UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT OF IOT FALL DETECTION SYSTEM FOR ELDERLY PEOPLE

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

AMARJEET SINGH S/O GURDIR SINGH

B071610611

950201-08-5063

FACULTY OF ELECTRICAL AND ELECTRONIC ENGINEERING

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Yang benar,

.....

AMARJEET SINGH S/O GURDIR SINGH

Alamat Tetap: NO 106, Block B,

Cherry Apartment, Cherry Park,

30100, Ipoh

Perak.

Tarikh: 13th December 2019

Disahkan oleh penyelia:

.....

WAN HASZERILA BINTI WAN HASSAN

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DECLARATION

I hereby, declared this report entitled Development of IoT Fall Detection System for Elderly People is the results of my own research except as cited in references.

Signature:	……
Author :	AMARJEET SINGH S/O GURDIR SINGH
Date:	13th December 2019

APPROVAL

This report is submitted to the Faculty of Electrical & 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:

Signature: …….

Supervisor : WAN HASZERILA BINTI WAN HASSAN

ABSTRAK

Pada masa kini, pengesanan kejatuhan telah menjadi salah satu aspek yang paling penting disebabkan peningkatan taraf hidup dan populasi orang tua. Kini, ramai profesional yang bekerja meninggalkan keluarga mereka yang berumur di rumah sahaja. Sebagai hakikat bahawa orang tua mempunyai peluang yang lebih tinggi jatuh dan menyakiti diri mereka kerana faktor umur dan sendi yang lemah. Kejatuhan boleh menjadi sangat berbahaya di kalangan warga tua terutama mereka yang tinggal bersendirian dan tidak boleh mendapatkan sebarang bantuan selepas jatuh. Dengan ini, pembangunan Sistem Pengesanan Kejatuhan IoT ini akan memastikan kejatuhan itu dapat dikesan dan mangsa boleh dirawat pada masa yang sesuai. Apabila sebarang jenis kejatuhan dalaman berlaku, ia perlu dikesan dengan betul dan memberi amaran kepada ahli keluarga untuk mengambil tindakan segera. Dalam kes ini, jika seseorang telah jatuh peranti prototaip yang dilekatkan pada tangan mangsa akan mengesan kejatuhan dan menghantar pemberitahuan kepada ahli keluarga untuk memberi amaran kepada mereka. Selain itu, ini menjadi sangat penting untuk menggunakan teknologi Internet Things (IoT) untuk mengintegrasikan dengan sistem pengesanan kejatuhan dan menerima pemberitahuan amaran menggunakan aplikasi Cayenne. Komponen utama dalam membangunkan projek ini ialah sensor Wemos D1 Mini, MPU 6050 dan aplikasi Cayenne. Input sistem adalah sensor pecutan / gyroscope dengan 6 paksi bersepadu yang akan mengesan perubahan dalam postur badan atau gerakan orang tertentu manakala Wemos D1 Mini akan mengintegrasikan dengan aplikasi Cayenne untuk menghantar pemberitahuan melalui IoT ke telefon bimbit dan menyimpan maklumat yang berkaitan.

ABSTRACT

In the recent time, detection of fall has become one of the most important aspect due to increase in the living standards and population of the elderly people. Nowadays, many working professionals are leaving behind their elder family members at home alone. As the fact that elderly people has the higher chances of falling down and hurting themselves due to age factor and weak joins. Falls can be very dangerous among elderly people especially those who are living alone and cannot seek any help after it. Hereby, this development of IoT Fall Detection System will ensure that the fall can be detected and the victim can be treated well at the right time. When any type of indoor falls occur, it should be correctly detected and alert the family member to take immediate action. In this case, if an individual has fallen down, this prototype device which is attached to the victim's hand will detect the fall and send notification to the family member to alert them. Furthermore, it has become extremely necessary to adopt the Internet of Things (IoT) technology to integrate with the fall detection system and receive the alert notification using the Cayenne app. The key components in developing this project are the Wemos D1 Mini, MPU 6050 sensor and Cayenne app. The input of the system is the accelerometer/gyroscope sensor with 6 axis integrated which will detect any change in body posture or motion of the particular person while Wemos D1 Mini will integrate with the Cayenne app to send notification via IoT to the mobile phone and stores relevant information.

DEDICATION

This thesis is dedicated to:

My beloved parents,

My supervisors,

My lecturers

My family,

And all my friends,

Thank you for the guidance, encouragements and support

ACKNOWLEDGEMENTS

First and foremost, I would like to take this opportunity to express my appreciation to those who helped me to complete my project. I would like to thank my supervisor Wan Haszerila Binti Wan Hassan for the significant guidance, patience and suggestion to make sure that my project is achievable. I have gain a lot of information and knowledge from my supervisor along this project. Furthermore, I would like to thank my beloved parents for their motivation and financial support along this project. Last but not least, I would like to thank my friends Harirajan S/O Krishnan and Vegneshwaran S/O Pitchamuthu who has supported and helped me during the progress of my project. I am really thankful to University Teknikal Malaysia Melaka (UTeM) for permitting me to utilize the facilities in its laboratories for smooth execution of my experiment.

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INTRODUCTION

1.0 Introduction

This chapter briefly describes the idea of the project. It gives a brief explanation on the background of the project, the problems lead to the idea of project implementation, objectives that need to be achieved from the project, the scope which is targeting and finally the outcome of the project.

1.1 Background

Nowadays people are so busy and due to their tight working schedule it is not constantly conceivable to allow and keep somebody at home to deal with elderly individual. The choice for the caretaker is the alternative and likewise one still cannot fully trust on guardian by accepting danger as that individual is near us and we are worried about their wellbeing very much. Statistics shown that by 2050, people aged 80 or above which are approximately 69% required to be available in creating nations in future. Most senior people are living alone and as per over 62% of the old patients were harmed because of fall. Studies has demonstrated that 5% to 10% of falls cause wounds, for example, fractures, head injury and from these accident 60% are indoor accidents [1].

Falls additionally lead to diminished autonomy and numerous individuals who have fallen has the fear of falling again. Tissue wounds, joint dislocations, bone fractures and head injury are a portion of the harms brought about by falling. Many people are unfit to get up independent from anyone else after fall and regardless of whether the individuals who are not harmed, half of the individuals who had encountered lying on floor for much time commonly over an hour died within half a year after that incident.

As it is basic and very important to have a system which can identify and detects fall in a split second with the aim that the patient will be properly treated at the exact time who suffers from any kind of fall. This is because if the fall victim has not given proper treatment at the right time the victim might goes in coma stage. The wearable sensor and external sensors are the two category which falls under the fall detection system. The external sensors are put around the individual whereas wearable sensors are joined and attached to individual's body. In this project, the development of the fall detection system is based on the wearable sensors.

In wearable sensor based methodology numerous sensors like accelerometer and gyroscope are utilized. Generally utilized sensor is accelerometer module. The function of this sensors are utilized to get the posture of the body. This sensors are attached on some body parts of subject like abdomen, thigh, wrist, shoes and so on to distinguish fall. In this case, the wrist will be the best place for the sensors to be attached. The project is to ensure when there is any fall detected indoor, it must be accurately identified and notify the family member about the incident through mobile phone. It prompts little and practical arrangement as the wearable gadget that can be synchronized with ongoing innovation, for example, Internet of Things (IoT) for safety purposes. It can utilize the modern technology such as IoT to speed up, efficient and dependable administrations to send notification to guarantee the exigency of the falling situation. Likewise because of latest innovation like IoT, it is simple to send the information gathered by the sensors for storage, monitoring and future analysis. This information stored at cloud can be access using mobile phone. In cloud storage, it provides continuous information accumulation, handling of information and simple visualization for its clients.

A fall detection framework can be actualized for old individuals in a worldwide system utilizing Raspberry-Pi 3 or Arduino on IoT platform. It has benefits of interest that it is executed as wearable and with the assistance of IoT stage we can monitor the older individual at home. Because of profitable recently included element of Wi-Fi to Arduino, it makes simple to connect and save the additional equipment to make the framework simpler and even financially saving. Finally, it is believed that the development of this

project gives a good and significant impact to a particular need of our society especially help those who are already aged.

1.2 Problem Statement

The detection of fall has turned into the one of the very essential aspect because of increment in the expectations for everyday comfort and the populace of old individuals. As indicated by World Health Organization, falls are one of the overwhelming wellbeing related issues among older. According to them, more than 33% of 65 and above year-old individual falls every year [2]. It is common that huge numbers of working proficient are leaving their senior individuals at homes all alone. This is because some of them do not have any option to look after the old individuals due to their working life. In metro urban areas there are working medical nurses accessible to deal with these older individuals. This might be the best practical solution to overcome this problem but yet some old individuals prefer to live at their own house environment and has the desire to live all alone. In such a circumstance, though the part old individual does not have any sickness, fall accident has been the real reason for damage and injury to the old ones. Falls are most crucial occasions among old individuals which requires auspicious salvage. Fall can be risky for older individuals those who are home alone and cannot look for any help after any type of fall happens to them. Falls leads to physical as well as extreme mental impacts on older individuals. After fall, staying on the ground without any assistant for a few minutes or hours can lead to injury state and can cause them pressure sores. Fall can likewise decrease the capacity to be more independent because of mental results. As seen in Figure 1.1, the statistic of fall deaths in U.S increases every year. It is estimated that in every 20 minutes there is an older adult dies from fall related injuries. This is so something which worries the community very much especially the families of the older individuals. In Canada, the statistics of fall related injuries among older individual increases as well from 2003 to 2009/10.

This represents a 43 % increase in numbers of individuals who reported a fall related injury from 2003 to 2009/10. The numbers are worrying and it has become an important issue to be discuss and need to be solved as soon as possible [3]. Figure 1.1 and Figure 1.2 shows the statistic of fall deaths in U.S and the survey on fall among elder in U.S.

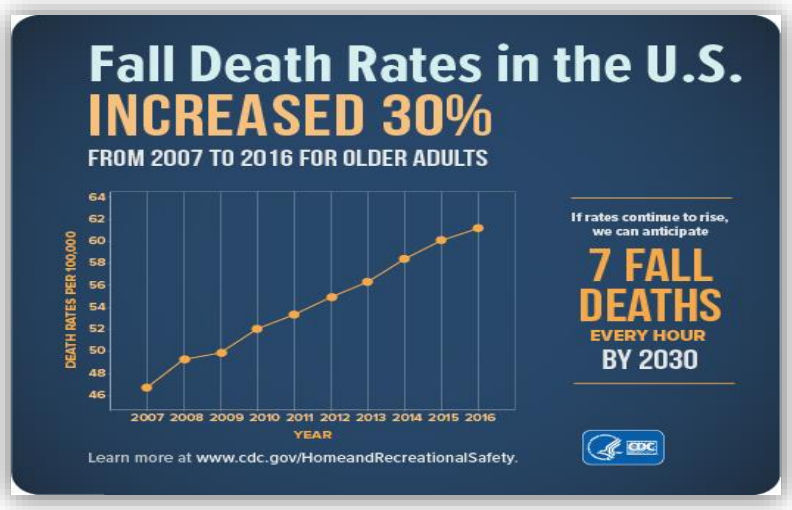

Figure 1.1: The statistic of fall deaths in U.S

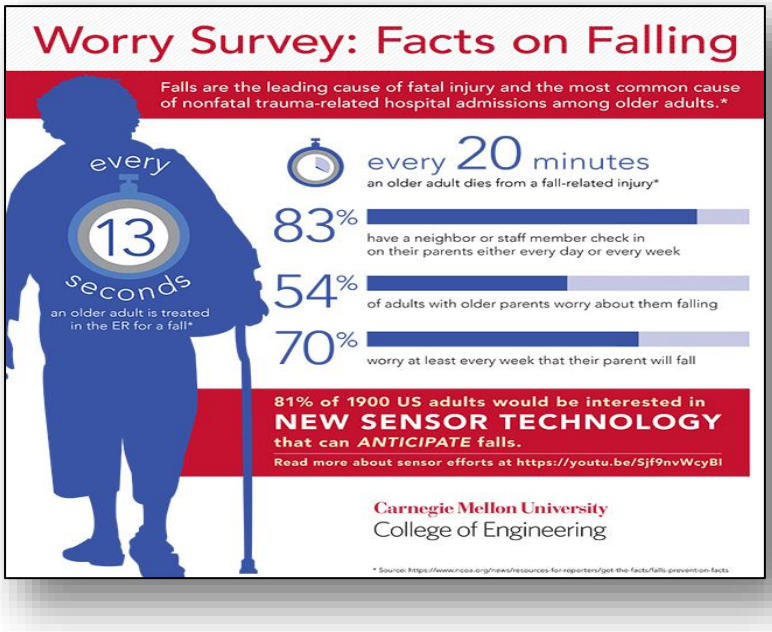

Figure 1.2: The survey on fall among elder in U.S