UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT OF HUMAN FALL DETECTION SYSTEM FOR THE ELDERLY

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Electronic Engineering Technology (Telecommunication) with Honours.

by

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APPROVAL

This report is submitted to the Faculty Of Electrical and Electronic Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Electronic Engineering Technology (Telecommunication) with Honours. The member of the supervisory is as follow:

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ABSTRAK

Kebanyakan jatuh adalah dari golongan warga tua. Jatuh yang dialami memberi kesan besar kepada mangsa apabila mereka jatuh mereka akan mengalami masalah seperti tulang patah , sukar untuk berjalan, sukar untuk membuat kerja, hanya mampu terbaring, mengalami masalah saraf, menyebabkan hentakkan di kepala, menyebabkan mati dan banyak lagi. Jatuh berlaku di dalam tandas akibat licin. Adakalanya, mereka yang jatuh ini sukar untuk mendapat bantuan dari orang lain apabila mereka jatuh di dalam tandas. Projek Membangunkan Sistem Pengesan Jatuh Bagi Warga Tua di hasilkan, berfungsi apabila warga tua masuk ke tandas ia perlu memakai rantai yang diletakkan pengesan MPU6050 dan bila beliau mula jatuh pengesan infra merah akan pancar cahaya penghantar dari setiap sudut tandas dalam bentuk cross-point dengan itu ia akan terkena kepada badan beliau dan cahaya itu di pancarkan semula kepada penerima, melalui itu kiraan cahaya infra merah yang bersentuh dengan badan beliau dapat dikira dengan itu jatuh dapat dikesan. Selepas itu, Paparan Kristal Cecair (LCD) akan menunjukkan "Seseorang Jatuh" bersama bunyi "bip" pada "Buzzer Piezoelektrik" dalam masa yang sama sebagai amaran kepada orang luar yang orang tua jatuh di dalam tandas. Pada masa yang sama, pengesan MPU6050 yang berada di Nano Arduino akan mengesan sudut berubah dan Bluetooth HC05 Hamba yang akan hantar data kepada Bluetooth HC05 Tuan yang berada pengawal iaitu Arduino Uno. Lain, titik pengesan sensor inframerah dan bacaan dan perubahan sudut dalam pengesan MPU6050 pecutan akan dipaparkan dalam bentuk grafik oleh perisian Thing Speak. Aplikasi "Thing Speak" ini, dapat digunakan bila Wi-Fi di hidupkan. Projek ini adalah

untuk menganalisis prestasi sistem dari segi kebolehpercayaan dan juga ketepatan dan juga menggunakan teknik cross-point yang berbentuk edaran.

ABSTRACT

Mostly elderly has problem in fall. The fall is a big impact on the victims when they fall they will have problems like broken bones, difficult to walk, difficult to work, just lying down, having nervous problems, causing headaches, dying and more. Falling usually occurs in the toilet as a result of slippery. Sometimes, those who fall this difficult to get help from others when they fall in the toilet as an effect. Thus, project Development of Human Fall Detection System for the Elderly is generated. This project works when the elderly goes to the toilet it needs to wear the necklace that is installed with the sensor's MPU6050 and when it starts falling infrared sensors will transmit the transmitter light from every corner of the toilet in the form of cross-point thus it will be exposed to the body of the parent and light it is transmitted back to the receiver, through which the infrared light count in contact with the elderly body can be calculated with that fall can be detected. After that, Liquid Crystal Display (LCD) will show “Someone Fall” along with "beep" sound on "Piezoelectric Buzzer" simultaneously as a warning in form to an outsider that the elderly fall in the toilet. At the same time the MPU6050 at Nano Arduino will detect the changing angle and Bluetooth HC05 Slave with will send data to the Bluetooth HC05 Master at controller of Arduino Uno. Other, the detect point of infrared sensor, reading and changes of angle in MPU6050 sensor will display in form of graph by Thing Speak software. Software Thing Speak will on by Wi-Fi. The Development of Human Fall Detection System for the Elderly is to develop a prototype

of fall detection system using distributed cross-point technique and to analyse the system performance in term of reliability and accuracy.

DEDICATION

This thesis is dedicated to my parents Aziz Bin Mamat and Sazilawati Binti Ab Aziz also my sibling Zaim Raziqin and Zaim Wafiuddin, who had taught me the best kind of knowledge. It is dedicated to my family who always support me during my studies. Special thanks to my supervisor, Sir Ahmad Fauzan Bin Kadmin for supervision. And also to my beloved friends who keep giving me encouragements of completion of this thesis.

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LIST OF SYMBOLS

Acceleration	-	344 m/s (1129 ft/s),
Area	-	25cm
Small Value	-	0.75µm-3µm
Gravity	-	1 g = 9.8m/s^2
Area	-	10 m2

LIST OF ABBREVIATIONS

PIR	Pyroelectric Sensor/ Passive Infrared
IR	Infrared Sensor
GSM	Global System for mobile communication
RSSI	Internet of Things
RF	Received Signal Strength Indicator
RFID	Radio Frequency
SWT	Radio-Frequency Identification
WSBN	Discrete Stationary Wavelet Transformed
WS	Wireless Body sensor organize
3DCA	Wearable sensor
IRC	single 3D commercial accelerometer
DOA	Infrared Radiation Change
WLAN	Direction of Arrival
GPS	Wireless Local Area Networking
ZMP	Global Positioning System
LRF	Zero Moment Point
MEMS	Laser Rangefinder
IT	Micro-Electro-Mechanical Sensors
OT	Information Technology
IP address	Operational Technology
PC	Internet Protocol.

IDE	Personal Computer
TDMA	Arduino Software
HSCSD	Time Division Multiple Accesses
HSCSD	High-Speed Circuit-Switched Data
GPRS	General Packet Radio System
EDGE	Enhanced Data GSM Environment
UMTS	Universal Mobile Telecommunications Service
FFMS	Feature Feedback Mechanism Scheme
EKF	Extended Kalman Filter
SVMLA	Vector Machine Learning Algorithm
MEWMA	Multivariate Exponentially Weighted Moving Average
SVM	Vector Machine Monitring
TST	Tele-communication Systems Team
MFCCs	Mel-Frequency Cepstral Coefficients
WT	Wavelet Transform
HOG	Histograms of Oriented Gradients
GLBP	Approach Together With the Gradient Local Binary Patterns.
HRCS	Human-Robot Coordination Stability
FA	Force-Angle
LED	Light Emitting Diode
LCD	Liquid Crystal Displa

CHAPTER 1

INTRODUCTION

1.1 Project Background

At this moment, most of the human in this earth are getting older and incapacitated. Accordingly, majority of elderly stay in different group for example who live alone as single. There are the big consequences and it is most universal among the elderly, and often represents the problem of the well-being and lifestyle of the victim. Usually, human who is 65 year old mature and more experience has problem or frequently involve in dangerous of fall. Though, elderly who is fall and unconscious and causes death which is cannot be heal. When elderly fall nobody detect the tragedy then causes take a long time to get some help.

In addition, usually elderly fall causes from the wet floor in the toilet and make elderly slippery by them self. From this problem this project has develop to prevent elderly from falling with using various sensor which is Infrared Sensor (IR) is put at the edge of the toilet wall by using cross-point technique to detect fall when fall happen and if infrared turn on many points is touch it means someone has fall. Liquid Crystal Display (LCD) will show “Someone Fall” along with "beep" sound on "Piezoelectric Buzzer" simultaneously as a warning in form to an outsider that the elderly fall in the toilet.

At the same time the necklace of MPU6050 sensor will be wear by elderly to know the changes angle of motion, the MPU6050 has a part at Nano Arduino and Bluetooth HC05 Slave with whom it will send data to the Bluetooth HC05 Master at

controller of Arduino Uno. Other, the detect point of infrared sensor, reading and changes of angle in accelerometer sensor will display in form of graph by Thing Speak software. Thing Speak will on when the Wi-Fi is connect to it. This project has be name as Development of Human Fall Detection System for Elderly.

1.2 Problem Statement

Nowadays fall can happen everywhere especially in toilet because of a wet floor causes people like elderly easy to fall. Referring to that problem so many elderly get injured. Injured that always happen is in different direction such as backward, forward, left and right side. Most elderly individuals suffer from poor muscle condition, reduced quality, and loss of adjustment after fall is happen. Sometimes cause irreversible injury and death to elderly. Less capability compare young people causes when in wet floor people like elderly easy to fall.Sometimes, when elderly had fall they cannot calling for help and sometimes it took a time to wait for help. In this case, many elderly needs to be protecting because majority people who always get fall is elderly.

That why, from this problem, device has being developed for human fall detection for elderly. It is because this device can help to decrease the value of elderly fall. This device helping with gives information to other people direct to other through LCD display and sound of buzzer to notice the fall. So people will alert if someone is fall in the toilet people can see the display and hear the sound of buzzer that will state someone has fall. Other, fall also can be detect with this system which is detect when infrared is touch to the person with many point it mean person has fall.