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Body Posture Guiding System

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Abstract - *We propose computer vision body posture detection system using deep learning methods to analyze the postures in a smart home environment for detecting fall or body activities. The background subtraction is employed to extract the foreground human body. The extracted human body can be used to find out the falling, bending, sitting, squatting, walking, and lying using deep learning methods. Falls are one of the major causes that lead to injury which can also be detected using the vision based fall detection. Using wearable devices for fall detection has a high cost and may cause inconvenience to use in the daily lives of the elderly. Height and width plays an important role in finding out the human body position in a given frame. Let's suppose if there exist a man standing then height width ratio will always be greater than 1 and if the person is lying then the height width ratio will usually be less than 1 which can be used to find that whether a person is standing or lying. This ratio can be further extended to find other positions of a body. Finding an incorrect body position can be further used to warn the care taker by sending an email or message or by generating an alarm.*

Key Words: **Human fall Detection , Body Posture recognition , Open CV.**

1. INTRODUCTION

The risk of falling is one of the most prevalent problems faced by elderly individuals. A study published by the World Health Organization [1] estimates that between 28% and 35% of people over 65 years old suffer at least one fall each year, and this figure increases to 42% for people over 70 years old. Approximately one third of the elderly (those over than 65 years old) in Europe live alone [2], and the elderly population is expected to increase significantly over the next twenty years. Falls are a significant source of mortality for elderly individuals in developed countries.

With the global problem of aging populations becoming more and more serious, there will be increasing numbers of elderly people who wish to stay at home but who are not healthy enough to fully take care of themselves on their own. So their safety is becoming a big challenge. In this case, it is really very important to design a system that can be used to generate an alarm when it detects the falling of human beings so that they can gain help from others without too many false alarms.

In this proposed paper, a novel computer vision-based fall detection approach suitable for a home environment is proposed.[10] The proposed approach starts by dividing the video into frames. The next step is to detect the different objects on which the model is trained. Atlast it will detect human and with the help of height-width ratio it will detect the fall.

2. LITERATURE SURVEY

A. Deep Learning for Posture Analysis in Fall Detection.

Falling is a common and dangerous event for the elderly population. In this paper, various methods and detection algorithms based on wearable sensors are introduced. This study presented a database that was created based on data collected by three tri-axis sensors in a real-life environment. We will establish a complete fall detection and alarm system which will protect empty nesters and the patients in hospitals.

B. Posture Recognition to Prevent Bedsores for Multiple Patients Using Leaking Coaxial Cable.

Leaky coaxial cable (LCX) has long been used to cover blind and semi-blind zones in wireless communication. In this paper, we propose a novel system using a LCX. The automatic patients' body posture detection with leaky coaxial cable with low-cost wireless devices can classify postures for multiple patients in hospitals.

C. Employing a visual based fall detection.

Falls are one of the greatest risks for older adults living alone at home. This paper presents a novel visual-based fall detection approach to support independent living for elder people through analyzing the motion and shape of the human body to quantify the motion of the person.

D. Deep Learning for Posture Analysis in Fall Detection.

Proposed a novel computer vision based fall detection system. Firstly, background subtraction is employed to extract the foreground human body and the binary human body images form the input to the classifier. With a novel computer vision based fall detection system based on posture analysis and employing deep learning methods for analysis and classification of postures.

3. SYSTEM ARCHITECTURE

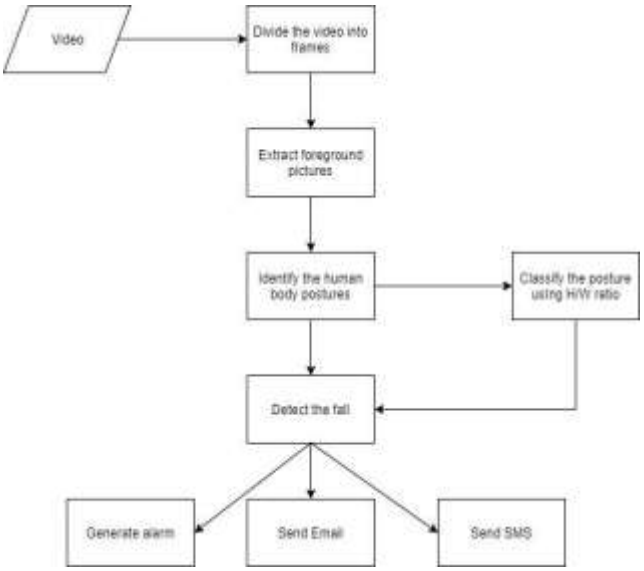

Fig -1: Architecture of proposed system

4. PROPOSED SYSTEM

1. The first part of proposed system includes capturing the video from live feed and convert it into various frames. The frames are allocated with various frame number sequentially helping it manage the frames accurately. The whole process involves identification of various objects on which the model is trained.

2. The second crucial part of the proposed system involves human identification step. In this step various frames are considered and out of them the frames having humans are identified.

3. The third part of the proposed system involves the H/W ration calculation that can be extended further to identify the body postures. Height and width plays an important role in finding out the human body position in a given frame. Let's suppose if there exist a man standing then height width ratio will always be greater than 1 and if the person is lying then the height width ratio will usually be less than 1 which can be used to find that whether a person is standing or lying. This ratio can be further extended to find other positions of a body. Finding an incorrect body position can be further used to warn the care taker by sending an email or message or an alarm generations.

4. The last part of the proposed system involves sending email, messages and an alarm to the acquaintances of the fallen person.

Modules

1. Module 1 : Human Identification
- Problem Statement.
- Objective Identification.
- System Architecture.
- Technology and Platform Selection.
- Requirement analysis &Design Done.

2. Module 2 : Posture Recognition
- Design Phase.
- Module Identification.
- Term 1 Report Writing.
- 1st Module Implementation coding 30% expected to be completed.

3. Module 3 : (Unimplemented)
- Fall Detection System source code need to be completed and testing will be started.

4. Module 4 : (Unimplemented)
- Integrate source code with Raspberry Pi.
- Integrate Alarm System.
- All module will be tested , verified and validated.

5. SYSTEM SPECIFICATIONS

➢ HARDWARE REQUIREMENTS :
- 4 GB RAM
- 2 GB Graphics Card
- Camera
- Raspberry Pi Processor (ARM 7)

➢ SOFTWARE REQUIREMENTS :
- 64 bit Operating System.
- DJango (Frontend)
- MySQL (Backend)
- Python, CUDA, cuDNN.
- Visual Studio and Visual Studio Code.

6. CONCLUSIONS

The work introduced in this paper is mainly focused on investigating a relatively low-cost and reliable fall detection approach for older adults based on computer vision techniques. The approach presented here employs enhanced features which are extracted from the human silhouette. These features are the motion information, orientation, ratio, the major semi-axis and the minor semi-axis of the fitting ellipse, the y-coordinate of the head point, the standard deviation of y-coordinate, the absolute difference of y-coordinate and the standard deviation of absolute difference of y-coordinate.

Experimental results show that the proposed algorithm is reliable for fall detection. The combination of motion and change in the human shape offers crucial information about human activities.

Adding the orientation feature helps in characterising a human's fall because it has less variation during the frames of the video sequence until a fall happens. Then the orientation will decrease suddenly until the human body reaches a prone position after the fall.

From the analysis, the system achieved the best performance and lowest false alarm rate by calculating the standard deviation of y-coordinate and the absolute difference of y-coordinate as input features. Detection results obtained using a different combination of features have shown that the best performance regarding accuracy and specificity is obtained when using all ten features together.

7. FUTURE SCOPE

In future work, various machine learning methods including SVM and KNN which have been documented to be appropriate to study human activities will be applied to the aim of fall classification.

In this proposed paper we have completed 50% of coding and the remaining part we will implement in further stages.

8. ACKNOWLEDGEMENT

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