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Implement a Portable Smart Device for Elder Health Care

Ching-Sung Wang*, S. M. Chen

Department of Electronic Engineering, Oriental Institute of Technology, New Taipei City, Taiwan
*Corresponding author: ff020@mail.oit.edu.tw

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Abstract The population structure of Taiwan is evolving toward aged society. The ratio of elderly population over total population is increasingly approaching to 1/4 or above, leading to the increasing demand of the aged care in Taiwanese society. Further the increasing the long-term care cost would have a great impact on National financial burden. As for the delimitation on the growth rate of the elder population, we would like to develop an auxiliary aid capable of reminding people's daily exercise, as well as detecting the people's aged degree. In this study we implement such an aid by a cost-effective, intelligent ring type sensor capable of measuring people's essential tremor as well as recording people's daily exercise/showing them up at a user friendly interface. Based on the state of the art sensor technology, the intelligent sensor comes out to be capable of recording aged people's essential tremor spectrum via fast Fourier transform (FFT) and their daily exercise simultaneously. With gathering both of detecting information, the sensor would be transmitting the information in a real-time fashion toward people's cellular phone via a Bluetooth interface. Then an application on the phone could evaluate the degree of the aging and show the daily sport records toward the medical staff at the remote site. In order encourage elderly people to exercise and prevent elderly people from falling accidentally, the device also has fall warning function. It is believed via such a surveillance on elder people and referring their daily sport records in a long term fashion, the phenomenon of population aging could be effectively improved.

Keywords: *automatic window glass opening device, emergency rescue, sensor, water level detection, abnormal gas detection*

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1. Introduction

The physical strength of old people degrades with age. It is better for the elders to form good habits of exercise, which can certainly slow down the declining of body function, so a device proposed in this study makes the elders to move their bodies by through a simple walking movement. At the same time, observe whether the frequency of hand tremor slows down. Once the aging process is postponed, it can not only maintain their own health, but also reduce the medical spend in terms of manpower and resources. It also has warning function design for elderly people to fall in the system.

2. Hardware Architecture

This research proposed a systemic composition by a combination of a hand detecting device and APP. The hardware is divided into three main structures, a single chip (NANO100), a three-axis accelerometer, and a Bluetooth wireless transmission. The three-axis accelerometer is divided into two parts: the X and Y axis are used to detect the number of steps, and the Z axis is used to measure the central frequency of the hand shaking. ADC conversion is done through NANO100, and the signal is transmitted from Bluetooth to the APP end of the phone as shown in Figure 1.

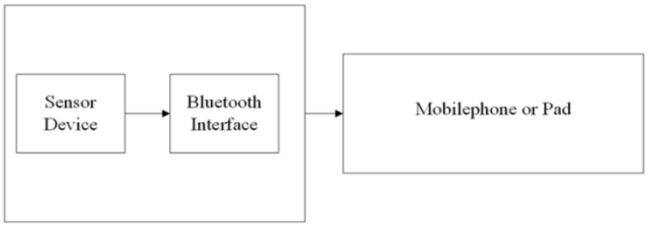

Figure 1. System Achitecture

3. Software Flow

Automatic and Hand Momentum Measurement: Detecting device if the Bluetooth is turned on; if not, it would not measure. If it is connected, the data during the receiving period is received. After the data-collection is completed and the FFT operation is then performed. Convert the hand tremble center frequency and approximate step number, decide whether to save or not. If the data-save is completed, loading the previous data and run an averaging calculation are carrying on. If all of the above is completed, it will update the file to the most up-to-date one.

Long-term report: Reading the current data will begin to draw a line chart. Once pages breaking has been detected, the data would not be read, or vice versa; If the detection is completed and true, the data would present as in Figure 2 in which the data before or after 10 days will be displayed.

4. Measurement and Results

The measurement will be connected to the Bluetooth device after the APP is opened. After the connection is completed, the measurement will be done automatically or manually press the bottom of the starting state to record as shown in Figure 3.

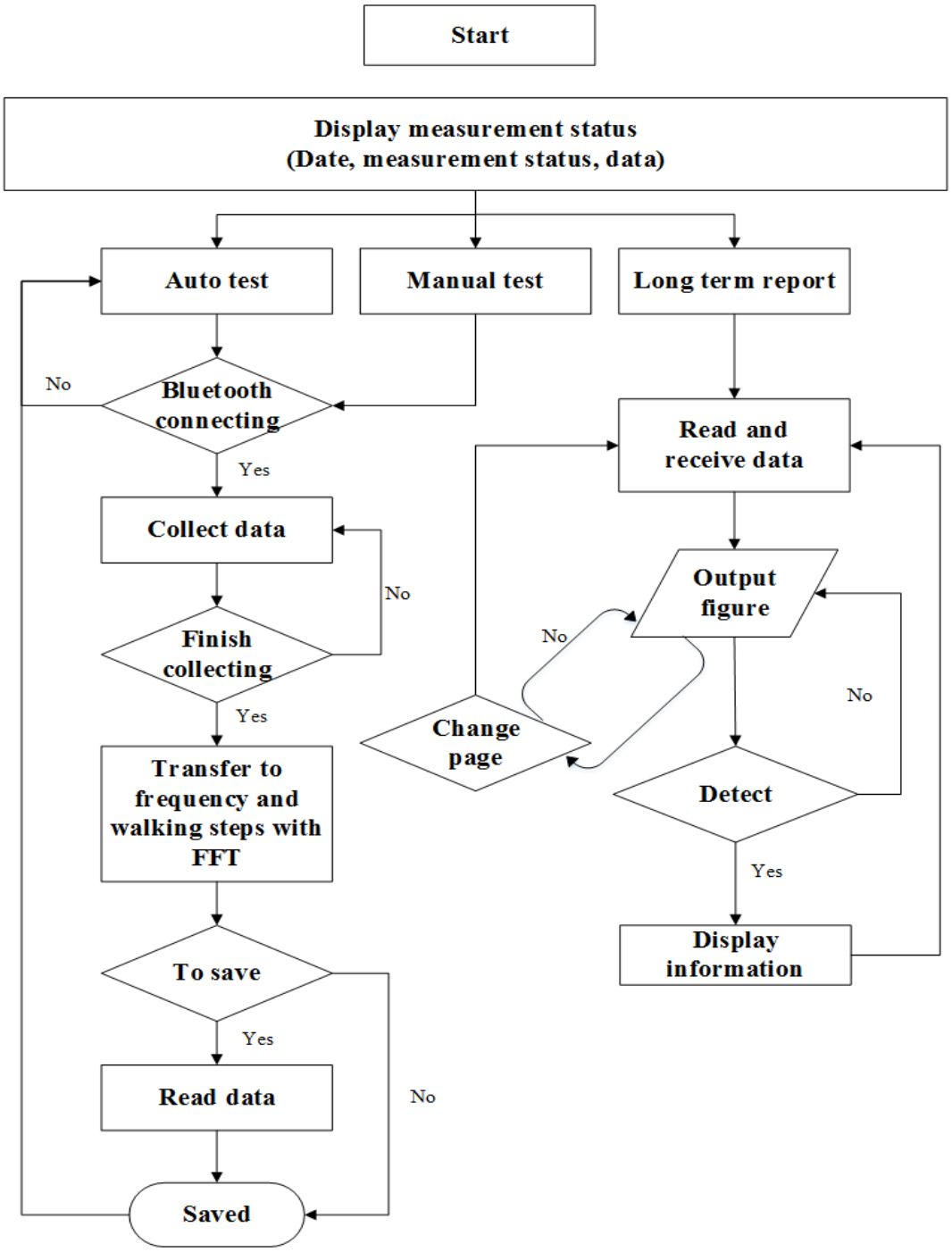

Figure 2. Software flowchart

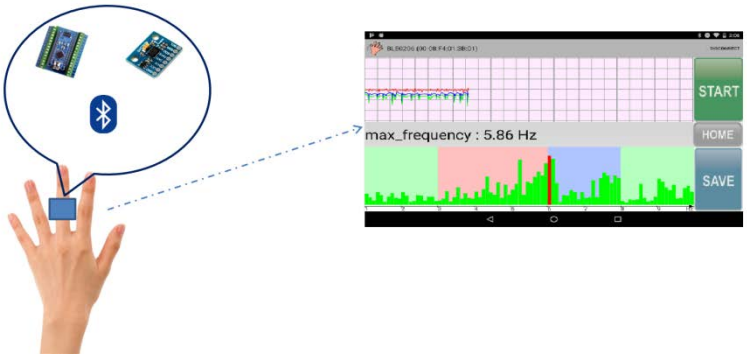

Figure 3. Measurement Device and Spectrum

This interface is for anyone who uses this device to keep the user happy by using a simple chart and warm greetings. In the Figure 4, the left block provides date and time for the user to view, which makes it easier for the user view the current time. The recorded number shows the total number of times that users uses this device from the very beginning till the present moment. This is useful for judging the accuracy of the measurement. The total average frequency will take the average of the past data and the hand tremor frequency measured by the present detection. As by the same principle, it will be used for the total average step number as shown in Figure 5.

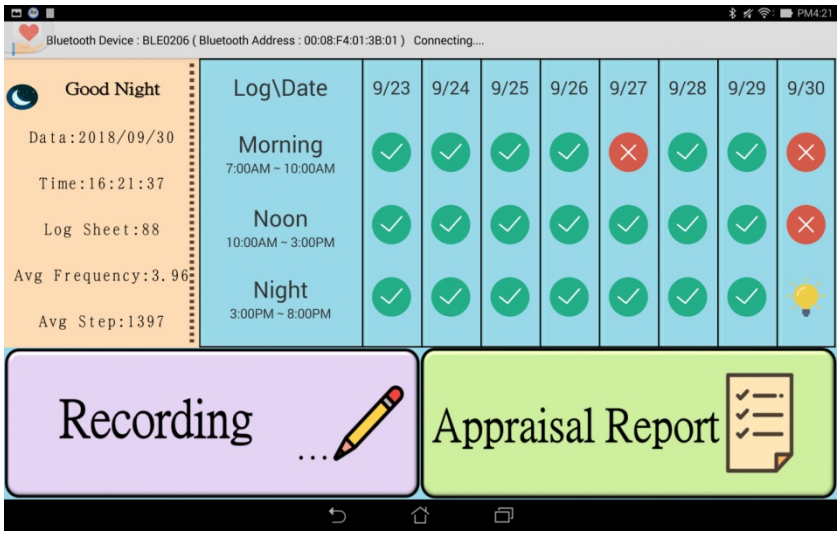

Figure 4. Measurement Report

Figure 5. Measurement Results

In order encourage elderly people to exercise and prevent elderly people from falling accidentally, the device also has fall warning function. We also measure the falling down signal as shown in Figure 6. In this study, when the fall signal is measured, the GPS position at the time of the fall will be displayed as shown in the Figure 7 and passed to the relevant caregivers for emergency or necessary treatment.

Figure 6. Fall down signal

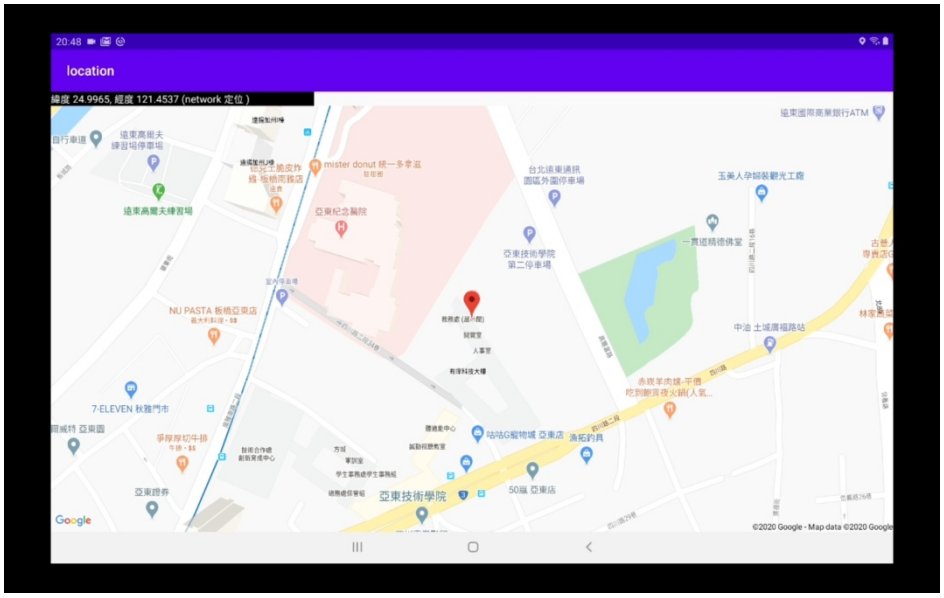

Figure 7. Display GPS position when falling

5. Conclusion

The main purpose of this research is to slow down the aging process in terms of physical activities for the elderly. Hand tremors are a common and noticeable sign of aging. The device is used to measure the frequency of hand tremor and walking steps of the user throughout the day. A report of measurements by the APP, makes it easy for the user to observe the physical condition of the body. It also has warning function design for elderly people to fall in the system. At the same time, it also encourages the normal activities of the elderly, which can limit the waste of medical resources and the pressure or overload of their offspring can also be mitigated.

References

[1] Hirsch, L., Jette, N., Frolkis, A., Steeves, T., & Pringsheim, T. (2016). The Incidence of Parkinson's Disease: A Systematic Review and Meta-Analysis. Neuroepidemiology, 46(4), 292-300.

[2] Frazzitta, G., Abbruzzese, G., Bertotti, G., Boveri, N., Pezzoli, G., & Maestri, R. (2013). Effectiveness of an intensive rehabilitation treatment on different disease subtypes. NeuroRehabilitation, 33(2), 299-303.