HIROSHIMA INSTITUTE OF TECHNOKOGY

A NEW MICROCOMPUTER-BASED SAFETY AND LIFE SUPPORT SYSTEM FOR SOLITARY-LIVING ELDERLY PEOPLE

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INTRODUCTION

In daily life, the sudden death of solitary-living elderly people is a serious problem. The causes are mainly cardiac and cerebral problems, which are induced by unexpected sickness or fall.

In this study, the microcomputer-based safety monitoring system, which is attached to the center of the abdomen with a waist band, detects the persons life-threatening physical condition from their body movements produced by posture changing, walking and running. The emergency situation is informed to the patient's family, a fire station or a hospital by the personal handy phone.

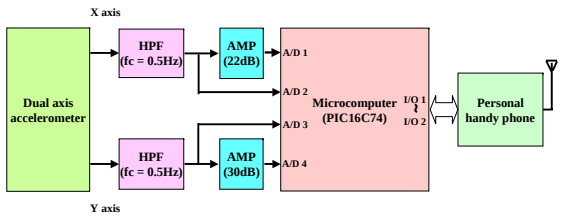

Figure1 The microcomputer-based safety and life support system. The system consists of a dual axis accelerometer (Analog devices, ADXL202E), two low-power filters, three amplifiers, a summing amplifier, a low-power 8-bit single chip microcomputer (Microchip, PIC16C74) and a personal handy phone(NTT Docomo, Pin).

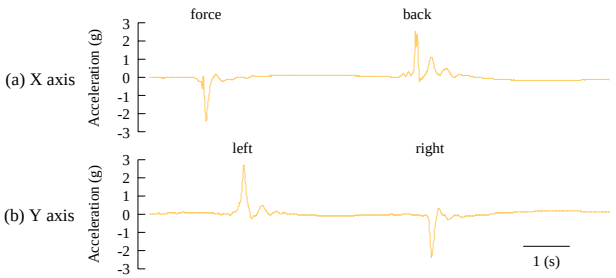

Figure2 The X and Y axis dynamic acceleration forces. These acceleration forces were recorded when a normal age 22 male subject fell down on bed from standing posture. The acceleration forces from the high-pass filters indicated a very short 600 ms period and large 2.5g acceleration.

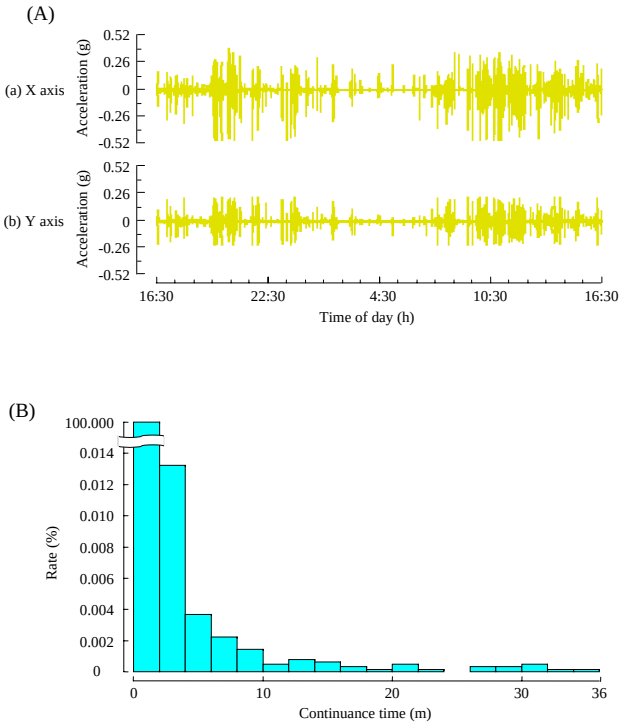

Figure3 The X and Y axis dynamic acceleration forces(plot A) and the frequency distribution histogram for the continuance time of the rest state (plot B) recorded for 24 hours. Both X and Y axis acceleration forces in inactive state from 0:00 to 7:30 are less than active state. The subject almost moved within 2 minutes. The maximum inactive period was 35 minutes. If the patient is in an inactive state for 5 minutes after falling, or for 35 minutes without previously falling, then the system automatically alarms the emergency situation, via the personal handy phone, to the patient's family, the fire station or the hospital.

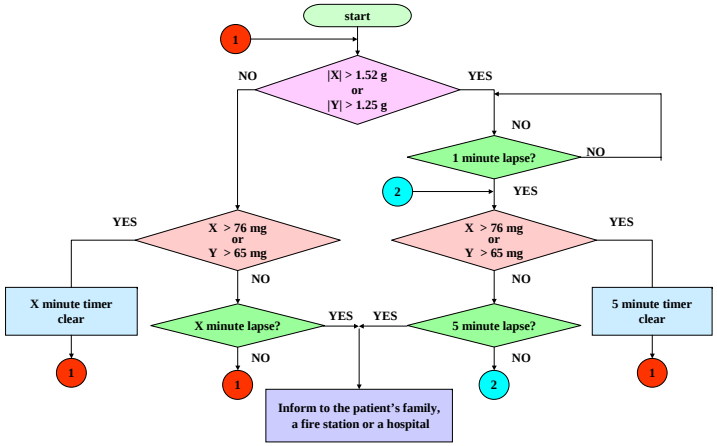

Figure4 The flowchart of the system. At first, the microcomputer detects whether the elderly person fell down. When the elderly person fell down and was in an inactive state for 5 minutes, then the microcomputer judges as the emergency situation. If the elderly person falls into a comatose state, then the body movements become very small X and Y axis dynamic acceleration forces and never exceed the X minutes continuance of the rest state[1]. The microcomputer judges as the emergency situation from the small body movements recorded by the amplifiers. The judged emergency situation is informed to the patient's family, a fire station or a hospital via the personal handy phone.

CONCLUSION

The new safety and life support system, which consists of dual axis accelerometer, two low-power active filters, low-power 8-bit single chip microcomputer and personal handy phone, has been developed to detect emergency situations of solitary-living elderly persons. The developed system is not only applicable to elderly people, but should also be found very useful for monitoring hospital patients and persons in welfare facilities.

REFERENCE

1) H.Maki, Y.Yonezawa, H.Ogawa, I.Ninomiya, K.Sada and S.Hamada,"A microcomputer-based life-safety monitoring system for elderly people", The 23rd Annual International Conference of the IEEE/EMB, proceeding, pp.336-339, 2001.

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