

Intelligent Video Surveillance System for Elderly People Living Alone Based on Video Image Processing System

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ABSTRACT

In this paper we represent a monitoring system [1] for elderly people which is based on multi-information fusion technology including video image, sound, infrared and pulse is designed. Video analysis technology, which includes the data of voice detection, infrared detection and pulse detection, is adopted to realize monitoring elder's living conditions in real time. In case of emergency, the system will achieve the alarming function by sending data to the server and messages to their children through the GPRS [1] At the same time the system design the mobile APP to query status of the elder's life in real time.

1. INTRODUCTION

According to the fast economic development and the fast technological advancement there is a great change in our population structure. As the population increases the time reduces for the children to take care of elders in order recover from this problem we are doing a research on the system of video image processing technology for the elderly care system.

2. EXISTING SYSTEM

There are mainly three kinds of elderly care systems based on wearable sensors, audio sensors and vision sensors.

>>For the physiological parameters and dangerous situations like fall of elders detected by acceleration sensor, pressure sensor, physiological parameter sensor but the problem is as the elderly people memory becomes less they forget to carry the wearable sensors

>>The sound sensors determines the living conditions of the old through voice signal, but it is more easily affected by environmental noise

>>The third determines exceptional behavior of the elderly through image processing technology, but due to the limited visual range, exceptional behavior can't be monitored beyond of visual range [2].

Considering the above problem, this paper includes a design based on the multi information fusion technology which includes video processing technology, voice detection technology, and infrared detection technology.

Drawbacks

- ❖ Limited calls.
- ❖ Not possible for capturing 360degrees video
- ❖ Need speed of data transmission

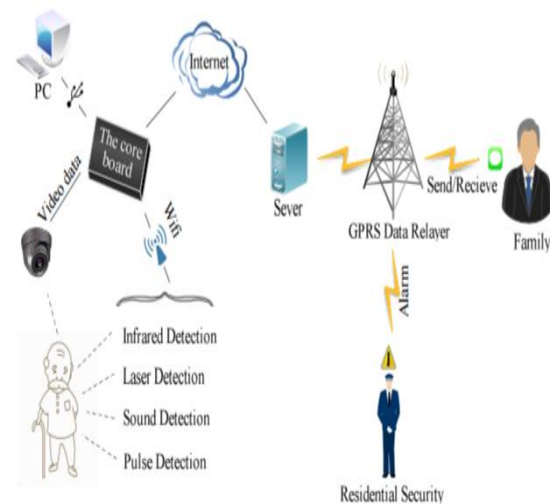


Fig. 1. System diagram

Fig.1. Block diagram of existing system



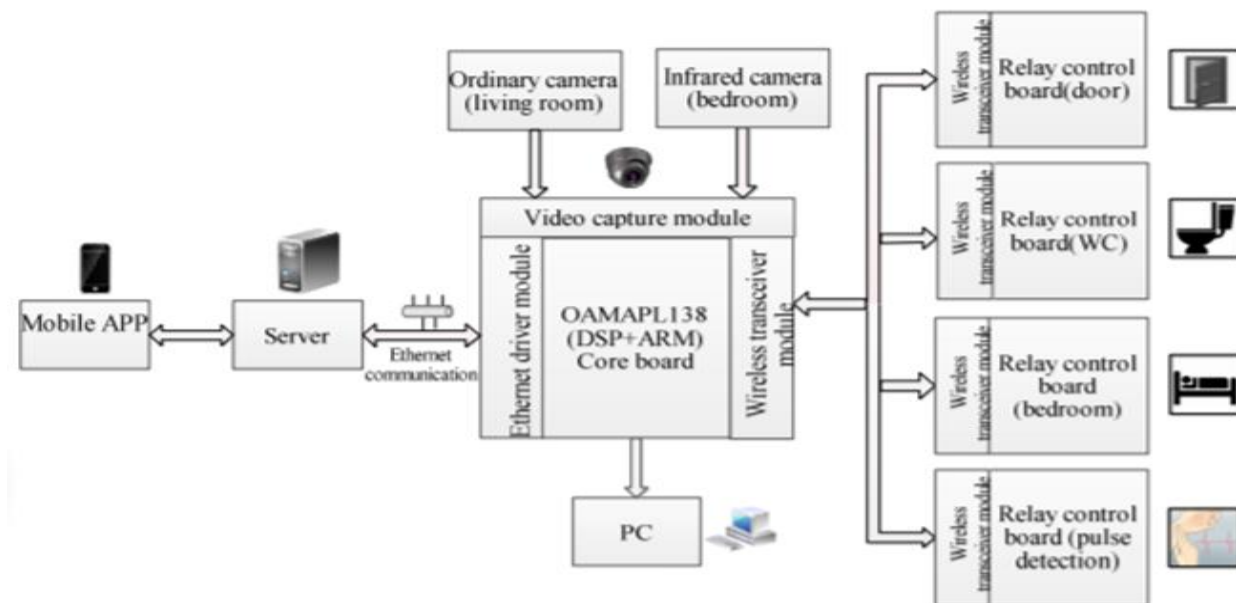


Fig. 2. The overall framework

3. OVERALL DESIGN

The core boards [3] which communicates with the four boards with wireless transceiver modules, in which there are three infrared and sound detection modules installed in washrooms, the door and bedroom respectively.

They detects the unexpected or exceptional behavior and the data of all are sent to the core boards which also includes the information like staying in the toilets for long time and not returning exceptional sleep etc. The pulse detection is done by pulse detection sensor which should be carried by elders.

The system is formed for caring the elderly people living alone. As it works indoor, so there is less disturbance from the environmental effects and the artificial moving objects. The camera position is fixed, and the image algorithm should be robust which can resist the simple noise. Based on the processor this system is on the hardware platform.

The core board which communicates with four relay boards with the help of wireless transceiver modules, among which there are three Infrared and sound detection modules installed in the toilet, the bedroom and the door respectively. as given in fig2 in order to detect the pulse. The pulse sensor should be carried with the elders to sense the pulse variation the core board also detects the exceptional behavior of the elder which contains

elders fall through the analog cameras and also abnormal sleep which is captured by the infrared cameras. All these data can be saved in the server so that their families can visit the historical details of the information of the elder people behavior on the daily basis. The sensors will send the data to the core board which includes staying in the toilet for too much time, longtime no returning, exceptional sleep, etc. These information will be saved in the server for the future use APP

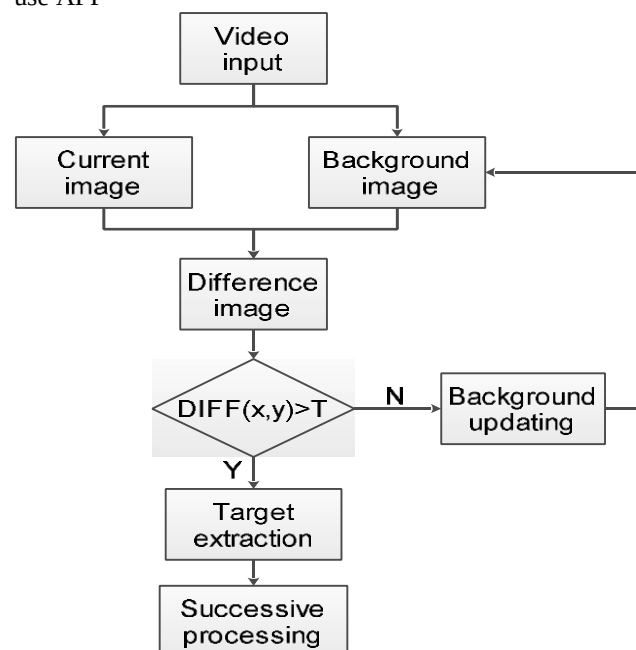


Fig. 3. Target Detection algorithm diagram

A. Target exceptional behavior analysis

The main aim of the image processing in this system is to detect the behavior of the elderly fall [3] and unusual sleeping behavior of the elders. The fall of the elder is mainly detected When the changes occur in the gravity center and the aspect ratio when the body falls to exceptional behavior.

The gravity center will reduce, and the aspect ratio will be grater then 1

Step1: The background image is obtained as mentioned in the part A

Step2: Subtract the current image to the background image to get the difference image

Step3: If the pixel gray value is greater than the threshold T then the point is a movement point which is assigned as 1 and the value will be 255, otherwise it is assigned as 0

Step4: Calibrate the rectangle at the foreground. 4 parameters X_{max} , X_{min} , Y_{max} , Y_{min} are needed for plotting the rectangle which is given in the below figure.

B. Moving Target Detection

Moving target detection means it obtains the target accurately from the background of the target video sequence and it is the backbone of target tracking and behavior analysis. There are background subtraction, inter-difference method .Background subtraction means the current frame is subtracted with the background frame and obtain a moving object after checking for the thresholding the differential frame. It is simple in principle, fast in operation, and has good result in complex background, but it is easy to be influenced by light variations, weather etc. The system uses a binary background template modeling method to get background image. The method makes image difference processing between the current N -th frame and the $(N-M)$ -th frame, gets binary image of the difference image

C. Moving Target Tracking

Moving target tracking is obtained by finding the interested Target which considers the coordinators, geometry, velocity. direction characteristics information target in every time .In order to find the target moving object the system uses the video capture module binary to conduct rectangular calibration at the foreground image obtained.

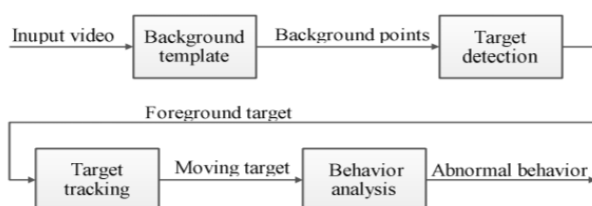


Fig. 4. The specific process of the video image algorithm

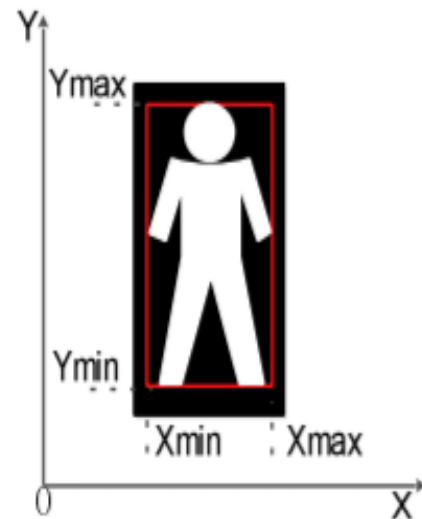


Fig. 5. Calibration algorithm diagram

The above figure shows the tracking of the body in a rectangular frame which is framed with the X_{max} , Y_{max} , X_{min} , Y_{min} .

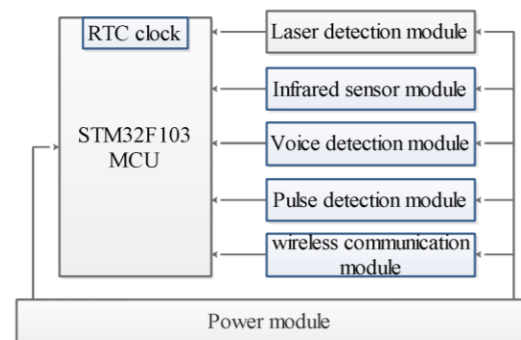


Fig. 6. Hardware block diagram of relay boards

Relay board [4] with STM32F103 includes a continues series microcontroller, aggregates and it also analyzes the data transmitted from each sensor module, then it sends the results to the main control board for further processing by wireless module.

>>>**Laser detection module:** placed near the door to detect the human passing

>>>**Voice detection module:** detects the sound sensitivity is adjustable

>>>**Infrared sensors module:** detects the weather someone is moving in the infrared sensing area the distance of sensing is adjustable

>>>**Pulse detection module:** detects the pulse condition of elderly

>>>**Wireless communication module:** send the data analyzed from MCU to the HOST

>>>**RTC clock:** it provides the real time clock to the record sleep and wakeup time and judging whether the elderly is out without returning so on

4. PROPOSED SYSTEM

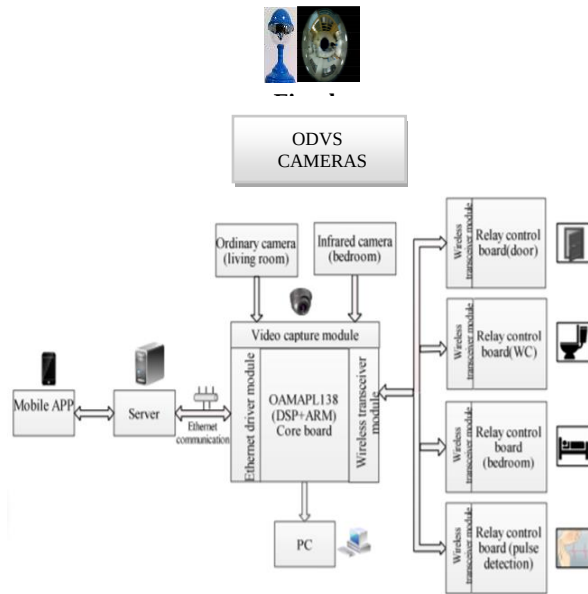


Fig.7. The overall framework with Omni –Directional Vision Sensors

Intelligent surveillance is one of the most important topics in the nursing and home-care system. we have proposed elderly care support system using ODVS. An ODVS is adopted to provide a 360° panoramic image in this paper. As per the ODVS result and image, a one-to-one correspondence is obtained between the image pixels and the locations on the ground. This study indicates the algorithm has the advantages like less computation, higher robustness and more intelligent

5. EXPERIMENTAL RESULTS

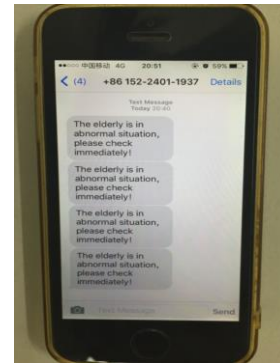


Fig. 8. Interface Messages and Mobile APP



Fig. 9: The result of video image processing



(a) when the object not through 360° expansion line



(b) when the object has passed through 360° expansion line

tracking. Different position of the elderly is obtained by using the aspect ratio of the minimum bounding rectangle in the basic of effective tracking. The experiment result shows that the above algorithm can meet elderly surveillance demand and has a heavy recognizing rate. To get the activity rhythm and detect variously behavioral abnormality for the elders

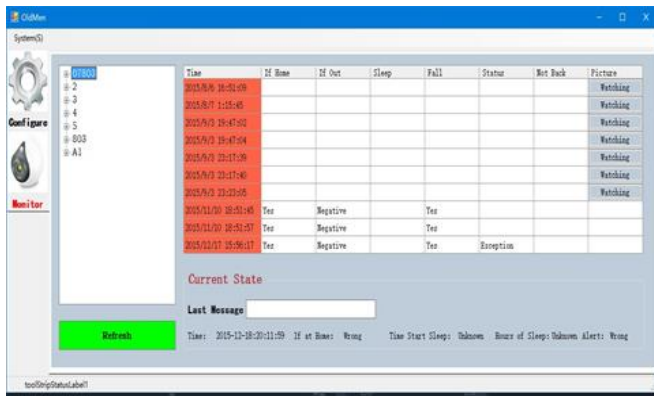


Fig. 10: Server interface

6. CONCLUSION

The system has DSP + ARM dual-core board along with the processor OMAPL138. PCB takes 6 layout technology, making the circuit easy for simplifying and reducing costs. The system uses the method of background modeling [5] and updating to obtain the moving object and calibrate a rectangle to track and obtain features to analyze for determining the exceptional behavior of the elderly fall. The algorithm is applied to DSP processor which is real time. The formation of relay boards is for detecting other living conditions of the elderly, which increases the accuracy of the determination and monitoring efficiency [6] on the basis of video image processing, meeting the basic need for the family care. After testing, the system is sensitive, accurate and low-cost, which can be widely applicable to the elderly care. It can also use the ODVS as an important application in the field of intelligent video surveillance. An ODVS [7,8] is utilized to provide a 360 degrees panoramic image for obtaining the real time situation for the elderly at home.

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