Fall Detection System by Machine Learning Framework for Public Health

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Abstract

Health is the major worrisome point whose impalpability increases with increase in the age. Thus, taking care of elders is very important responsibility. In such scenario, technology is helping people by providing living assistance. One of the major causes of health degradation or death of elders is `fall'. In this paper, a fall detection system is proposed based on machine learning. The system detects falls by classifying different activities into fall and non-fall actions and alert the relative or care taker of the elderly person in case of emergency. The dataset SisFall with variety of activities of multiple participants is used to calculate features. Machine learning algorithms SVM and decision tree are used to detect the falls on the basis of calculated features. The system acquires accuracy up to 96% by using CNN algorithm.

I. INTRODUCTION

Now-a-days elderly people live alone at home because of poor conditions, different working culture of people and due to many other reasons. According to World Health Organization (WHO) studies, falls causes many accidental deaths. Greatest number of fatal falls is seen in adults older than 65 leading to health problems or injuries. Thus, elderly people require an attention at the times of emergencies at their residence because they cannot call for help due to lack of technology access in rural areas or due to their physical conditions. To improve quality of life of old aged people and to provide living assistance to them, automatic fall detection systems are in place. The risk of falling is high among older people, individuals with Parkinson's disease or patients in rehabilitation units. Main reasons for occurrence of falls are physical factors like of muscle weakness, posture, Gait balance, vision, due to old age, or psychological factors or environmental factors etc. Falls are the major cause of injuries and hip fractures. If immediate aid is not provided, it may lead to death. To ensure proper treatment and care of the elderly people, fall detection system plays important role. Various researches have been done on the fall detection system. There are no fixed criteria on basis of sensors used or on calculated features or on algorithms used to classify. Image processing techniques are used after capturing images from camera to detect falls. Wearable sensors like accelerometer, gyroscope at knee, wrist, neck, and waist are used to get the data input. Features are calculated by using sensor readings to get some meaningful data out of the raw data. Falls also can be detected by using ambient sensors like IR sensors or movement based sensors. Major hurdle to develop precise fall detection system is false alarms i.e. alerting fall when there is a fall like activity but not exactly a fall. Most of the researches are focused on reducing false alarms and improving accuracy of the fall detection system.

II. SYSTEM ARCHITECTURE

The purpose of System Implementation can be summarized as follows: It making the new system available to a prepared set of users (the deployment), and positioning on-going support and maintenance of the system within the Performing Organization (the transition). At a finer level of detail, deploying the system consists of executing all steps necessary to educate the Consumers on the use of the new system, placing the newly developed system into production, confirming that all data required at the start of operations is available and

accurate, and validating that business functions that interact with the system are functioning properly. Transitioning the system support responsibilities involves changing from a system development to a system support and maintenance mode of operation, with ownership of the new system moving from the Project Team to the Performing Organization.
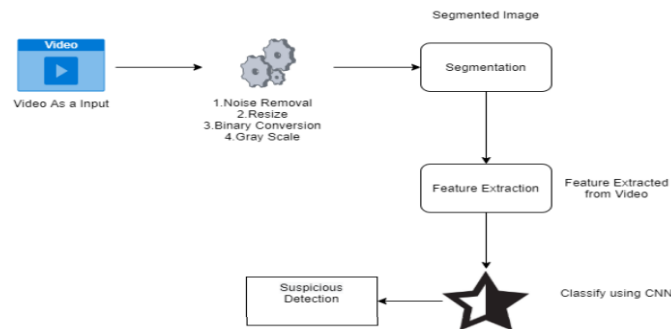

Fig 2a. System Architecture

Planning is the first task in the system implementation. Planning means deciding on the method and the time scale to be adopted. At the time of implementation of any system people from different departments and system analysis involve. They are confirmed to practical problem of controlling various activities of people outside their own data processing departments.

III. LITERATURE SURVEY

The first step was to decide which suspicious activities to focus on. We selected 5 suspicious activities to classify: Shooting, punching, kicking, knife attack and sword fight. These 5 activities formed 5 classes for our classifier model. The non-suspicious activities were put in a 6th class. The CCTV Camera is a video camera that feeds or streams its image in real time .The system will detect suspicious person i.e. unauthorized entry in a restricted place in a video by using AMD algorithm and will start tracking once the user has specified a suspicious person by his/her on the display. The main purpose of efficient background subtraction method is to generate a reliable background model and thus significantly improve the detection of moving objects. Advanced Motion Detection (AMD) achieves complete detection of moving objects. A camera is been connected inside the monitoring room which produces alert messages on the account of any suspicious activity. The purpose of Prepare for System Implementation is to take all possible steps to ensure that the upcoming system deployment and transition occurs smoothly, efficiently, and flawlessly. In the implementation of any new system, it is necessary to ensure that the Consumer community is best positioned to utilize the system once deployment efforts have been validated. Therefore, all necessary training activities must be scheduled and coordinated. As this training is often the first exposure to the system for many individuals, it should be conducted as professionally and competently as possible. A positive training experience is a great first step towards Customer acceptance of the system.

IV. SOFTWARE DESCRIPTION

Python is a general-purpose interpreted, interactive, object-oriented, and high-level programming language. It was created by Guido van Rossum during 1985- 1990. Like Perl, Python source code is also available under the GNU General Public License (GPL). This tutorial gives enough understanding on Python programming language. Python is a high-level, interpreted, interactive and object-oriented scripting language. Python is designed to be highly readable. It uses English keywords frequently where as other languages use punctuation, and it has fewer syntactical constructions than other languages. Python is a MUST for students and working professionals to become a great Software Engineer specially when they are working in Web Development Domain. Pandas is mainly used for data analysis and associated manipulation of tabular data in Data frames.

Pandas allows importing data from various file formats such as comma-separated values, JSON, Parquet, SQL database tables or queries, and Microsoft Excel. Pandas allows various data manipulation operations such as merging, reshaping, selecting, as well as data cleaning, and data wrangling features. The development of pandas introduced into Python many comparable features of working with Data frames that were established in the R programming language. The panda's library is built upon another library NumPy, which is oriented to efficiently working with arrays instead of the features of working on Data frames. NumPy is a general-purpose array-processing package. It provides a high-performance multidimensional array object, and tools for working with these arrays. Matplotlib is a plotting library for the Python programming language and its numerical mathematics extension NumPy. It provides an object-oriented API for embedding plots into applications using general-purpose GUI toolkits like Tkinter, wxPython, Qt, or GTK.

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