AUTOMATED HEALTH ALERT SYSTEM FOR MONITORING OLDER PEOPLE LIVING ALONE

[1]Prinu K Philip, [2]Deepa Mary Sobha
[1]PG Student, [2]Assistant Professor
[1]Industrial Instrumentation and Control,
[1]Holy Kings College of Engg. & Tech., Muvattupuzha,India

Abstract : Today's life is very fast, so that the unhealthy aging of older adults increases day by day. The number of elderly people who needs more care is increasing whereas the number of people who are able to provide the care is decreasing. Without receiving sufficient care elderly people losing their healthy life. So, an automated health alert system permits the elderly person to live safely at home. This paper presents an automated health alerts system, which consist of analysing human behaviour and looking for changes in their activity patterns. The system includes detecting people, tracking people as they move and detect bed restlessness using a camera and necessary software. The collected data from the environment is compared with the reference data which is already analysed by an experienced clinician. If there is any health problem the system will create an alert.

***IndexTerms*-Health monitoring, Artificial intelligence, Image processing, Raspberry pi.**

I. INTRODUCTION

The telemonitoring technique has a wide range of applications in medical field. It helps to improve the life conditions of older adults, reduce number of visits in hospital and also minimize the hospital expenses. These techniques helps the elderly people to stay safely at home. The patients get benefits from telemonitoring system, which are good caring, monitoring and reduce the number of visits in hospital. One of the major challenge behind the telemonitoring system is that the clinician can analyse the data only when they get free time[6]. Analysing the human behaviour and changes in the activity of daily livings are one of the best technique to identify the mental and physical health change detection before it become serious. To improve the quality of life, identify and assess health problems early while they are in the preliminary stage[6]. Early treatment is more effective in older adults because it provides a better health care and reduce the health care cost. By using sensor network, activity patterns can be easily measured but it does not give any personalidentification of the patient, and also the implementation of sensor network is very difficult. Improper installation of sensor network makes some faults in the alert generation.

This paper discuss an alternative solution of telemoniotring system, which helps to reduce the drawbacks as mentioned above. The system incorporate with embedded network, which makes the individual identification as simple as possible. The neural network helps to generate a health alerts to an experienced clinician.By changing or adding extra features of human activity pattern, this system can be used for person affected by any kind of diseases. For example, by adding simple wearable sensor network, we can measure the heart rate, blood pressure and also the respiration rate.

In section II contains the information about the existing system. Section III describes the proposed system. Section IV illustrate the methodologies used in the proposed system and also the health alert system (method). Section V represents the result. Section VI includes the advantages and disadvantages of the system. Section VII conclude the entire work.

II. EXISTING SYSTEM

The existing system is an example of health a health alert system, shown in figure 1. The system is designed for older adults who are having chronic health issues. The system is made up of a group of sensors which is embedded in the environment for detecting the health changes. The sensor networks are mainly focused on the changes in the health conditions. A group of sensors like motion sensor, bed sensor and temperature sensors are mainly used for collect the data from the environment. The sensor data collected from the environment is stored in a secure server. The heat generated from the environment (stove and oven) is detected by LM 35 temperature sensor. PIR (passive infrared) sensor is used as a motion sensor, which helps to identify the motion and activities in the detected area of a motion sensor.

The PIR sensor can be installed anywhere in the environment. Data transmission from the passive infrared motion sensor is done by wireless X-10 protocol, which is a signaling protocol. If there is a continuous motion detected by the PIR sensor, it will generate an event. The bed sensor is work on the basis of respiration rate and bed restlessness. The aim of the pneumatic bed sensor is to identify the sleep patterns. To detect the sleep pattern the bed sensor is installed on the mattress, it can also be installed in a chair. The collected data from the environment is stored in a secure server and it is compare with the trained data which is installed in the same server.

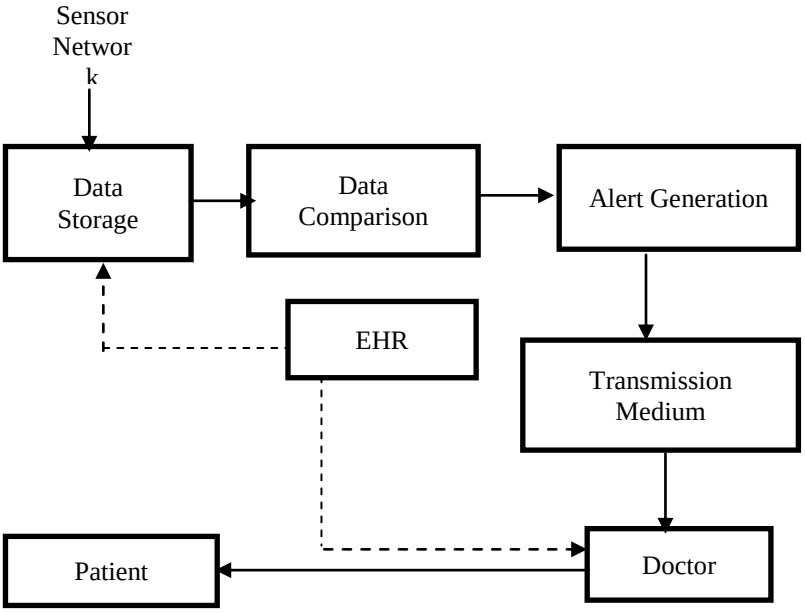

Fig.1.Block diagram of existing system.

The four methods are used to train the system such as fuzzy pattern tree, fuzzy k-nearest neighbor, neural network and support vector machine. Compare the collected data with the trained data, if there is any health changes were detect, an alert message is sent to clinician. The experienced clinician provides the limits of a disease. The features of a particular disease was selected by the OCC (one class classification) method. Internet helps to receive the alert to the clinician. The alert mail has 2 web link, the first link into the web portal which provides clear data visualization and also have high speed. The second link helps to provide a rating to the alert signal. The health alert received by a clinician, andanalyze the data with the help of EHR (electronic health recorder) and also provides the needful to the patient.

III. PROPOSED SYSTEM

To provide a comfortable and independent living circumstances to older adults, this paper proposed a system that generate a health alert based on the human activity and sleep pattern. Figure 2 shows the block diagram of the proposed system. From the figure the cameras helps to collect the required data from the environment, raspberry pi camera is used for collecting the data. A micro SD (storage device) card is inserted into the raspberry pi for the storage of collected data from the camera.

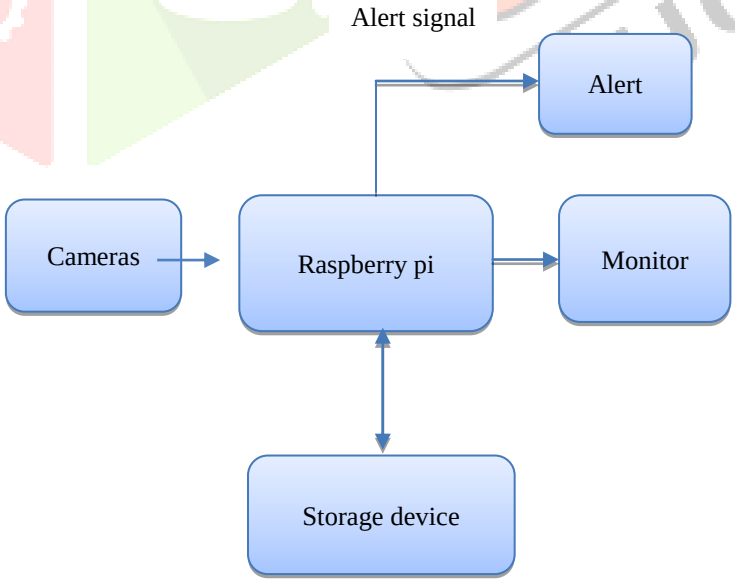

Fig.2 Block diagram of proposed system.

Camera Serial Interface (CSI) port is in build in raspberry pi for connecting the raspberry pi camera. The trained data's already stored in micro SD card is inserted into the raspberry pi for the comparison of data collected from the environment. The micro USB port provides the power source to the raspberry pi. The camera data is compared with the trained data, if there is any change, it will

generate a health alert. The data was trained by deep learning neural network method. Figure 3 represents the hardware of health alert system.

Fig.3 Hardware of health alert system.

IV. WORKING

The system is a combination of a group of raspberry pi cameras, raspberry pi, micro SD card and a personal computer. The raspberry pi cameras are embedded in different locations in the environment such as living room, dining room and in front of a restroom for collecting required data. The camera continuously record the data for the analysis. Convolutional neural network helps to identify the human face. Figure.4 represents the human face identified by convolutional neural network.If the detected image is matched with the reference image which is trained by deep learning neural network, the captured videos are stored in micro SD card inserted in raspberry pi, otherwise it will be discarded.

Fig.3 Human Face identification

The logged video frames are analysed by an another algorithm to detect the information about the frequency of usage of above mentioned locations. Human face identification is the first step of this paper, which was done by an algorithm. Similarly the sleep pattern such as bed restlessness were detected by an another algorithm; first the centroid of the face is identified, based on the centroid movements the bed restlessness were measured, a small dead band is provided to avoid the fault recognition of bed restlessness, due to the small movements in normal stream. Figure 5 represents the tracking of human eye.

Fig.5 Human eye tracking.

The captured videos are logged to processing when the person in the captured video stream is similar to the reference image that is whose health status is monitored. The output from the activity monitoring section and sleep pattern section are fed into the alert generation process. This process produces a health alert only when there is a change in the normal activity as well as sleep pattern of the reference person.

V. RESULT

In this automated health alert system, it will generate an alert when there is any change in the sleep pattern and repetitive action. Any changes in the normal Sleep pattern can be recognised by a parallely facing camera. Variation in Sleep pattern(bed restlessness) can be identified by comparing the collected data with the reference data. Sleep pattern changes can be detected from the facial analysis. Here centroid tracking is used for face analysis. In figure 4 middle of the eyebrows is treated as centroid. Small variation from the centroid is permitted it ranges from X= -145 to 145, Y= -60 to 60. Within this range it is taken as a standard one and any variation from this range will result in an alert. This alert can be indicated by an LED. Figure 6 represents the sleep pattern (bed restlessness) recognition. Figure 7 shows the health alert generation by an LED bulb.

Fig.6 Sleep pattern (Bed restlessness) detection.

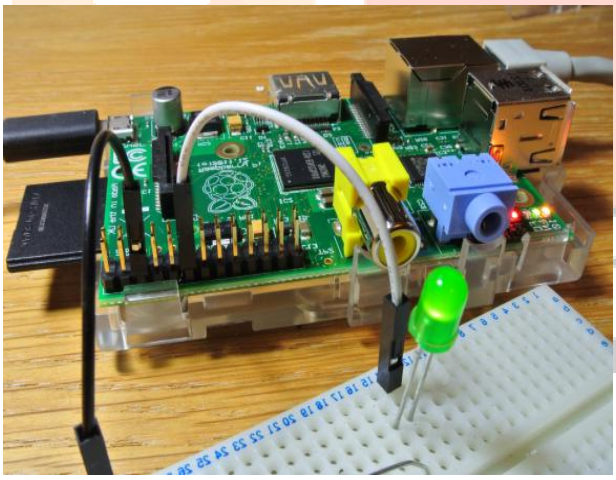

Fig.7 Health alert generation in LED

VI. CONCLUSION

An efficient and effective health alert system can reduce the number of visits to the hospital, and also provide a healthy living for the elderly people. In this paper the health alert generation was based on changes in sleep pattern and repetitive action (frequent usage of daily actions). The raspberry pi camera was used for collecting the live status of a person who is in the detecting area of camera. Neural network helps to compare the live data with trained data, if any health changes occurs, the data related to the health changes will be stored in the micro SD for future reference and also generate a health alert by blinking the LED. Early health changes was recognized passively by the system, This health alert system help us to provide an opportunity for early treatment and also help us to identify health issues before it becomes complicated. This system helps to reduce the health care cost and also provide better lifestyle for the elderly persons.

VII. REFERENCES

[1] Tracy Barger, Donald Brown, and Majd Alwan, "Health Status Monitoring Through Analysis of Behavioural Patterns,"University of Virginia, Systems and Information Engineering, Charlottesville, VA.

[2] Lixun Zhang, Jinsong Wang, Lan Wang and Ting Wang, "Experimental Research on Human Gait Measurement,"Proceedings of the 2007 IEEE International Conference on Robotics and Biomimetics December 15 -18, 2007, Sanya, China.

[3] Saxon Ridley, "The recognition and early management of critical illness," *Ann R Coll Surg Engl* 2005; 87: 315–322 doi10.1308/003588405X60669.

[4] Mrs. Manali Chaudhari, Prof. Srinu Dharavath,"Study of Smart Sensors and their Applications,"International Journal of Advanced Research in Computer and Communication EngineeringVol. 3, Issue 1, January 2014.

[5] Tanvi Banerjee, Student Member IEEE , James M.Keller,Fellow IEEE, Marjorie Skubic, Member IEEE, and Erik Stone, Student Member IEEE,"Day Or Night Activity Recognition From Video Using Fuzzy Clustering Techniques," IEEE transaction on fuzzy systems, December 2013.

[6]Nadia Zouba, François Bremond, Monique Thonnat, Alain Anfosso, Éric Pascual, Patrick mallea, Véronique Mailland, and Olivier Guerin,"Assessing Computer Systems For Monitoring Elderly People Living At Home." INRIA Sophia-Antipolis, 2004 route des Lucioles, 06902 Sophia Antipolis Cedex, France.