Automatic Monitoring and Detection System for Elderly and Physically Disabled People

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Abstract: - There has been a marked increase in the number of elderly people, which can be directly correlated to the various advancements in the area of Health care. There are medicines and vaccines for the majority of serious illnesses, which has increased average life expectancy by a large margin. There is also an increase in the number of smaller nuclear families, which has also increased the incidences of elderly people living alone. This is an alarming sign as due to old age; a person is unable to take care of themselves. There is also a possibility that they lose balance and fall, which is a very common occurrence in elderly people as the old age negatively, impacts their balance.

These falls can cause a lot of damage to the person and if timely assistance is not provided, it can actually be fatal. Therefore, to provide a solution to this problem, the proposed system utilizes Recurrent Neural Networks to implement image processing.

The presented technique utilizes cameras to track the subject frame by frame and looks for signs of a fall through pixel displacement and region of interest. If a fall occurs, the system then informs the relatives and the doctors through a text message for timely action Falls are abnormal activity events that occur infrequently; however, they are serious health problems among elderly individuals. With the advancements of technologies, falls have been widely studied by scientific researchers to minimize serious consequences and negative impacts

Key Words: —Software, Lifesaving, Costeffective

1 INTRODUCTION

Introduction

Fall detection is one of the most crucial and critical aspects of modern health care. This is due to the fact that there are an increasing number of senior citizens in the world, which need some form of monitoring due to their old age. This is attributed to the fact that there have been great advances in the field of medical science and health care sectors, which has gradually increased the quality of life as well as the average life expectancy. This is the reason why the number of elderly individuals is increasing day by day.

Most of the elderly individuals cannot take care of themselves and the age is a deciding factor in many of the situations. Elderly people also, in general, have a few diseases due to their old age and need extensive amounts of care. This coupled with the fact that majority of the elder lies stay alone aggravates even the slightest of inconsistencies in their health. Older people are also more susceptible to fall as they are more prone to lose balance and are also more fragile and major falls could also be fatal.

In hospitals and clinics, falls are a very crucial and extremely critical safety issue, due to the fact that falling could cause dangerous injury or aggravate any existing conditions, that can result in grave social,

psychological and physical consequences. Falls are a potential to cause undue hurt and psychological trauma to the person affected and is a major cause of concern for the hospital administrators, families and patients. As hospitals have patients with various different ailments visiting the premises, a group of patients with equilibrium disorders or vestibular dysfunction is more susceptible to falls.

As the patients in a hospital are alone in their wards, the fall incidents are frequent and would not be detected in time as someone has to be physically present with the patient at the time of the fall, which is not viable for the hospital staff to achieve on an already crunched timeline. Therefore, fall identification and detection have become a very critical issue to be dealt with, which increases and intensifies the need for an implementation of a reliable, effective, automatic and non-invasive technique for the detection of falls which is also cost effective.

Fall is one of the leading causes of injury and death and it usually occurs in mostly older adults due to their age.Now days Falls are major public health problem among older people. When they are alone at home they need a help for a weak up.In addition, there are more than half of them are living alone, whom are called "empty nest seniors". Worse still, fall is a frequently happened event. Concretely, one-third of seniors fall down each year.Fall is not a big deal for teenagers, but is very dangerous for seniors because it may cause some severe disease such as hip fractures

Problem Definition

Approximately 28-35% of people aged 65 and over fall each year increasing to 32-42% for those over 70 years of age. The frequency of falls increases with age and frailty level. In fact, falls exponentially increase with age-related biological changes

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Scope

Future prospects aim to deploy this technique into CCTV cameras to provide real-time surveillance and fall detection even in the dark. In future this project may get more chip because of the we can then it in the simple mobile app

Can be develop in crowded places too we can apply this to this to government hospital. Because of the 20th generation so most of people are refried rudrashram for there old parents so it can also implement in the ridrasharam

Can be develop as Mobile App:

We can also make the simple app app instant of using camera or cctv then the project make more chip because of now a days the everyone have mobile then easy to use all elder or old person also.

There is still considerable scope to improve upon the device in its current state. Using different packaging materials, the ruggedness and usability of the device can be improved. The packaging can also ensure that the device is waterproof. Further using infrared or heart rate sensors, it would be possible to detect whether the device is being worn by the user at any given time. The user interface to access the device can also be improved to enable the care-taker to access it easily irrespective of their computer literacy

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We observe that while there has been considerable research into finding out the correlation between a person's health profile and his probability of fall (as indicated by the odds ratio), not much has been explored in evaluating the impact of this odds ratio on the performance parameters of various ML algorithms for fall detection.

Project Modules
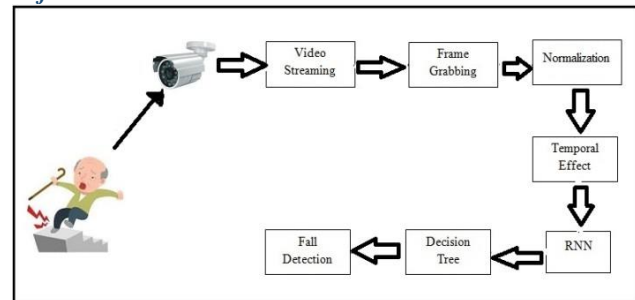
1. Video streaming

Here is start and camera is also on and in video streaming start the getting the live video. When is get started then the per second frame is collected and given to the system for the testing. In video streaming input is came from the camera of laptop or we can use the CCTV camera also. Video streaming start the main part of the system. In the system we use a higher rang of camera then we can get better output otherwise its also possible to detect the fall but not accrual.

Frame grabbing

To perform image processing, we need to first setup a webcam for the purpose of grabbing frames of the subject. The webcam from a laptop is utilized for this purpose. The webcam has 1.3 Mega Pixel depth which keeps a vigilant eye on the subject. The laptop utilizes the Java Media File API to allow easy extraction of frames by utilizing the Frame Grabbing Controller. These frames are subsequently saved and for easy retrieval, their paths are stored in a Queue.

2. Normalization

The paths stored in the Queue in the previous step are now utilized to extract the frames with a 1 second interval time. The first frame in the queue is designated as the model image and the subsequent frames are then normalized according to this particular model frame. This is to ensure that the frames maintain some sort of uniformity between them.

The act of normalization is achieved with the application of the mean difference of the model image to the other images in the queue. Algorithm 1 given below elaborates the process in detail.

3. Temporal Effect

The temporal effect is where every step of the frame has its temporal features maintained in a smooth manner. This is due to the fact that after every frame in the Queue, there are temporal changes made to the pixels in that frame. This change in the temporal values is maintained y assigning the current frame value to the one immediately before that frame. The next step handles the temporal effect quite efficiently.

4. Recurrent Neural Network (RNN)

The frame paths stored in the queue are utilized to extract the particular frames. These extracted frames after going through the various steps listed above are

then converted into an average grayscale image.
The Grayscale image is formed by averaging the RGB values of each pixel of the frame and then combining them into one. The values are further adjusted according to the original values to output the Grayscale image. The Grayscale image obtained in the previous step is further converted into a binary image through algorithm 1 given below. The threshold of the binary image while conversion is 125.

5. Decision tree

A divide and conquer approach, and their basic data structure is a tree that most of the time is binary. Created by Ross Quinlan generates a decision tree that can be used to solve classification problems. The construction of the tree is performed in a recursive manner. An attribute is chosen as the root of the decision tree, and branches are created for every value of the attribute. The process is repeated on every branch using the remaining attributes that reach them. The stopping criteria are met when all of the instances in the branch have the same class or there are no more attributes left. The selection of the nodes (attributes) is determined using a measurement of the purity of all possible nodes. The level of purity associated to each node is just the number of instances in the node that have the same class. The more instances of a given class the node has, the more pure this will be. C4.5 uses information gain to measure the purity of the nodes .

6. Fall detection

The system first reassures if it was a legitimate fall by sounding the alarm and intimating the person to respond. This is done three times in order to allow the subject to rule out any false positives. When the subject does not respond even after the three alarms, the relatives, the hospital and the neighbors are intimated via a text message for assistance to the elderly subject.

2. LITERATURE SURVEY

J. Lee [1] describes that fall is one of the leading causes of injury and death and it usually occurs in mostly older adults due to their age. Since the last decade, there has been tremendous growth in the field of wearable sensor and MEMS-based miniature inertial sensors (e.g., accelerometers and gyroscopes) in particular. In fact, the fall detection method separated in two-part detection of a subject who has already fallen (i.e. post-impact fall detection) and detection of a subject who is about to fall (i.e. pre- impact fall detection). Thus, the proposed paper is implemented successfully for detecting the fall.

X. Kong proposes a methodology that extracts binary images by using the depth images. Binary images give the outline of the image by utilizing the canny filter. Then the fall is detected from this outline of these images. After the extraction of the white pixels from the image outline the system calculates the tangent vector angle and the white pixel into different 15-degree groups [2]. This model includes over 700 experimental images which prove that the proposed method is one of the most effective algorithms in detecting the fall detection. K.

Chaccourelaborates that since the last two-decades the health care sector is facing some serious problems and one of them falls trauma and this fall mostly affects older people very negatively. These types of falls are extensively investigated by different medical institutions to minimize the consequences of falling. Extensive research has been made in falls by the academia and industry. Lots of research has been done on falling by using the sensing method. Later the authors shifted to fall prevention – how to avoid fall, and experienced some effective outcomes. [3]B. Y. Su explains that human falls are the main cause of mobility issues among the elder people whose age is

65 or above. Detecting and preventing fall is an important task for elder and older people. The authors have proposed a methodology that introduces fall detection and prevention on it by using Wavelet transform (WT), which is used to detect the fall. In the presented technique, the radar senses the motion to detect if the fall has occurred with the help of the Doppler effect [4]. Thus, the proposed technique is tested under laboratory and real in-home environments and has proved to be the most promising product for fall detection.

N. Otanasap expresses that there are various types of accidents such as slipping, tripping and falling whichis the main reason for injury or death in the elderpeople. In this paper,the dynamic threshold is used fordetecting falls. This threshold is adjusted automatically to identify the pre-impact of the fall by using wearable devices.There are various experiments conducted for the purpose of falldetection and to test or evaluate the results and also tocheck the sensitivity, specificity, and accuracy of themeasurements. Thus, this technique is suitable for usein the pre-impact fall detection system than thetraditional fixed threshold-based method. [5] S.Waheed [6] proposes a smart and cost-effective fall-detection scheme using IoT technologies like PiCamera. The proposed system is a very low cost andvery high accuracy system. In our country, 33 % ofthe population is senior citizens who are the oldies orelder people and it is very important to observe thesepeople for their health and safety. CCTV is an optionto keep an eye on the elder people but this systemhasa very high cost. This system uses low-cost PiCamera mounted on Raspberry Pi to monitor and detect a person's fall-like movements. As a personfalls it gives an alert in the form of an alarm and asksthe victimto press a stop button if he does not pressthe stop button,an alert will be sent to his relatives fora quick medical check-up.

Z. Huang states that fall detection is one of the active topics for research which comes under the smart home application and the smart healthcare system. Fall is one of the leading factors of death for senior citizenssince the last decade in China and the US[7].Therefore, there is a need forsmart home and a smart healthcare system at a low cost with high accuracy. Thus, in this paper, the optimal method is compared with other methods such as wearable sensors and ambient sensors in the field of indoor fall detection. Thus,the proposed systemexhibits highsensitivity.

Pei Dipresents an intelligent walking-aid cane robot is developed for helping the old people and the

physically challenged people by walking with the walking-aid cane robot. Thus, this methodology guarantees the safety of both robot and of the elderly people by just walking with it[8]. This module is based on the real-time calculation of the COP.By calculating the COP in real time, an integrated load sensory system that consists of a six-axis forcesensor and built-in shoe load sensors was developed. N.Ozgedescribes that one of the biggest problems onthe rise nowadays is that the elderly population is falling. As old people fall, they lose consciousness and are unable to call for help[9]. As they fall our system should help them in a very short time and assoon as it's possible. These people often fall in indoor premises such as home, this system should be inserted in such a way that each and every moment is monitored. There also one module the victim can useas an emergency if there is an emergency situation.

3. ALGORITHM

Module A: Video Frame Collection Input: Live Video captured Through JMFProcess: Frame Grabbing technique Output: Frames at said interval

Module B: Normalization
Input: Video Frame at said interval Process: Mean RGB application of Modelimage
Output: Normalized image with respect to Model Image

Module C: Temporal Effect
Input: Normalized images
Process: Factor Displacement
Output: Maintaining frame displacement

Module D: RNN
Input: Normalized image
Process: Grayscale conversion and Binarization ofthe image
Output: Binary Image

Module E: RNN Deep layer
Input: Binary image
Process: Pixel displacement estimation
Output: Displacement count

Module F: Decision Tree
Input: Displacement count
Process: Fall Decision Output:
Alarm through SMS

4. BLOCK DIAGRAM OF SYSTEM
1. Use case Diagram
Following is the diagram of use case for fall detection. The main model of the system is the user and user and do the three main works in the system as shown below user can register, user can also login and user can also initiate to the system.
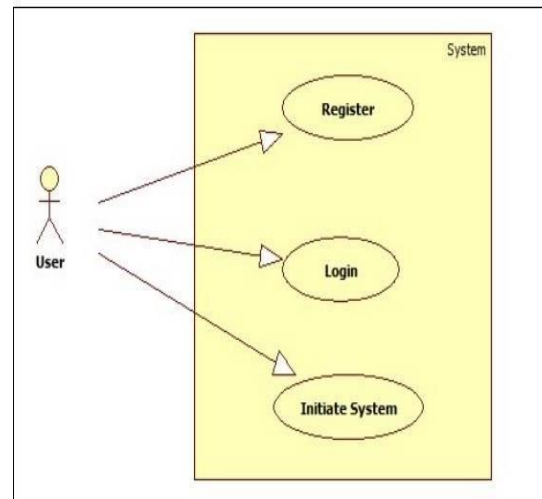

2. DFD Diagram
As show in the following DFD diagrams. RNN and decision tree is the process part of the system. In system first video streaming is started and input is given to the main algorithm used in the system that is RNN. In RNN data get process the means find out the mean of the RGB module of the per frame and data is given to the temporal effect process and give output to the decision tree and in process decision tree data of the RNN is collected and find the difference of two frames and give this data to again RNN. RNN takes the decision if the difference id larger than 300 then fall detected and system stop but when case gone wrong then its again ho to the decision tree and start even fall is not detected .
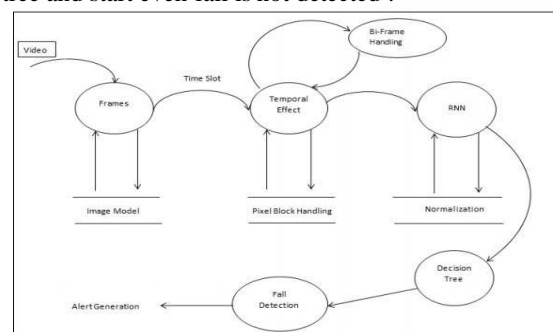
3. Activity diagram

Following diagram present the activity follow of the fall detection process. That is first of all system get started then in second step user is interacted to the software and user can also login or signup to the system when user is new then user will should firstly signup to the system as show in the third box fill the all information related to the patient and set the protocol then user is initiate to the system
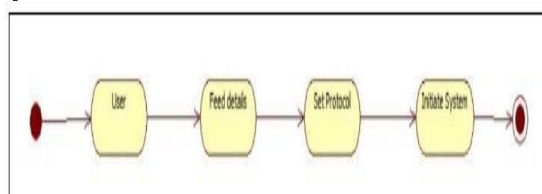
PROPOSED SYSTEM

Proposed system intended to provide the security to the old peoples when they are alone at home. Because of 60% death of old peoples are occurs from a fall. In this project we create a simple software for the fall detection using a camera[5]. In camera we set pixels of images, when the pixels gets increased then alarms or send message to the neighbors, or we can also set others mobile number.

Many time the old peoples are fall done and make some small injuries but not getting the timely help it become a big problems for her. Using of this software we want to reduce the percentages of death from simple fall. Using this software that old peoples gets help for getting up from fall
.

CONCLUSIONS

Automatic Fall Detection for the elderly has been successfully implemented with the help of video monitoring and has been deployed in an environment with various constraints, such as an inbuilt webcam with Mega Pixel of depth. Due to the fact that there have been an increasing number of nuclear families and the elderly are left alone to look after themselves, a fall in such a situation can bedevastating if not fatal.

The proposed methodology is utilized to provide constant vigilance on the elderly subject by capturing the frames from a webcam. The frames are normalized and their temporal effect monitored by the Recurrent Neural Network. In the event of a fall, the system sends a text message to the relatives, neighbors and the doctors to provide immediate assistance to the patient.

The device uses a threshold based approach to identify a fall and to distinguish it from other daily activities that may involve high accelerations. This approach requires lesser processing power as opposed to other techniques of fall detection and hence it greatly improves efficiency and robustness of the device.

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