markov Models, May 2020
- [12] Prarthana T V1, Dr. B G Prasad, "Human Activity Recognition using Computer Vision based Approach – Various Techniques", Human Activity Recognition, HAR, Deep learning, Computer vision, pp. 20-33, May 2020
- [13] Shuangjun Liu and Sarah Ostadabbas, "A Vision-Based System for In-Bed Posture Tracking", Vrsion Based System, Bed Posture Traking, pp. 22-30 May 2015
- [14] Dr. Keerthika V, A Abhiram, "Suspicious human activity recognition and alarming system using cnn and lstm algorithm", Activity Recognition , Deep Learnign, May 2012
- [15] Sathyanarayana, Supriya "Vision-based patient wellness monitoring using facial cues" Computer science and engineering Computing methodologies pp.22-34 March 2017