

# Design and Implementation of Intelligent Medicine-taking System

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**Keywords:** Electronic Health, Wireless Communication, Smart Alert, Take Medicine List

**Abstract.** With the total level of unhealthy people increasing, it is common for people to take medicines. To guarantee organisms absorb drugs dose to the max, it is necessary to take medicines on time. In this paper, a portable appliance is designed, which can remind people to take pills on time, and the information can be feedback to their relatives. The system consists of medicine box and wrist watch. It can realize the goal of real-time remote condition observation and home health care. The system has great value for Smart home.

## Introduction

Nowadays, with the rapid development of economy and technology, the living level of people is improving, and the pace of life is increasing. Under the pressure of much external factors, people are gradually in the sub-health state, and a morbidity rate is increasing. In recent years, a “Hospital-Community-Family” system using Wireless Sensor Networks in health care system has been established in developed cities, home or abroad. Nevertheless, in most cities there are still some urgent practical problems, such as taking medicines is not in time, and illness treatment is delayed, which result in the dysfunction especially for the middle aged and elderly people. To make drugs absorbed faster and more efficiently, taking constant dosage within stipulated time is very important. But in daily life, the middle-aged always forget to take pills, or take an improper quantity of pills due to their physical factors, such as poor eyesight and memory. Moreover, some emergent situations occasionally happen, such as they suddenly feel sick or promptly faint, or stray, etc.

In this paper, a medicine-taking system is designed. It combines with WSN wireless communication synchronization and GSM wireless communication technology, establishes an intelligent gateway. The system have real-time reminding monitor, on-net intelligent pill boxes, which has the function of intelligent vocal reminding to take medicines. The system is with wristband of preventing the old from getting lost, and so on. So it improves traditional divided doses of obliviousness of the defect effectively, and brings the convenience.

## System Scheme

This system consists of two parts, one is the medicine box, and the other is the watch part.

In the paper[1][3][4][5], the structure of the WSN health care system was described, as shown in Fig.1. Via the GPRS/GSM and the intelligent gateway, the message that people take medicine can be sent to the relatives, hospital care and upload database, and when people is in case of emergency, the location message also can be sent, so that the public security organization can rescue in time, and the family know about in time. The health care system with intelligent gateway can inform the relatives about the situation of taking pills, that's very good.

Similar to mention in the paper[2], Watch part basically achieves human movement state detection. It not only realizes the real-time synchronous vibration of taking medicines to remind, but also can realize alarm of emergency rescue, and location position when the old get lost. Through the network connection, state information can be uploaded the service-side, and by analyzing, the physical state of user can be predicted. The user's family may check and analyze the data through the Explorer or mobile phone.



Fig.1. the scheme of the medicine box

### Hardware Design.

**The Medicine Box.** The system structure is shown in Fig.2. The STM32 microprocessor is used, including touch screen display module, the GSM module and the wireless communication module, and so on. The box can realize drug loading and delivery.

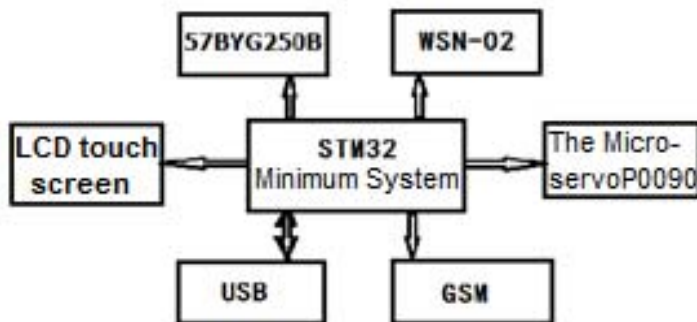


Fig.2. The medicine box structure diagram.

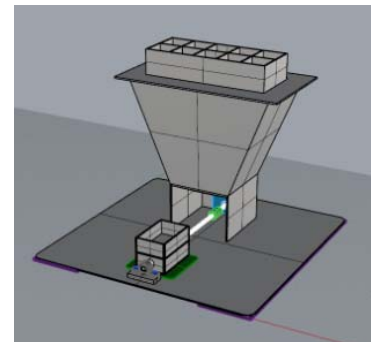


Fig.3. External structure model.

- **Drug Loading and Delivery.** The most prominent characteristics of this system is the structure of drug loading and delivery, which break through the model of getting medicines. When users set taking-medicine time and dose on a touch screen according to the instructions, the designated drugs will be put in the sub-boxes. Once arriving presetting timing, the micro-servo P0090 works, and the door of the loading sub-boxes is open, leaking out the pills to the delivery vehicle which is under the loading sub-boxes. At the moment, the minimum system drives stepper motor 57BYG250B to work. Stepper motor controls screw shaft transmission the delivery vehicle to outside of medicine box, and lets users get the drug. External structure model is shown in Fig.3.
- **Short Distance Wireless Communication Circuit Design.** The WSN-02 wireless data transmission module is used, which has small size, high stability, high sensitivity, long transmission distance, high communication rate, internal auto complete communication protocol conversion and cost-effective features of data transceiver control, etc. It realizes connecting with watch part, and the parameters of the user's health can be uploaded to the cloud.
- **GSM SMS Module.** GSM module according to the data transfer rate, can be divided into the GPRS module, the EDGE module, 3G module and pure text messages module. In this system, before using the pure message module, but now has been upgraded to automatically call, by voice message to tell relatives that the old has taken the medicine.

**The Watch Part Design.** The watch part uses the chip STC12LE5A. It is including the single chip microcomputer, the power supply circuit, GPS module, the wireless module and the vibration module.

Watch can receive a signal from main box through a wireless module, and remind people to take medicines by vibration. The hardware structure diagram of the Watch part is shown in Fig. 4.

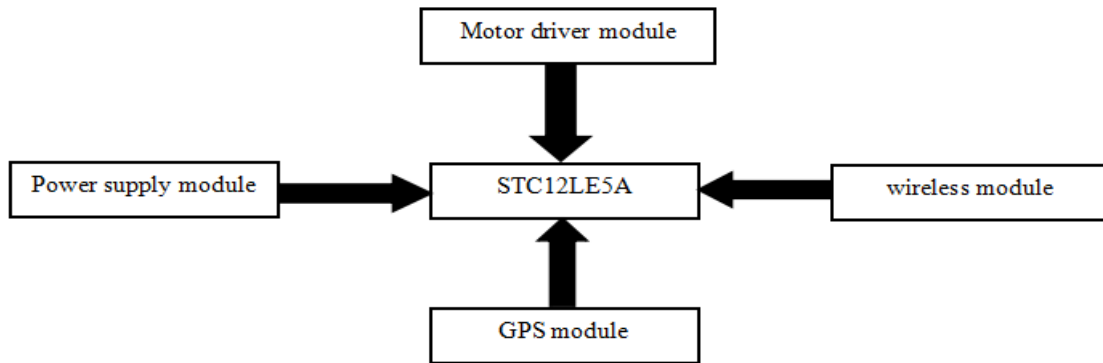


Fig.4. the hardware structure diagram of the Watch part

**Software Design.**

- **The Software Design of Medicine Box.** The function of medicine box is to set parameter and time, and leak out pills and delivery drug, feedback message, etc. Once the preset time of the loading sub-box 1 is arrived, the micro-servo is running, and the pills of the sub-box 1 will automatically fall. When detecting the sub-box 2, program scan continues. If there is no medicine in box 2 now, system screen will light up, which alert users to fill pills in loading sub-boxes. Once the time of the box 3 is arrived, system repeatable continues above action of the box 1, the third of the micro-servo is running, and the door of box is open, then pills fall down. At the same time, the stepper motor works, driving screw shaft moving forward, and the medicine is sent out. The main program interface is shown in Fig.5.

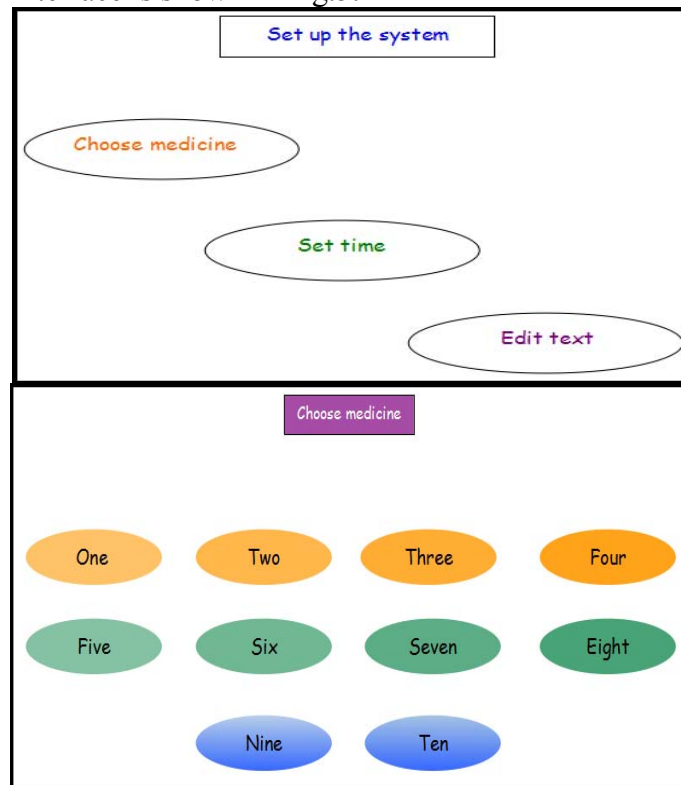


Fig.5. The main program interface

- **The software design of the watch.** Watch part not only matches with main part forming "Enhance each others beauty", but also is in the future development of real-time monitor forming a "Close security guards". Currently in this system has realized watch synchronization of medication remind, and vibration, etc. Mainly through the parameters Settings of the wireless

module, and then make it connected to the wireless module of the main part. After received the signal, the watch drives Audion conduction, the motor start shaking, to realize reminder. Follow-up work will also be implemented using the watch to realize time display, or using the watch to rough measurement of man's pulse, body temperature, blood pressure, or other functions, to further improvement. The program design flow chart shows in Fig.6.

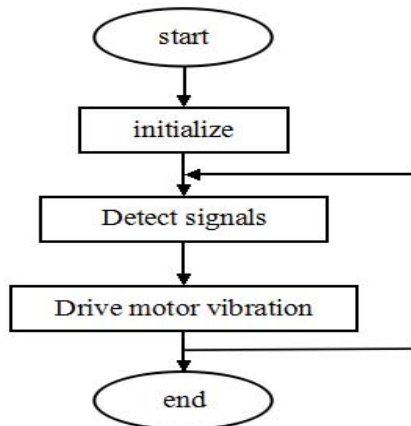


Fig.6. the flow chart of the Watch part



Fig.7. the realization

## Conclusion

In this paper, a scheme of a medicine box system is put forward. The realization shows in Fig.7. The system can realize to remind people taking medicine on time. At the same time when the user in an emergency, they can press the emergency button alarm, to realize the GPS positioning, which can provide reliable and convenient information for relatives and police searching and rescuing. The basic health status can be uploaded to the cloud. A series of experiment results show that this model system is feasible and reliable. It has great value for smart home and intelligent taking medicine system.

This work was supported by “National Undergraduate Training Programs for Innovation and Entrepreneurship of Dalian Nationalities University (S2014046)”.

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