SMART MONITORING DEVICE FOR ELDERLY

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JUDUL: SMART MONITORING DEVICE FOR ELDERLY

SESI PENGAJIAN: SESI 2017/2018

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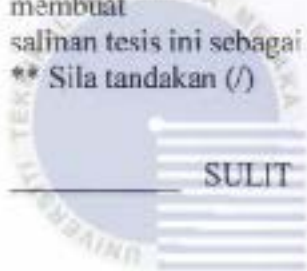
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SMART MONITORING DEVICE FOR ELDERLY

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This report is submitted in partial fulfillment of the requirement for the

Bachelor of Computer Science (Computer Networking)

FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2017

DECLARATION

I hereby declare that this project report entitled

SMART MONITORING DEVICE FOR ELDERLY

is written by me and is my own effort and that no part has been plagiarized

without citations.

STUDENT   : _____   DATE: 23 AUGUST 2017

(MOHAMAD FAIZ FARHAN BIN AHMAD FAUZAN)

SUPERVISOR   : _____   DATE: 23 AUGUST 2017

(DR.NORHARYATI BINTI HARUM)

DEDICATION

To my beloved parent thank you for their endless support and always stay behind me all the time.

To my supervisor for encouraging, motivating and believing in me.

ACKNOWLEDGEMENTS

ABSTRACT

The project about to develop Generic Webcam with Raspberry Pi. Nowadays, many elderly are live alone at home when their children are busy with work. Some others do not live together with their children at all. When it happen, it make more elderly person need to do their own. It makes much accident happen. With this project, family members can monitor their parent from anywhere. To avoid from the bad happen in home, I am proposing the project **Smart Monitoring Device for Elderly**. The use of Raspberry Pi and Webcamare increasingpopular because there are many systems that can be developed with these technologies to facilitate daily activities. The Raspberry Pi acts as a small computer and Webcam acts as a camera to capture and record with high resolution when motion is detected, so it is easier to locate incident pictures and video. The Raspberry Pi 3 as a main component because it just using only 5.1V/2.5A power supply which using less power and save more energy. The function in this project is will detect the motion of elderly in the range time limit to record and send the alert notification to the family member via Telegram applications to take an action. The detection happen when the elderly going down on the floor and not move in the time that has setting before. The advantages for this project to avoid from death among these elderly. Mostly elderly had chronic disease, so they need more attention and care. The family members take the responsibility to the elderly when the falling happen among them.

ABSTRAK

Projek ini akan membangunkan Generic Webcam dengan Raspberry Pi. Pada masa kini, ramai orang tua tinggal bersendirian di rumah apabila anak-anak mereka sibuk dengan kerja. Sesetengah yang lain tidak tinggal bersama dengan anak-anak mereka sama sekali. Apabila ia berlaku, ia membuatkan orang yang lebih tua perlu melakukan sendiri. Ia membuat banyak kemalangan berlaku. Dengan projek ini, ahli keluarga boleh memantau ibu bapa mereka dari mana-mana sahaja. Untuk mengelakkan dari keadaan buruk berlaku di rumah , saya mencadangkan **Smart Monitoring Device for Elderly.**. Penggunaan Raspberry Pi dan Webcam semakin popular kerana terdapat banyak sistem yang boleh dibangunkan dengan teknologi ini untuk memudahkan aktiviti harian. Raspberry Pi bertindak sebagai komputer kecil dan Webcam berfungsi sebagai kamera untuk menangkap dan merakam dengan resolusi tinggi apabila gerakan dikesan, jadi lebih mudah untuk menyimpan gambar insiden dan video. Raspberry Pi 3 sebagai komponen utama kerana hanya menggunakan hanya bekalan kuasa 5.1V / 2.5A yang menggunakan kuasa kurang dan menjimatkan lebih banyak tenaga. Fungsi dalam projek ini akan mengesan usul orang tua dalam had jangka masa untuk merekod dan menghantar pemberitahuan amaran kepada ahli keluarga melalui aplikasi Telegram untuk mengambil tindakan. Pengesanan berlaku apabila orang tua turun ke lantai dan tidak bergerak pada masa yang telah ditetapkan sebelum ini. Kelebihan untuk projek ini untuk mengelakkan daripada kematian di kalangan orang tua ini. Kebanyakan orang tua mempunyai penyakit kronik, jadi mereka memerlukan lebih perhatian dan perhatian. Anggota keluarga bertanggungjawab kepada warga tua apabila berlaku kemerosotan di kalangan mereka.

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CHAPTER 1

INTRODUCTION

1.1 ProjectBackground

Nowadays, many elderly are live alone at home when their children are busy with work. Some others do not live together with their children at all. Because of this, most of elderly persons have to stay at home alone. This might cause unexpected accident such as fall. It makes much accident happen. With this project, family members can monitor their parent from anywhere.

Falls among elderly person have become a big problem and serious. Falls can cause injuries to the elderly and many cause death. With a growing population of elderly persons we need to improve the safety and healthy of elderly persons. Computing technology becomes more robust by combining with a variety of other technologies such as the use of Raspberry Pi and Webcam. Nowadays, the use of Raspberry Pi and Webcam are increasing popular because there are many systems that can be developed with these technologies to facilitate daily activities. The Raspberry Pi acts as a small computer and Webcam acts as a camera to capture and record with high resolution.

In this project, we develop a smart device that can provide a platform that ease family to monitor his/ her parent from outside, know as **Smart Monitoring Device for Elderly** is the project that detect the elderly person fall in the home. There are many technique uses to this project.An automatic monitoring system for formal at home. It will provide security and a feeling of safety by detecting when a resident fall. After the detection the system will be able to alert family members. The system should be affordable and should not be significantly less accurate than other available options.

A Generic Webcam will used in this project for detect the motion of elderly and it also act to capture the images and recorded videos when fall happen. The captured images and recorded videos will be saving on the Samba server that acts as the storage and the backup for this project. The video will recorded in 10 seconds when fall is detected. In this project also, will used social media as the receive notification when fall happen. We choose Telegram Application as the part of this project because this application is quite famous among the people. A Python languages will used for a script to fall detection program.

The program detects if the person is not moving for a time period. In a real situation the time period would be set around 2 minutes if the person is on the floor. For the sofa there could be a limit of two hours and for the bed there could be a limit of 12 hours. There are currently not different detection times for the sofa or a bed. There are three features that usually occur when a person falls. Firstly, the incident will happen in a short time period. Typically in a range of 04-0.8 seconds. Secondly, the person centroid changes rapidly and significantly. Lastly, the vertical projection of the person changes significantly.

1.2 ProblemStatement (PS)

Many elderly are live alone at home when their children are busy at work. Nowadays, elderly person are hadchronic disease. Therefore, with these chronic disease, there may happen unexpected fall that may cause bad injuries. Many elderly people afraid about falling because it may cause of accidental death among elderly persons. Some others do not live together with their children at all. In this project, we develop a prototype to monitor the elderly people and make home more safety.

Table 1.1 : Problem Statement

PS	Problem Statement
PS	Most elderly people live alone at home because other family members are busy with work and does not have a time for their parent who have chronic disease and need more attention especially of they fall down when no one else is around

1.3 Problem Questions (PQ)

Table 1.2: Problem Question

PS	PQ	Problem Question
PS	PQ1	How to design a product that can avoid severe injuries or death because fall?
	PQ2	How to develop the system?
	PQ3	How to test the prototype in order to ensure the system functions properly?

1.4   ProjectObjective (PO)

The objectives are the suggestion and solution for the problem faced. This project is built to monitoring the fall elderly person at home. This project objectives (PO) are developed based on the previous section which is the project question (PQ) The Project Objective (PO) is shown below.

Table 1.3: Project Objective

PS	PO	Project Objective
PS	PO$_1$	To design a fall detector device that can ease family to monitor elderly person from outside and received notification when detected fall.
	PO$_2$	To develop a fall detector device that can ease family to monitor elderly person from outside and receive notification when detected fall.
	PO$_3$	To verify a fall detector device that can ease family to monitor elderly person from outside and receive notification when detected fall.

1.5   ProjectScope

Nowadays, many at home do not have the safety camera that is to detect the elderly that falling there. In which, when home have this safety camera to detect and monitor elderly person and automatically handle them from bad happen. For this project, implement security the detection of camera that will capture the image to analyse the falling detection by Raspberry Pi. The scopes of this project will cover item below.

a) **Raspberry PI**

The Raspberry PI is an ease, card measured PC that fittings into a PC screen or TV, and usage a standard comfort and mouse. It is an able little device that enables people of all ages to explore figuring, and to make sense of how to program in dialects, for example, Scratch and PythonRaspberry Pi 3 Model B released in February 2016 is bundled with on-board Wi-Fi, Bluetooth and USB Boot capabilities. As of January 2017, Raspberry Pi 3 Model B is the newest mainline Raspberry Pi. In this project, I used the Raspberry PI 3 Model B, because this Raspberry PI 3 is the latest Model produce. Besides, Raspberry PI 3 Model B it has many upgraded from Raspberry Pi 2.

b) **Generic Webcam**

Generic Webcam USB will use in this project as to capture and recorded the video when fall detect. A webcam is a video camera that feeds or streams its image in real time to or through a computer to a computer network. A webcam is generally connected by a USB cable, or similar cable, or built into computer hardware, such as laptops.

c) **Raspbian OS**

Raspbian is the Foundation's official supported operating system.Raspbian comes pre-installed with plenty of software for education, programming and general use. It has Python, Scratch, Sonic Pi, Java, Mathematical and more. Raspbian is a free operating system taking into account Debian streamlined for the Raspberry PI equipment. Besides the Raspbian principally the endeavours of Mike Thompson and Peter Green.

1.6   ProjectContribution (PC)

This project was developed to enhance the current safety system at home with advances the technology, Monitoring and security solutions can be utilized by family takers. With this project, home become more safety and make elderly person feel suitable to stay there.

In this project, it develops to safe guard the elderly people and to make the people surrounding suitable. It also makes home more safety. Its mean easy to the family members to monitor their elderly at home when family are not around them.

By using the Raspberry Pi and Webcamis the best way to launch fall detector and monitoring the elderly person. The use of this technology can resolve the entire problem faced. This is because by detecting fall action on the elderly person, the project will send the alert to the family members that can fast action on their parents to more take care.

Table 1.4: Project Contributions

PS	PQ	PO	PC	Project Contributions
PS	PQI	PO1	PC1	Improve of current system used to more ease family to monitor elderly from outside, how they use to receive notification when detected fall.
	PQ2	PO2	PC2	Build a new system for make home become more safety and eases to family member monitor elderly.
	PQ3	PO3	PC3	New system and test to ensure the prototype work properly how the system capture the image when object are going down

1.7   ExpectedOutput

In this project, the problem for the safety and ease to monitor falling elderly person from anywhere can be solved. The expected output from this project consists of a to perform background study on Raspberry Pi and how to handle WebCam. Besides, the expected output for this project is to achieve the objective of the project which is to develop the system of Smart Monitoring Device for Elderly. This project will detect fall action on the elderly person and send alert to the family members to take action by Telegram. Lastly, to make sure the prototype of this project work properly.

1.8   ThesisOrganization

This report will consist of seven chapters which is Chapter 1: Introduction, chapter 2: Literature review, chapter 3: methodology, chapter 4: design, chapter 5: implementation, chapter 6: result and finding and lastly chapter 7: conclusion

CHAPTER 1: INTRODUCTION

In this chapter, will be discuss about introduction for my project that is Smart Monitoring Device for Elderly, project background that containing a common description of this project and to produce the expected amount of work, problem statement will defines you the entire scope of this project to involved for example elderly person, medical profession, problem question, project objective will tell you the aim for this project to make home more safety and less the falling person, project scope, project contribution and expected output for this project to make sure the project work properly.

CHAPTER 2: LITERATURE VIEW

In this chapter, will relate the work or previous work of this project. Using another paper research, it will use as resources for this project. Analysis the current problem that had found by researcher before and proposed the solution for further project. After that, all the sub-topics will be analysed to make understanding of this project.

CHAPTER 3: METHODOLOGY

This chapter discusses on the methodology part which is the activities, steps and stages to complete this project according to it sequence phase by phase for the category of analysis. Which is try and error the code to make sure the system work? When face the method problem, try to do another method. In this chapter also will include the milestone and Gant Chart.

CHAPTER 4: DESIGN

In this chapter, the hardware and software requirement for this project will be discussed. I will use the Raspberry Pi and Webcam for monitor person and the Python languages for this system. Besides, in this chapter also will propose the environment setup, experimental design and simulation design.

CHAPTER 5: IMPLEMENTATION

In this chapter, will explain and show the implementation of this project methodology along with the supposed output. In this project, will show the algorithm used to make sure the system work. The technique used for this project to monitor elderly person.

CHAPTER 6: TESTING

This project discusses the steps and methods in testing the prototype. This is determine the result of the test either it is effective or not. Test the system either it work for detect fall or not. Test the system either send the notification or not when detection fall happen. Besides, in this chapter also will show the technique used to complete this project? Then, analyse any problems that occur during developing the design.

CHAPTER 7: CONCLUSION

In the last chapter, an overall picture of limitations, contributions and future works will be summarized will be discussed. This chapter compiles all chapters in a final documentation and state the contribution that able to provide for future works. This is because will used to improve the fall detection,

1.9   Conclusion

Conclusion, this chapter shows the project background that tells the background this project and summary. The problem statement subsection presents the current problem face by now technology. In addition, the objective this project becomes the goal to achieve the system and make the system more effectively and friendly. In this chapter also depicts portrayal and the strategy how to execute this project. Improvements of this system will follow the rules suggested this project can satisfy the objectives and follow the phase by phase of the project. Then, will achieve the project objectives and home become more safety. By taking the strategy and scope of the project, it is hoped this project will help the parties in completing their obligations all the more viably.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In this chapter, we discuss about literature review of the related information of camera using Raspberry Pi. Literature Review also is to collecting related information or project, analysis current problem, critical review of current problem, solving and proposed solution and do conclusion. In this chapter also, will discuss the previous project and their problem.

This project "Smart Monitoring Device for Elderly" uses Raspberry Pi and Webcam as hardware to monitor the fall detection. This Raspberry Pi also has their own OS that is Raspbian OS.

The figure below is the summary of content in this chapter.The entire element in this chapter will be references for us to complete this project.

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                    ┌──────────────────┐
                    │ Literature Review │
                    └──────────────────┘
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     ┌──────────────────┐          ┌──────────────────┐
     │ 2.2 Related Topic │          │ 2.3 Previous Work │
     └──────────────────┘          └──────────────────┘
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                    │ 2.4 Critical Review │
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                    │ 2.5 Proposed Solution │
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                    │ 2.6 Conclusion    │
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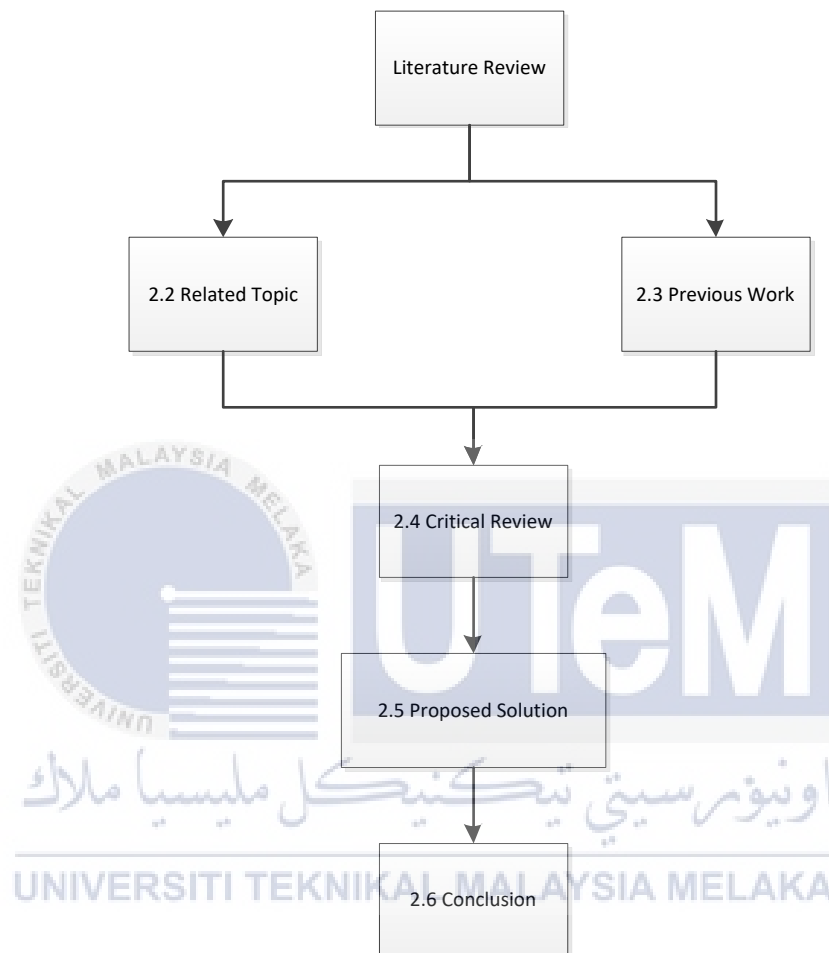
Figure 2.1: Summarize of Literature Review

2.2   Related Topic

2.2.1   Raspberry Pi

The Raspberry Pi is an ease, card measured PC that fittings into a PC screen or TV, and usage a standard comfort and mouse. Raspberry PI has many models such as Model A+, Model B+, PI 2 and PI 3. All the models have different specification. Model A+ has low cost variation of Raspberry PI. It has 256MB of RAM, 1 USB port only, 40 GPIO pins and not provides Ethernet port. However, The Model B+ has 512MB RAM, 4 USB ports, 40 GPIO pins, and required Ethernet port.

In this project, we used Raspberry Pi 3 model B because model B has 512 MB RAM, 4 USB Ports, 40 GPIO pin and has own Wi-Fi adapter. The Raspberry Pi 3 model B is the redesign of principal Raspberry Pi. Most of school will recommended to their student to used Raspberry Pi 3 model B because it a latest release and more flexible.

Figure 2.2: Raspberry Pi 3 model B

2.2.2 Webcam

Generic Webcam USB will use in this project as to capture and recorded the video when fall detect. A webcam is a video camera that feeds or streams its image in real time to or through a computer to a computer network. A webcam is generally connected by a USB cable, or similar cable, or built into computer hardware, such as laptops.

We choose this Webcam because the specification of this webcam is better than another Webcam. This is because, this Webcam is high definition image. Next flexible and easy to capture and lastly, the price of this Webcam also cheap compare to another Webcam or Pi Camera.

Figure 2.3: Generic Webcam

2.2.2.1 Camera detection of elderly person

Camera will be used to detect the elderly person in the particular area. The detection for elderly person will separate in three classification postures, which is sitting, standing and falling.
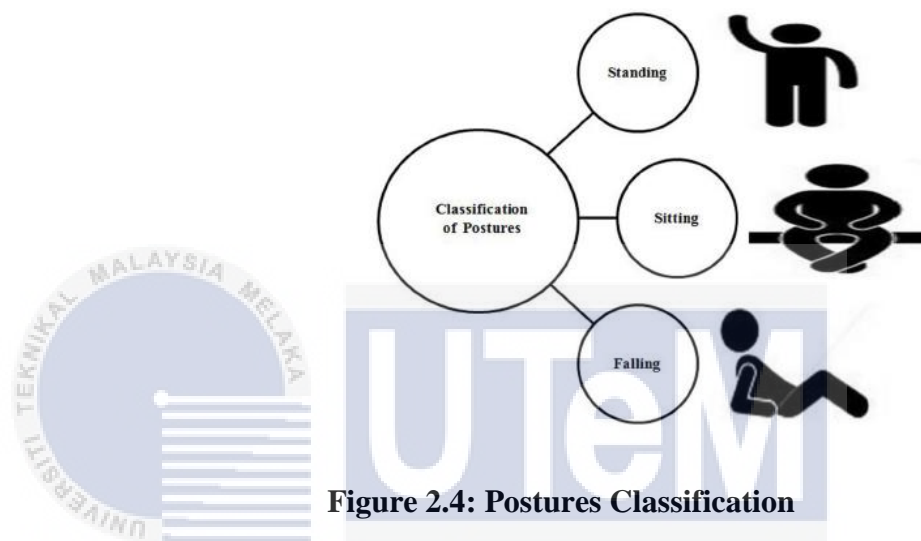
Figure 2.4: Postures Classification

There is having three different classification postures to monitoring elderly person. In static analysis the elderly person will analyse at a specific time. The time for taking action will be longer when the posture of person in sitting and standing. That mean in good posture. While the dynamic analysis is the elderly person in the fast motion going to down. This dynamic analysis will analyse at a specific time typically in short time range between 0.4 or 0.8 second.

2.2.2.2 Motion and position analysis of elderly person

The camera will detect and take the image of falling elderly person. The detection will work on three different posture of elderly person that is sitting, standing and falling. Every posture has their own specific time range. However, in real world it difficult to determine the accurate time to detect fall happen.

Figure 2.5: Fall detect work

When fall happen, the camera will capture the image in the typically time range that has be set. The postures analysis elderly person on camera with detects the elderly people with the position, velocity falling down and the orientation. Motion and position of the elderly people is the useful information to make decision activities. If the elderly people are going down but on the sofa and then it detected as sitting. Fall detection happen when the not normal activities among the elderly person such as lye down on the floor.

2.2.3 OpenCV

In this project, we will use the OpenCV-Python on this system. OpenCV is Open Source Computer Vision, a library aimed for real-time computer vision, it was develop at Gary Bradsky in 1999 and it was release in 2000. OpenCV also supports a variety of programming language like python, java, c++, etc. Besides, OpenCV also available on different platform such as Windows, Android, Linux, etc.
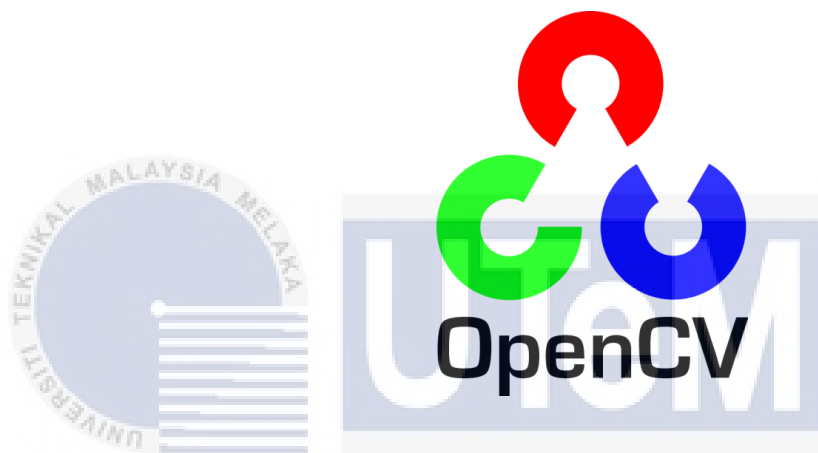

Figure 2.6: OpenCV logo

To prepare this project, we will use the Python languages. We choose this languages because of this languages is simplicity and readability code can make ease to use understand the language and friendly. Compared to other languages, Python is the slower. Some researcher said, Python can be easily extended with another language. Python wrappers that can be used as Python modules. There are many advantages of python languages. Firstly, the code is as fast as the original anther languages code andsecond, it easier to code in Python than another languages code.

Figure 2.7: Python logo

2.2.3.1: Benefit of OpenCV-python

In the future, more technology will develop and born to make the world became advanced. Learning OpenCV, its allow we to solve any problem that cannot be solve using ordinary current system. Besides, when use OpenCV, we will get lot information according the camera. In addition, OpenCV also will helps to write code quickly because the code is simplicity and readability.

2.2.3.2 Benefit of python languages

We choose the python languages because it easy to work and read and it suitable to develop the prototype. Besides, most automation, data mining, and big data platforms rely on Python. This is because it is the ideal language to work with for general purpose tasks. Lastly, Python allows for a more productive coding environment than massive other languages

2.2.4 Telegram

Telegram is a free cross-platform messaging application which is free installation for mobile such as android, iOS, Windows Phone). The Botfather is a third-party application that runs inside the Telegram. Telegram has chosen as element that used to send notification in this project.
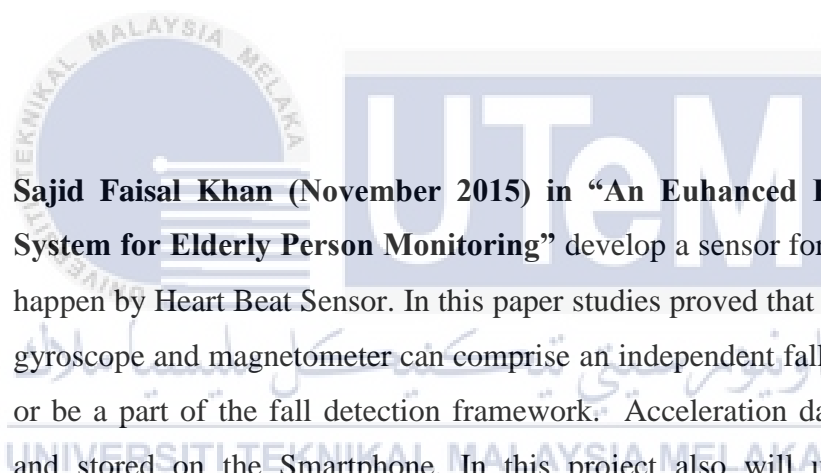

Figure 2.8: Telegram Application

Figure 2.9: The Botfather

2.3   RelatedWork/PreviousWork

Bora Banjanin, Lingrui Zhang, Chia-Ning Wang (June 2015) in their "Fall Detection Monitoring" develop a sensor that can remote the patient monitoring at nursing home. In this system will used stand-alone sensors able to alert medical personnel when a patient has fall presents. This project will focuses on creating a real-time, high accuracy, and low-cost fall detection system that employs a detection algorithm based on tri-axial accelerometer and gyroscope data. The problem in this project developing an accurate fall detection algorithm lied with interpreting noisy accelerometers and fluctuating gyroscopes data.

Sajid Faisal Khan (November 2015) in "An Euhanced Fall Detection System for Elderly Person Monitoring" develop a sensor for detect the fall happen by Heart Beat Sensor. In this paper studies proved that accelerometer; gyroscope and magnetometer can comprise an independent fall detecting tool or be a part of the fall detection framework. Acceleration data will collect and stored on the Smartphone. In this project also will used ARM 11 processor, GPS, Wi-Fi, Router and Heart Beat Sensor. This project also can monitor the elderly from the outside. The problem in this project is the cost of ARM 11 is more expensive maybe can replace by using ARM CORTEX A8. In addition, the storage is not enough to save. For the future work, maybe can provide more security to data by using encryption, decryption techniques.

Qifan Dong, Yang Yang, Wang Hongjun, Xu Jian-Hua (July 2015) in "Fall Alarm and Inactivity Detection System Design and Implementation on Raspberry Pi" this project will develop by using Raspberry Pi. A fall alarm and abnormal inactivity detection system is implemented for security surveillance of unattended home environment. This project proposes a novel method for fall alarm with a small amount of computing. In this project also, will used email and SMS warning as a notification. This project also have own advantages that is small size and low power consumption. This project also solves the current problem because they put the camera on the ceiling so that they have wide angle camera. The problem in this project is they use big cost and high power computation.

J. Sree Madhubala and A. Umamakeswa (May 2015) in "A Vision based Fall Detection System for Elderly People" is a project to ease monitor elderly. A develop by using a Microsoft Kinect Sensor on Raspberry Pi for fall detection. In this project will used a technique by identify the shape of person and mean based classification distinguish the fall from usual activities. Microsoft Kinect Sensor will act dataset to build of three type postures such as sitting, standing and falling. The problem in this project is, the development is needed to improve the smaller movement tracking of elderly people and to build an IOT application in Raspberry pi.

2.4   CriticalReviewOfCurrentProblemAnd Justification

Based on previous research and studied paper had been discusses, future prospect for the project to this system. Fall detection on elderly people using WebCam and Raspberry Pi are aim to ensure the entrance can run smooth that can reduce complexity in the work. The purposed project also can be used on multiple different and cross-platform compatibility.

Table 2.1: Summary of critical review of current problem

Research Title	Purpose	Description	Problems
Fall Detection Monitoring using Raspberry Pi Author: *Bora Banjanin,* *Lingrui Zhang,* *Chia-Ning Wang*	To develop a sensor that user can monitor the patient at nursing home using Raspberry Pi	This system will used stand-alone sensors that able to alert medical personnel when a patient has fall present.	This project developing an accurate fall detection algorithm lied with interpreting noisy accelerometers and fluctuating gyroscopes data. An unfortunately, the cost of responding to false positives or failing to respond to false negatives makes it difficult to commercialize such a system.

An Euhanced Fall Detection System for Elderly Person Monitoring Author: *Sajid Faisal Khan*	To develop a sensor for detect the fall happen by Heart Beat Sensor using Raspberry Pi	The author proved that accelerometer, gyroscope and magnetometer can comprise an independent fall detecting tool or be a part of the fall detection framework.	The cost of ARM 11 is more expensive maybe can replace by using ARM CORTEX A8. In addition, the storage is not enough to save.
Fall Alarm and Inactivity Detection System Design and Implementation on Raspberry Pi Author: *Qifan Dong, Yang Yang, Wang Hongjun, Xu Jian-Hua*	To develop fall alarm and abnormal inactivity detection system is implemented for security surveillance of unattended home environment.	Propose a novel method for fall alarm with a small amount of computing and we also present an inactivity detection method and will used email and SMS warning as a notification	This project, they used a big cost and high power computation.
A Vision based Fall Detection System for Elderly People using Raspberry Pi Author: *J. Sree Madhubala A. Umamakeswa*	To develop by using a Microsoft Kinect Sensor on Raspberry Pi for fall detection.	In this project will used a technique by identify the shape of person and mean based classification distinguish the fall from usual activities.	Needed to improve the smaller movement tracking of elderly people and to build an IOT application in Raspberry pi.

2.5   Proposed Solution

Based on the problem that state before in the critical preview, we develop a monitoring device that can detect the motion of elderly and detect the fall accident at home. This project also will capture the images when fall detected. The captured images will be send to the family members by using Telegram Application. This is because the current problem is some project does not have alert system when fall happen. Besides, some project does have the alert system but many of them use E-mail to send notification. But in this project will use Telegram applications because the current application produces and ease to family members used it. Besides, many of people are infrequently open the E-mail. Furthermore, Telegram application is faster access then E-mail. The motion will used the WebCam because this camera can monitor the coverage area in real-time. Python language also will used in this project as a script of fall detector. Other than that, the captured images will be saved into Samba server because when family cannot access the recorded video, them still can view the images in the Samba server.

2.6   Conclusion

In this chapter we discuss about the current problem that happen on family and the previous work. Based on summarize of critical review, it helps to identify and collect the information for the future. The problem on previous project are no alert system, just a security camera, and costly for installation sensor. The solution is developing a camera using Raspberry Pi which is more cheap and easy to lean for installation. This project will ease to family member because they can monitor from outside cause the project will use Telegram application for receive notification which is family can view the captured images and recorded videos. Then, the captured images and recorded video will save on Samba server as a backup for this project. Basically, this chapter is use to improve the previous work and make the solution the problem to become better.

CHAPTER 3

METHODOLOGY

3.1 Introduction

These chapters will be explaining about the methodology of this project and the activity for every stage. Besides, in the chapter also will be describe based on this project flow and this flow will help to achieve the project goal. In addition, requirements and project tools to test the project and to implement all the criteria and parameters that have been decided to choose which the best of queuing. Besides, these tools and requirement will help to achieve the goal of project and finish on time.

3.2   ProjectMethodology

Project methodology is very important to use as a guide to this project to make sure this project in a correct flows. Prototyping methodology is the methodology used in this project. This methodology is suitable for develop the project, it also easy. In protyping model, the basic idea in is that instead of freezing the requirements before a design or coding can proceed, a throwaway prototype is built to understand the requirements Activity involve in each phase will describe afterwards.A schedule can be set with deadlines for each stage of development and a product can proceed through the development process model phases one by one.

Figure 3.1: implementation Cycle for the Protyping Methodology

3.2.1 Project Planning

In the phase 1, the project planning is a discipline for stating how the project completes within a certain time frame and determines the goals. Review and study the whole project by identifying entrance held. Identify what type that current technology used and suitable for this project. For started this project, must know the software and hardware that suitable to use and make the project run as expected.

- Hardware
    - ✓ Raspberry Pi 3
    - ✓ WebCam
    - ✓ Monitor LCD
    - ✓ HDMI to VGA converter
    - ✓ USB Keyboard
    - ✓ USB Mouse
    - ✓ Access Point
    - ✓ Smartphone
    - ✓ Personal Computer

- Software
    - ✓ Python language
    - ✓ Raspbian (Raspberry Pi Operating System)
    - ✓ OpenCV
    - ✓ Telegram
    - ✓ Samba Server

3.2.2 Analyse Problem

In the analyse problem phase, decency of new requirement is studied in detail. In this section also, we collect all information that related with this project. In addition, we need to identify the problem then analyse the problem that was facing now. We also study the current problem, why that problem happens at home, how to solve the problem that facing at home when fall happen. Thus, all the equipment, software, the people included and the information used should to be considered as a part of the project. There is a technique used about this project to capture the object which is elderly people when them falling that mean when the object are going down.

Table 3.1: The current Common Smart Camera at Home

	Common Smart Camera
Price / One camera	RM 700.00
Camera Resolution	5MP
Features	-Using motion sensor detects motion only. -Do not have alert notification.

3.2.3   System Design

In this phase 3, System Design is a new design to produce the solution for the problem facing. This project will design for the system how the equipment must look and setup. In addition, system design also will propose a new design and suitable design for fall detection. This project will build the Smart Monitoring Home for Elderly that just used the camera to detect fall and used Samba server to store the captured images and recorded videos.
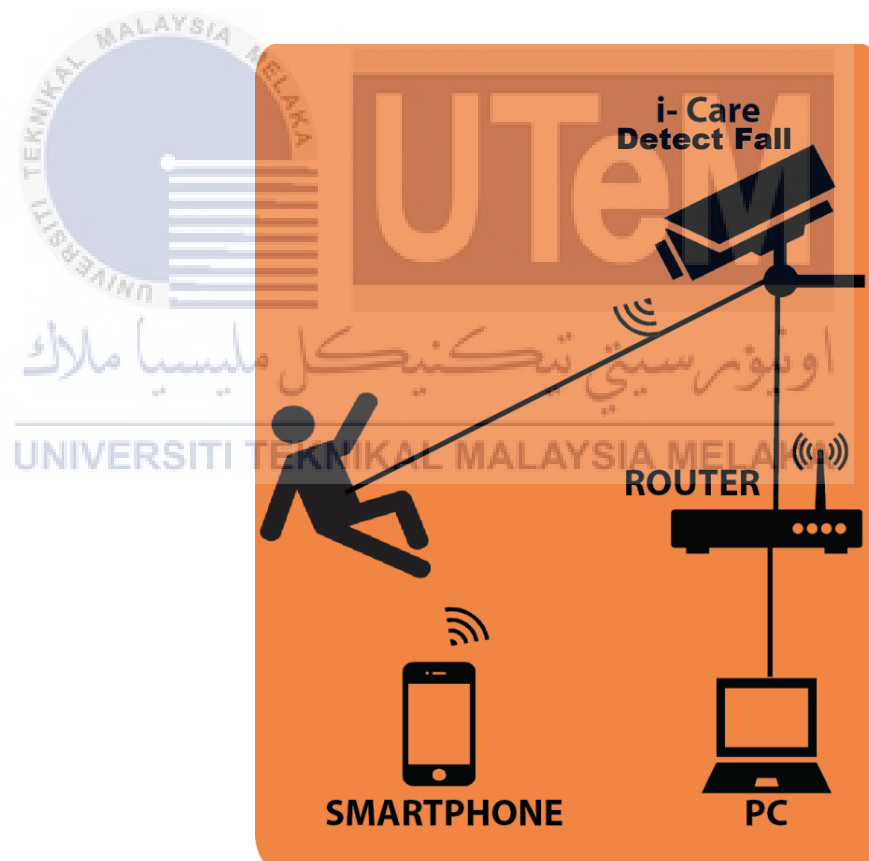

Figure 3.2: System Design for this project

3.2.4 Implementation

An implementation in phase 4 is for installation and configuration will be implemented in this phase. In this project, WebCam will connected to the Raspberry Pi. The Python languages will used to developed the integration between Raspberry Pi and Telegram. This intergrade is used to send the captured images and videos toward to owner's Telegram Application. The captured images and videos will save to Samba server that family member can access it when they can not access the images and video, in other word is backup.

3.2.5 Testing

In this phase,testing is used at key checkpoints in the overall process to determine whether objectives are being met. The Waterfall methodology is testing. The project is testing the implementation to find if have any failures or fault on this system. The integration is the entire system to make sure the system tested is faults and failure. In this project, we will test the fall detection on camera is function and working well. Samba server and Telegram is synchronizing on Raspberry Pi. Then, we will test captured images and video to send to Telegram. Lastly, we test the captured images and video save on Samba server is working well.
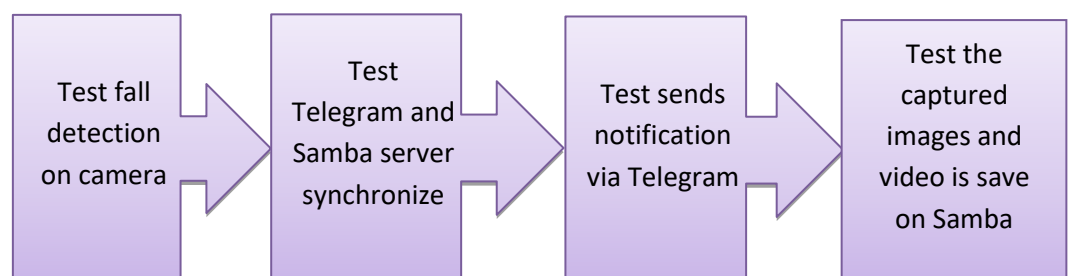
Figure 3.3: Testing process

3.2.6   Maintanance

In the phase 6, Maintanance is a phase that will use to repair or upgrade the product after get the feedback from the user. Not all the first production is good for user, so we need the maintanance phase to repair or fix the product.

3.3   ProjectSchedule And Milestones

Gantt chart is used to show the activities in this project displayed against time. In Gantt Chart also will show the starting of the date and the ends of this project. The aim of Gantt Chart produce is to make sure the project work developing from the starting to end which in on the right flow. Every activities and process are link each other, one process must do and it can proceed to another phase in methodology. The Milestone is a specific point in time within a project lifecycle used to measure the progress of a project goal. In the Milestone, it has a specific time for this project.

Table 3.2: Milestone

Activity	Responsibility	Date Start	Date End
Submission proposal	AJK	Week 1	Week 2
Prepare chapter 1 and chapter 2	Student and Supervisor	Week 1	Week 2
Submission of chapter 1 and chapter 2 and discussion	Student and Supervisor	Week 2	Week 3
Prepare the analysis chapter 3 and project progress	Student and Supervisor	Week 3	Week 3

Submission of chapter 3 and discussion	Student and Supervisor	Week 4	Week 4
Design and Implementation	Student	Week 5	Week 10
Prepare chapter 4	Student and Supervisor	Week 8	Week 8
Progress evualtion	Student	Week 10	Week 10
Improvement of chapter 4 and prepare for PSM 1 presentation	Student	Week 11	Week 11
Presentation PSM 1	Student, SV and Evaluator	Week 12/13	Week 12/13
Discussion for PSM 2	Student and Supervisor	Week 1	Week 1
Prepare testing phase chapter 6 and project progress	Student	Week 2	Week 2
Progress evaluation	Student and SV	Week 5	Week 5
Submission of full report (draft)	Student and Supervisor	Week 6	Week 6
Demo Project	Student and SV	Week 7	Week 7
Presentation and evaluation of PSM 2	Student, Supervisor and evaluator	Week 8	Week 8
Submission full report	Student and Admin	Week 8	Week 8

3.4 Conclusion
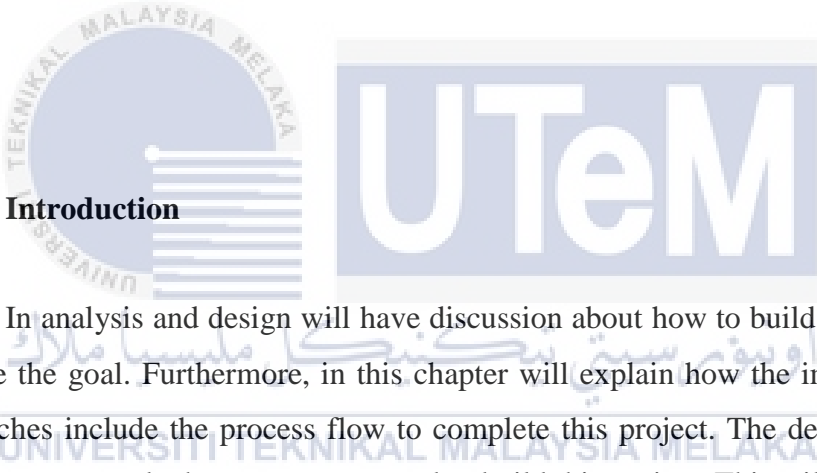
Finally, in this chapter show the methodology of this project. There are many resources to develop the project. In this chapter also show the Waterfall methodology that use to finish and as a guide of this project. Every phase is very important and it links each other, so it needs to finish the previous phase to proceed to next phase. The methodology is a guide line to us to make sure the project are finish on time and it is very important to make sure the project follow the flow. Testing is to test of developing a project as it can determine the success. To achieve the goals of this project, the plan for the whole PSM 1 and PSM 2 must been followed.

CHAPTER 4

ANALYSIS AND DESIGN

4.1   Introduction

In analysis and design will have discussion about how to build this project to achieve the goal. Furthermore, in this chapter will explain how the implementation approaches include the process flow to complete this project. The design of the all the component and what component used to build this project. This will help to make sure the requirement of this project is fulfilled. Lastly, in this chapter also will show the phase design that need a lot of attention because the design in important to created the project and need more carefully because it will be affected the whole system. To make sure the project will be carried out smoothly, the flow chart will be constructing in detail and correct.

4.2   Problem Analysis

Most of elderly are live alone at home, this is because many family members are working and busy with works. In addition, many of them are not living together with their parent at home. However, many elderly has chronic diseases that need more attention and easy to fall.

4.3   RequirementAnalysis

In this section will discuss about input requirement and out requirement for this project. Addition will show the functional requirement for this project.

4.3.1   Data Requirement

The input in this system is when elderly is fall in the specific area that has setting by the Raspberry Pi. The motion of the elderly fall will detect with the specific velocity. The time will set how long elderly fall on the floor without any motion. This system will analysis when elderly sitting, standing and falling. For the fall on the floor it has the specific time to detect it falls. Then, router as the network that connect to Raspberry Pi. Router gives the IP Address to the Raspberry Pi.

The output of this system is the fall happens camera will capture images and will saved to the Samba server and send it to the family member when the fall detected via Telegram Application. After family member get the notification from the system, it depends on them to take an action.
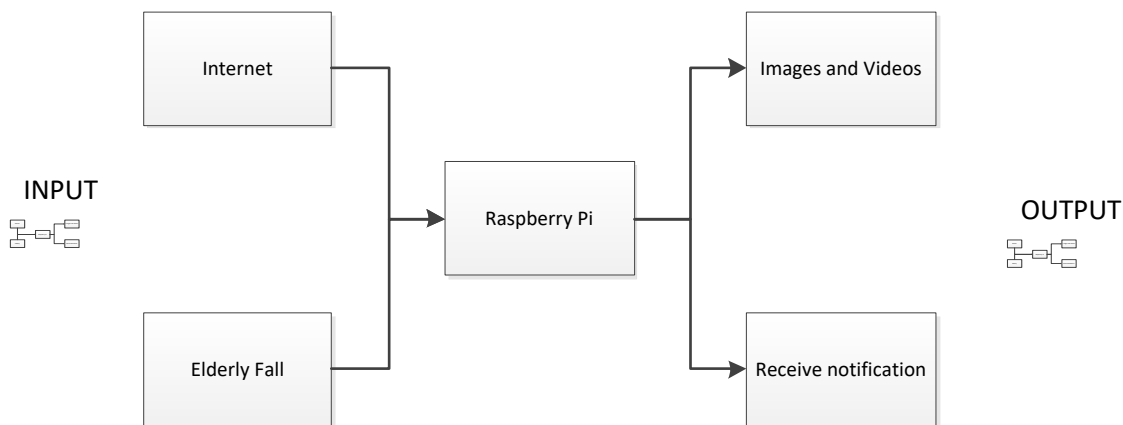
Figure 4.1: Block Diagram of Fall Detector

4.3.2   Functional Requirement
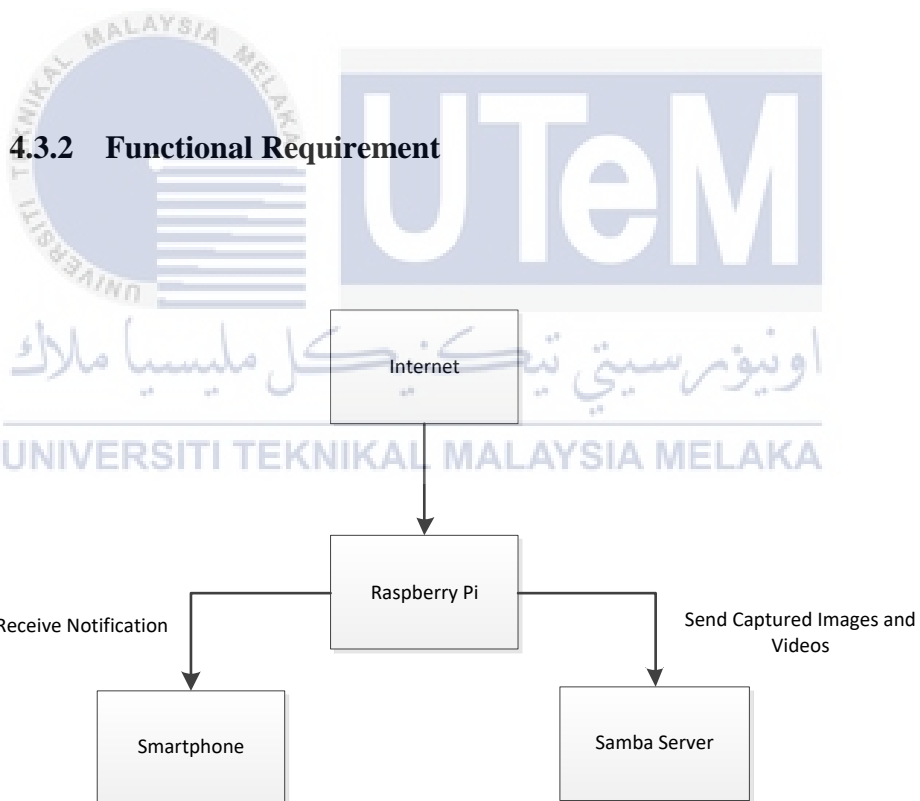
Figure 4.2: Context Diagram of Fall Detector

In the system, router will assign the IP Address to the Raspberry Pi when Raspberry Pi is connected to the network. When the fall detected happen, the information will send to family by Telegram that can access by smartphone. Family member can view the picture that had sent to them. The image that had captured will send to Samba Server that acts as the storage for this system.

1.3.3 Other Requirement

In this section, other requirement will discuss about hardware and software requirement that will used in this project. Addition, in this section, will choose the suitable software to use for fall detection.

4.3.3.1 Hardware Requirement

    i.   Raspberry Pi

In this project, we used Raspberry Pi 3 model B because model B has 512 MB RAM, 4 USB Ports, 40 GPIO pin and has own Wi-Fi adapter. In this Raspberry Pi will be installed the Raspberian OS that main of Raspberry Pi OS. In addition, The Python programming will used in this project to create a script.

Figure 2.2: Raspberry Pi 3 model B

ii. WebCam

In this project will use a Webcam to capture the image and recorded video when it detect the fall. A capture picture and recorded video will save in one file in samba server.

Figure 2.3: Generic WebCam

iii.   Access Point

In this project will use Access Point that allows a Wi-Fi compliant device to connect to a wired network. A router will connect to Raspberry Pi and Computer.

Figure 4.3: Access Point (AP)

iv.   Personal Computer

Personal Computer will set as a Samba server that will used to save the captured picture.

Figure 4.4: Personal Computer

4.3.3.2 Software Requirement

i.   Python Programming

Python is effective programming language that is easy but difficult to utilize. In this project will used Python script to synchronize the fall detection.

Figure 2.4: Python Programming

ii.   Telegram

The Telegram will used in this project to family receives images that have been record.

Figure 2.8 : Telegram Application

4.4 High – level Design

In this section, will discuss about system architecture and physical design for this project. This is important because to design the project or how the project must look. Addition, in this section also will show the flow chart for this project.

4.4.1 System Architecture, Physical Design
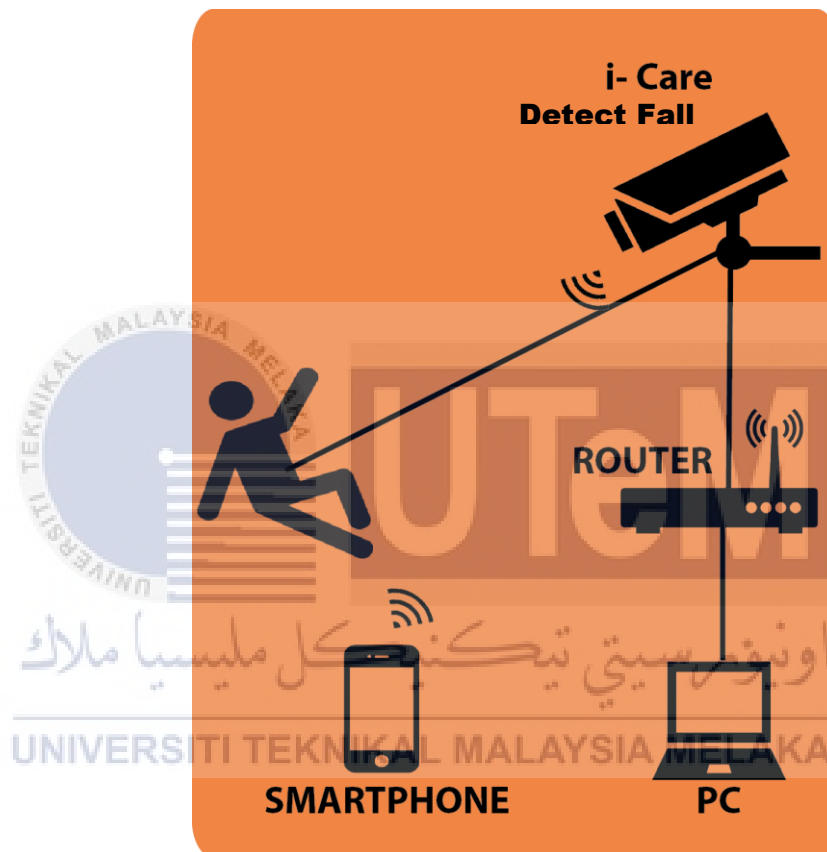
Figure 2.8: The Illustration of Fall Detection that using Raspberry Pi

The figure above show that the designed using Raspberry Pi, camera, Router, Smartphone and PC

4.4.2 Flow Chart
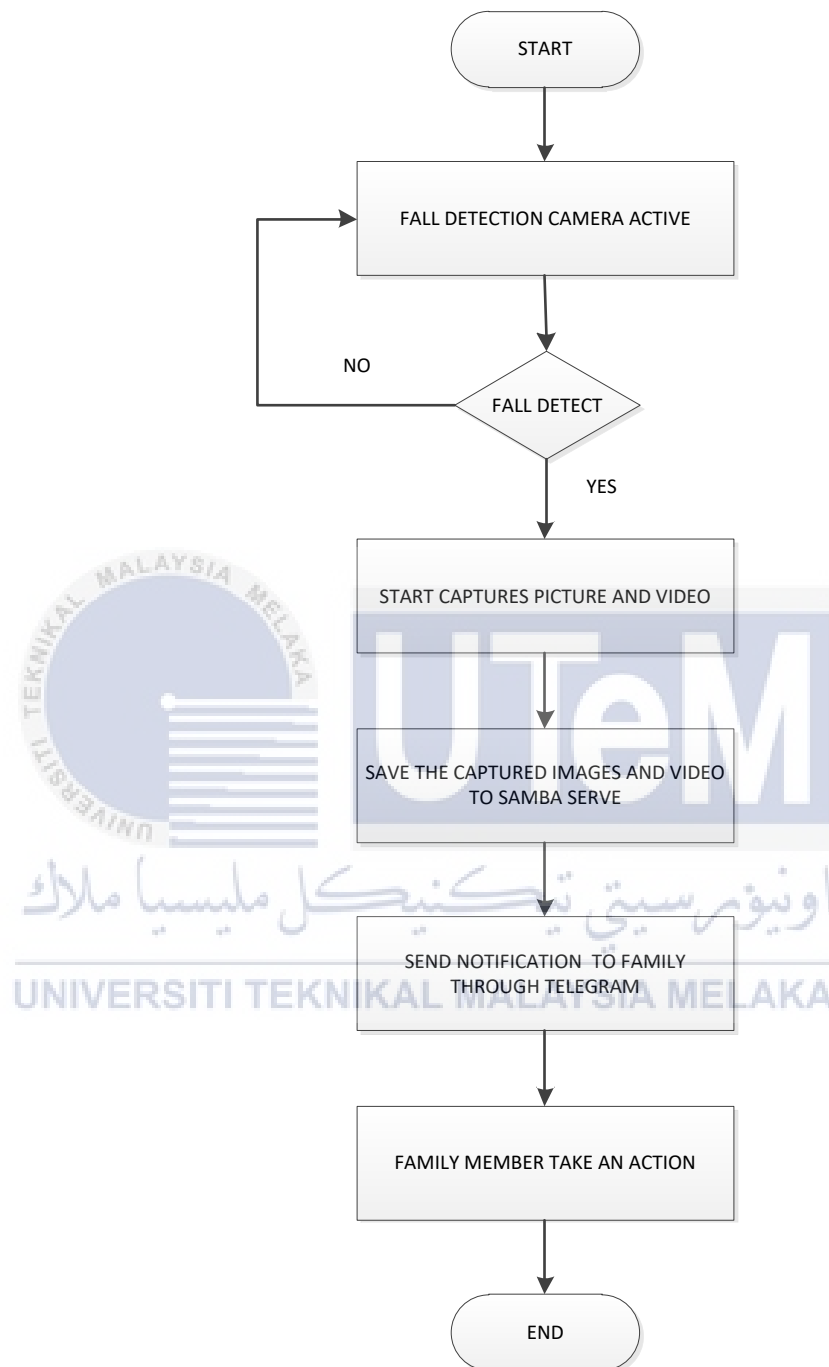
Figure 4.11: Flow Chart for Fall Detection System

The figure above show the logical design for fall detection system. When the camera is active, it will wait for the motion detection. Once, the motion

detection is detected, the Raspberry Pi will capture the images. Then, the captured picture will save in the Samba server. The Raspberry Pi will send the captured pictures to the family via Telegram

4.5 Conclusion

In conclusion, for the next implement chapter, analysis and phase is very important phase to taken. Nevertheless, this chapter includes the software and hardware requirement as it is a part that needs to be implementing. The flow chart is important to make sure the project work properly. The designs in this chapter also will guide the next phase implementation. Before start the implementation, in this chapter must gathered all information in this project to ease to achieve the goal.

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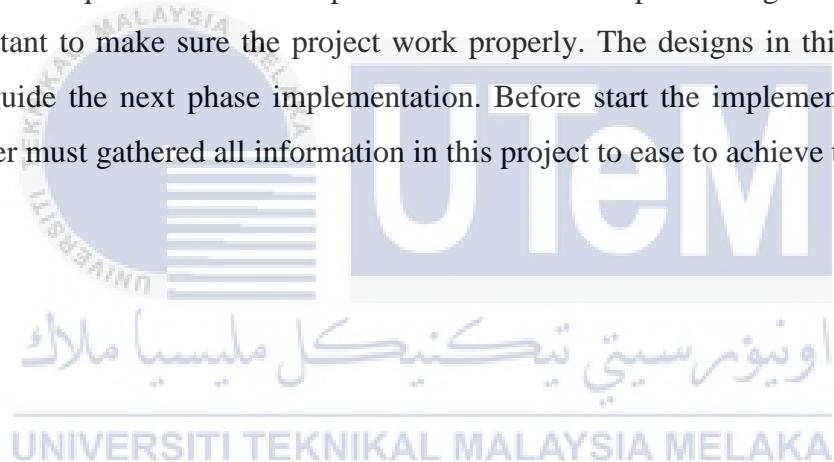
CHAPTER 5

IMPLEMENTATION

5.1 Introduction

This chapter will discuss about the implementation of the project. The environment setup and the configuration management will list and explain how to make the project work. Furthermore, this chapter will explain the step by step of implementation for ensure that is working well. Other than that, the software and hardware installation, fall configuration, Telegram configuration, Samba Server configuration will be explained as well. Figure 5.1 shows summarize of implementation activity. All the implement activity are show all the congfiguration at have been done in this project.
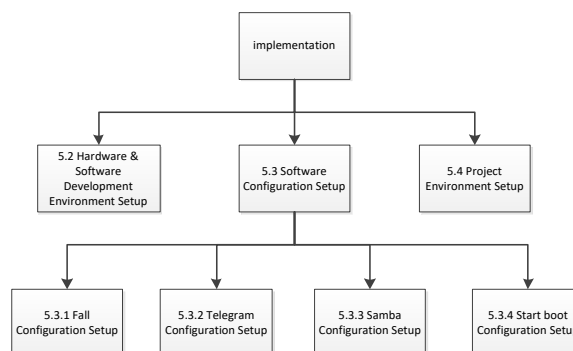
Figure 5.1 : Summarize of Implementation Activity

5.2   Hardware and Software Development Environment Setup

5.2.1   Hardware Setup

a)   Hardware Requirements

- Raspberry Pi 3
- Micro-SD with preloaded (NOOBS)
- WebCam
- USB Mouse
- USB Keyboard
- Monitor With HDMI input
- Power Supply
- Laptop
- Smartphone with Telegram application
- Router with internet connection

b)   Hardware Installation

i)   Figure below shows the combination of the hardware for this project. Which is the mouse, Pi Camera, HDMI cable and Micro-SD with preloaded (NOOBS), speaker and power supply.
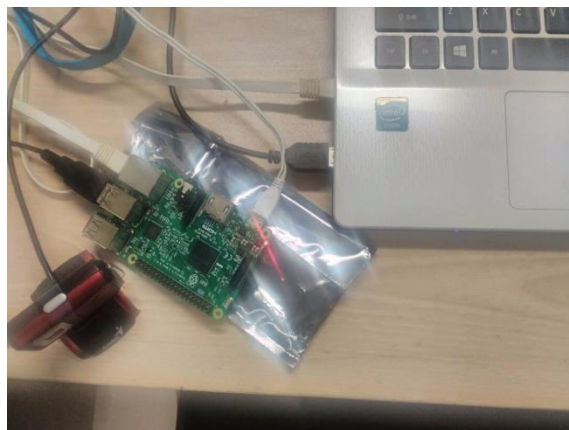
Figure 5.2 : Hardware Installation

ii)   Power on the Raspberry Pi to boot, when Raspberry Pi is boot, choose Raspbian os to install.
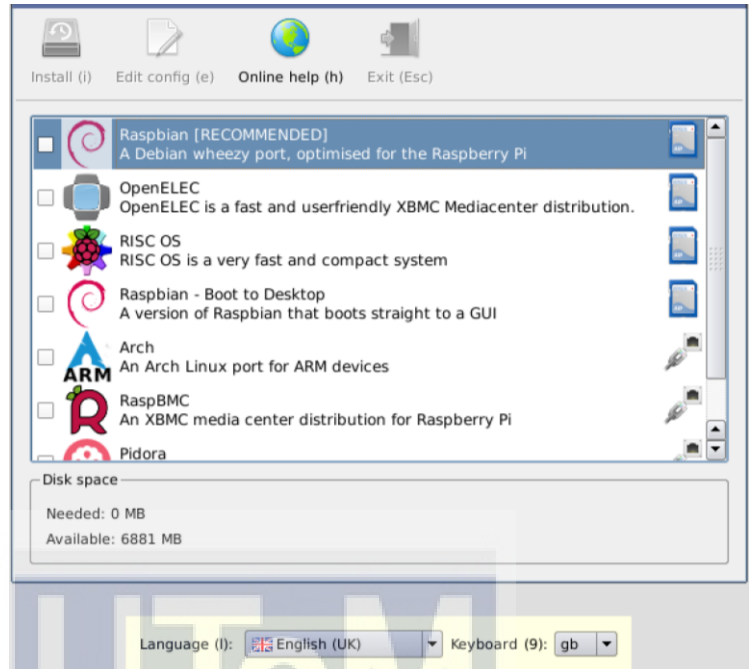
Figure 5.3 : Choose Raspbian as OS on Raspberry   Pi

iii)   After that, wait until the installation complete. It will take some times to finish install.

iv)   Next, when it complete install, the desktop will show the GUI interface of Raspbian.
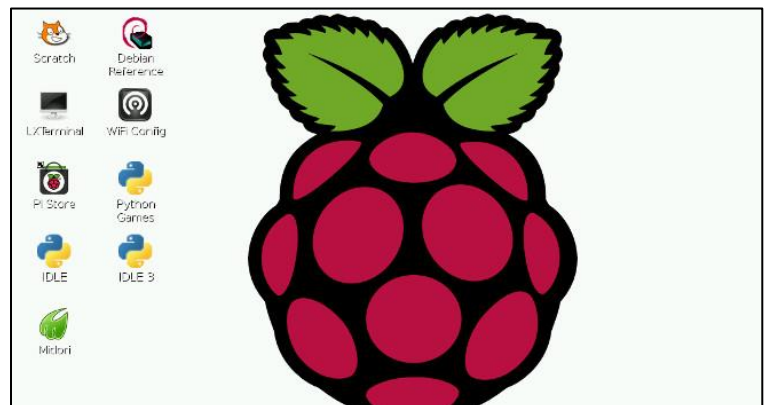
Figure 5.4 GUI interface

v) Setting the laptop and Raspberry Pi connect in same network.

vi) Telegram application must install in the smartphone which come with IOS, Android or Windows OS.

vii) Hardware setup finished.

5.2.2 Software Setup

a) Software Installation.

Linux operating system is the Raspbian OS that will used in this project, so that all the installation commands will based on the Linux installation commands.

i) When the hardware is already setup, we must to upgrade and update the latest Raspbian OS by using these commands. First open terminal and type this commands.

```
sudo apt-get update
sudo apt-get upgrade
```

ii) After that we need to install python-pip, pip is a python package manager by using these commands.

```
sudo apt-get install python-pip
```

iii) Then we need to install python telegram bot by using these commands.

```
sudo pip install python-telegram-bot
```

iv) We need to install the OpenCV before start the project; we must find the suitable version for this project and the Raspberry Pi. We can install developer tools required to build OpenCV from source.

> **sudo apt-get install build-essential git cmake pkg-config**

v) Before we start install and configure OpenCV, we must install libjpeg because some image I/O packages that allow us to load various image file formats from disk.

> **sudo apt-get install libjpeg-dev libtiff5-dev libjasper-dev libpng12-dev**
> **sudo apt-get install libavcodec-dev libavformat-dev libswscale-dev libv4l-dev**
> **sudo apt-get install libxvidcore-dev libx264-dev**

vi) After install all package, we need to configure the OpenCV.

vii) After all, we need to reboot the Raspberry Pi before start the project. We will use the reboot command.

> **sudo reboot**

5.3   Software Configuration Setup

5.3.1   Fall configuration Setup

a)   To get fall configuration cloned script for camera and Raspberry Pi, download it from https://github.com/infr/falldetector-public.git and replace the source in one folder.

b)   In this cloned source, it has the process that detecting the motion in coverage area of the camera. The motion will detect the elderly through the significant part of the picture has changed. The system will compare the last frame and the current frame of the elderly. When no any motion from elderly, the script will start according the configuration.

5.3.2   Telegram configuration Setup

a)   Telegram application will setup on the smartphone using the Telegram bot. Open the Telegram application, search to find BotFther and start configuration.
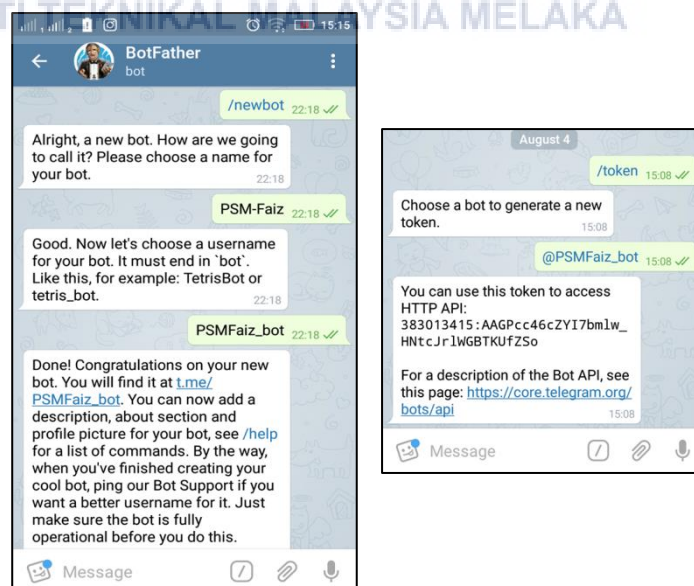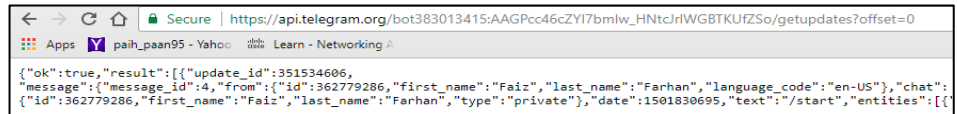
Figure 5.5 : Configuration for Telegram application

b)　　　After finish setup on Telegram bot, we need the chat_id to enable that the only who in group chat will only have the access to control the camera. To get the chat_id, open the browser and key

https://api.telegram.org/bot"token"/getUpdates?offset=0
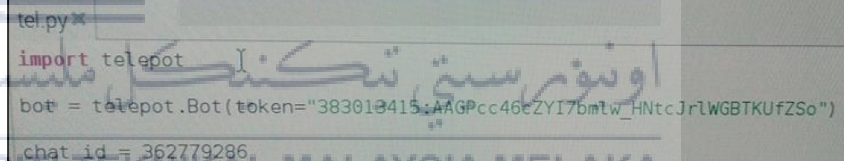
Figure 5.6 : Get Telegram chat id

c)　　　On the Raspberry Pi, create the python fill with name tel.py which is our telegram configuration setup. On this python file we will set the chat id and bot token.

Figure 5.7 : configuration for Telegram in Raspberry Pi

5.3.3   Windows share configuration setup

a)   The video and pictures that has captured will save to share file. Figure below will show the configuration which need to setup at windows file sharing. We need to create a folder. After, open the window to find the share network by RASPBERRYPI then enter user and password to access samba server.
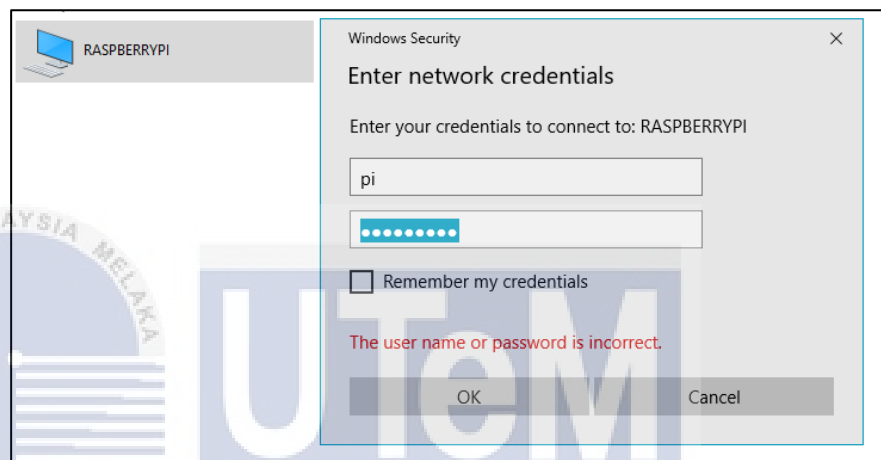
Figure 5.8: File sharing on windows

b)   In the window, after we can access samba, the file that we create in raspberry pi can be access. In that folder, we will store the video as a database to the owner.
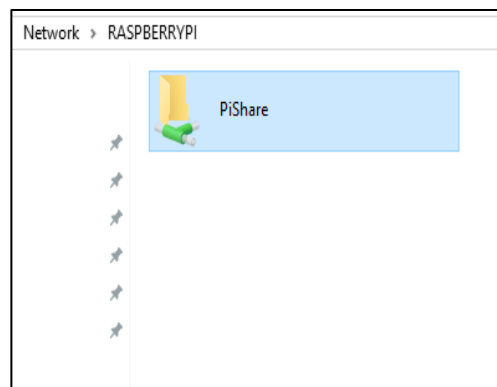
Figure 5.9: Windows share in raspberry pi

5.4   Project Environment Setup

In this section will explain step by step of this project development. All the requirement for this project will discuss.

a) Firstly, we need the Raspberry Pi and Webcam to proceed this project. Raspberry Pi and Webcam is the main part of this project.

Figure 5.2 : Hardware Installation

b) We need SD Card to install OS for Raspberry Pi. This project will use the Raspbian OS using NOOBS packages. We can get installer NOOBS in this website

https://www.raspberrypi.org/documentation/installation/noobs.md
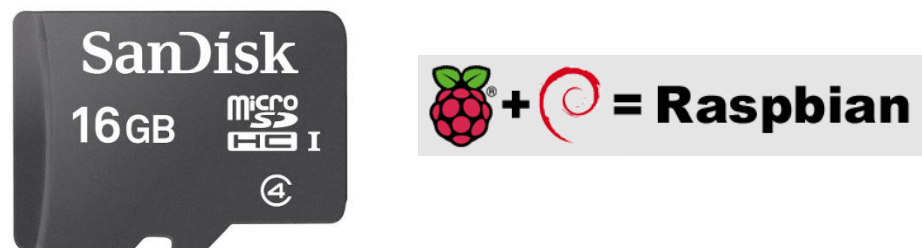
Figure 5.10 : SD Card and Raspbian OS

c) After that, when will have NOOBS package in the SD Card, on the
Raspberry Pi to install the Raspberian OS in it. Figure below when we
need to choose the Raspberian as OS for this project. The installation will
take a long time to finish.
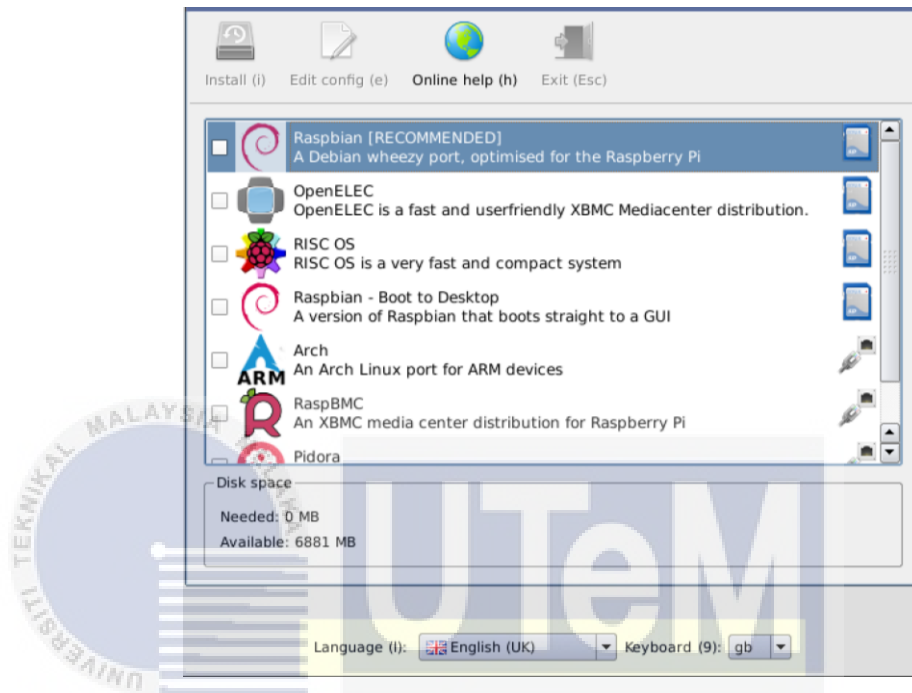
Figure 5.3 : Choose Raspbian as OS on   Raspberry   Pi

d) After the installation is finish, the figure below is the GUI interface for
Raspberry Pi.
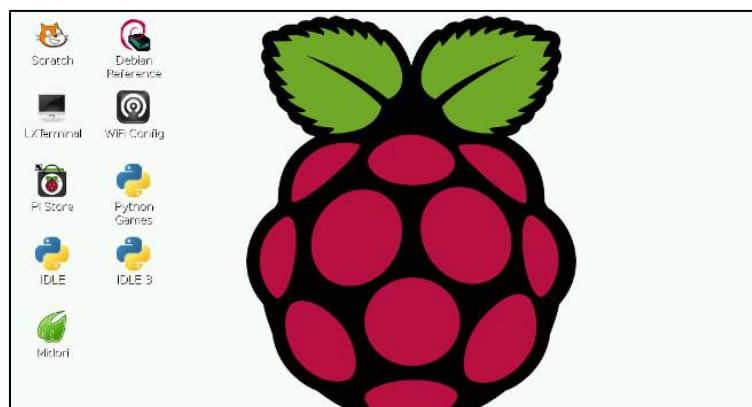
Figure 5.4 GUI interface

e) To proceed next step, this project also next the python langunage and OpenCV to accomplish this project. We choose Python language because the python is more update and mostly use for develop the product. We choose OpenCV because this project need to detect the motion of the person. So the OpenCV is more suitable to use.In this project, we use python version 2.7.x and the OpenCV version 2.4.x . To install the OpenCv packages and Python packages, we use the resource in this website

http://www.pyimagesearch.com/2015/12/14/installing-opencv-on-your-raspberry-pi-zero/

All the step for install the python and OpenCV will be explain in this website.

f) Next, We need to download the Telegram Application on the mobile phone because the Telegram Application also the main part of this system. In this project will use the Telegram as to send the notification to the owner when fall detected.

g) After we have the Telegram Application, open this application to configure it for this project. In the Telegram application, it has the Botfather to create new bot accounts and manage the existing bots.

Figure 2.9: The Botfather

h) We need to congfigure the Telegram Application to create a new bot. After we create a new bot, we will get the token for the bot that we create before. Using that token, we need to get the chat id for use to connect the Raspberry Pi and Telegram Application. Figure show the create of new bot, get a token for that bot and the chat id for a bot.
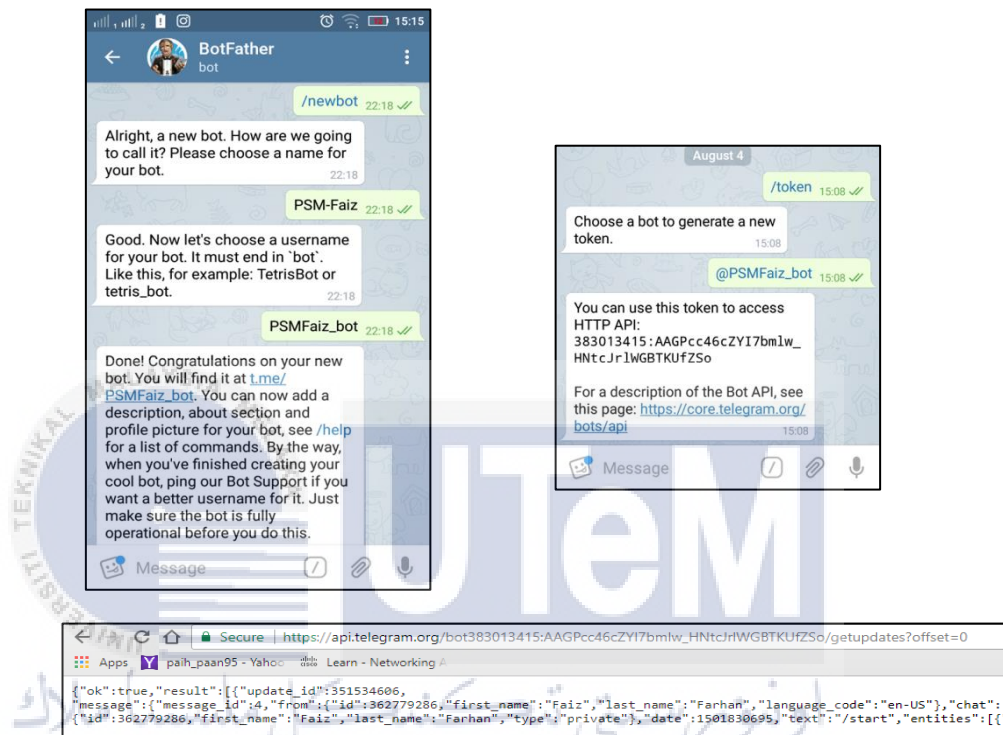
Figure 5.5 : Configuration for Telegram application

i) Next, in the Raspberry Pi we need to configure the Samba server. This project will use the Samba server to store the captured image and recorded video. Using the Samba server, the Raspberry Pi and Windows can access the file share in the Raspberry Pi. It also can be the backup file to owner.

Figure 5.11: Installation Samba Server

j) In the Raspberry Pi, we will create the file or folder that will use to store and windows can access that file. Figure below show, the file already create in Raspberry Pi and the file that can access in the Window. Using Windows share network.
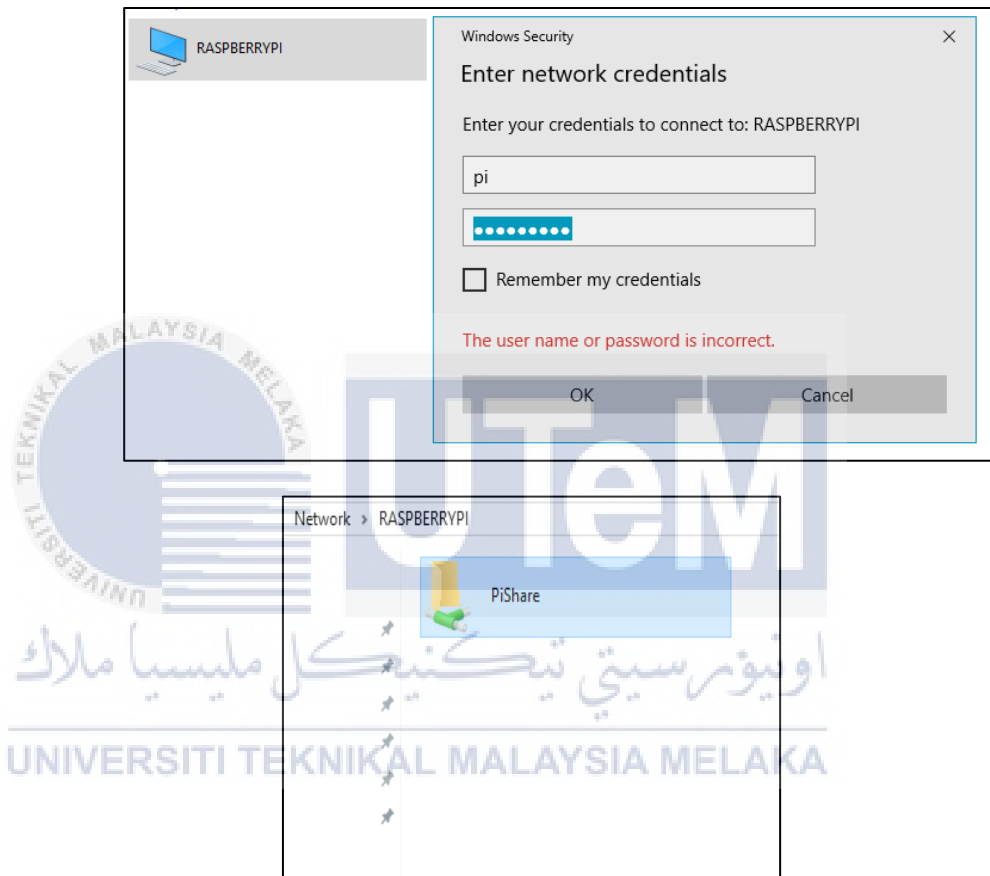

Figure 5.12 : Windows and Raspberry Pi can access file

k) For fall detection, create on folder to save all the coding for this system include the telegram configuration. In this project , we use the not moving algorithm to detect the fall. All the code will put in the appendex. We also have the setting the maximum movement for person and the mininum movement of the person. The video file also have the Telegram configure that use to send alert to the owner. It also have the code to save the captured image and recorded video in the Samba server.

5.5   Conclusion

This chapter discuss all the implementation that need in this project work. All the step of this implementation will be test in working condition. If we get some error, we must find the solution immediately until the function is working.

CHAPTER 6

TESTING

6.1   Introduction

This chapter discusses about testing methods of the project. The process of testing is to find out the effective of performance how the algorithm detect not moving movement in time limit using Raspberry Pi and Webcam.This testing has been done several times to make sure the not moving algorithm and the receive the notifcation will work properly. Based on the testing phase that have been discuss before, the testing will be test based on these testing which is include the test plan, test strategy, test design and result and analysis. This chapter also will discuss about functionality testing and false testing,

Figure below show the summarize of the testing the project as a guide for us to complete the testing chapter.
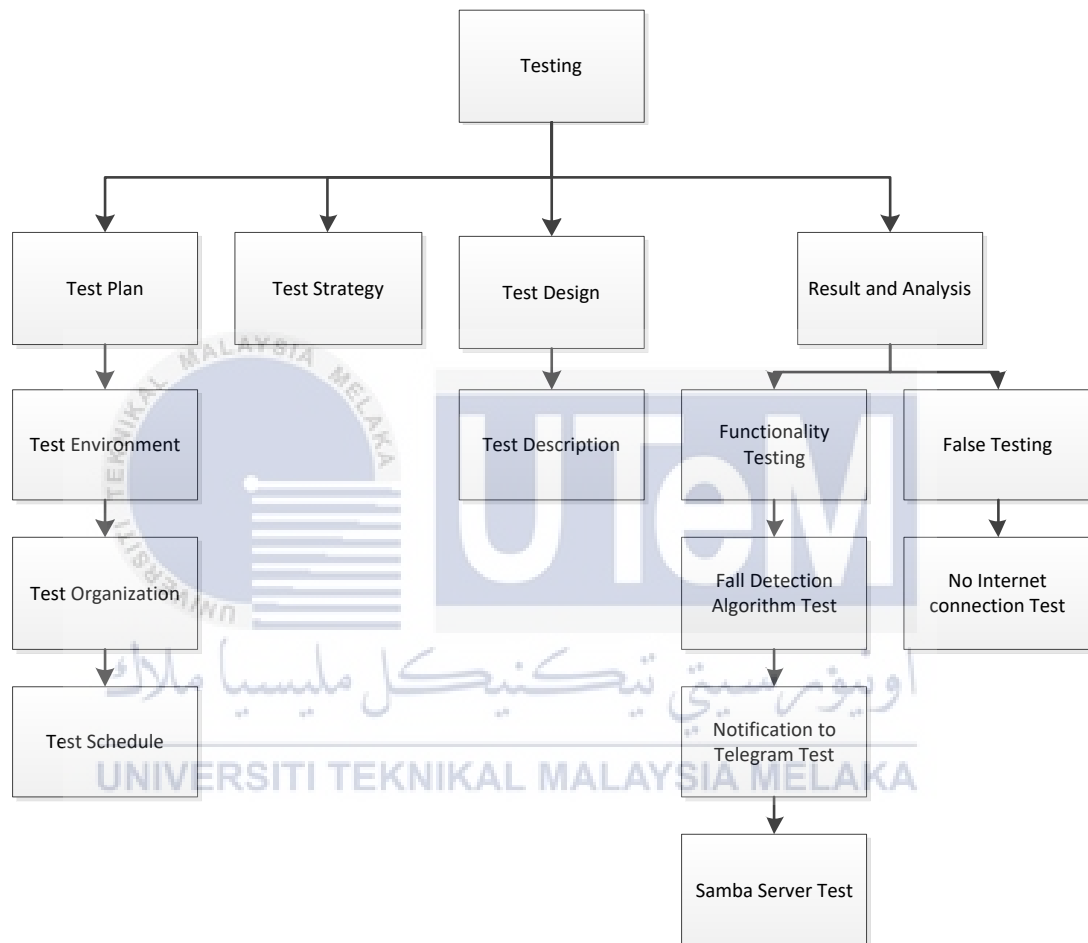
Figure 6.1 : Summarize of testing

6.2 Test Plan

These parts explain about the basis for the testing of the system. It also covers testing activities and scope of the system.

6.2.1 Test Environment

In the phase design, we have been discuss before about the design about this project. The camera to detect fall and used Samba server to store the captured images and recorded videos. Then send notification to the owner when camera detect fall in the house. The purpose of the test environment is to provide a structure for the testing activities. In this task, the test environment requirements are established and reviewed before implementation.

6.2.2 Test Organization

In this testing phase, developer will test the system. Developer will know how the system is working from the beginning phase until the end.

6.2.3 Test Schedule

This section describes how the testing are carries out by developer in a period of time. During the testing process, the system error and problems are returned back to implementation phase. Then, error and problems are declared and solved. If the errors and problems cannot be solved, the issues are returned to implementation phase again. This is a continuous process cycle until the system is successfully built.

6.3   Test Strategy

In test strategy, the testing technique that examines the program structure and derives test data from the program logic or code. Firstly, switch on the Raspberry Pi. The main system for this project is to detect fall when the Raspberry Pi and Webcam detect not moving algorithm using code. Then, send notification to the owner through the telegram. Main.py file is the main python script for the system. The developer runs the main.py to execute/start the system.
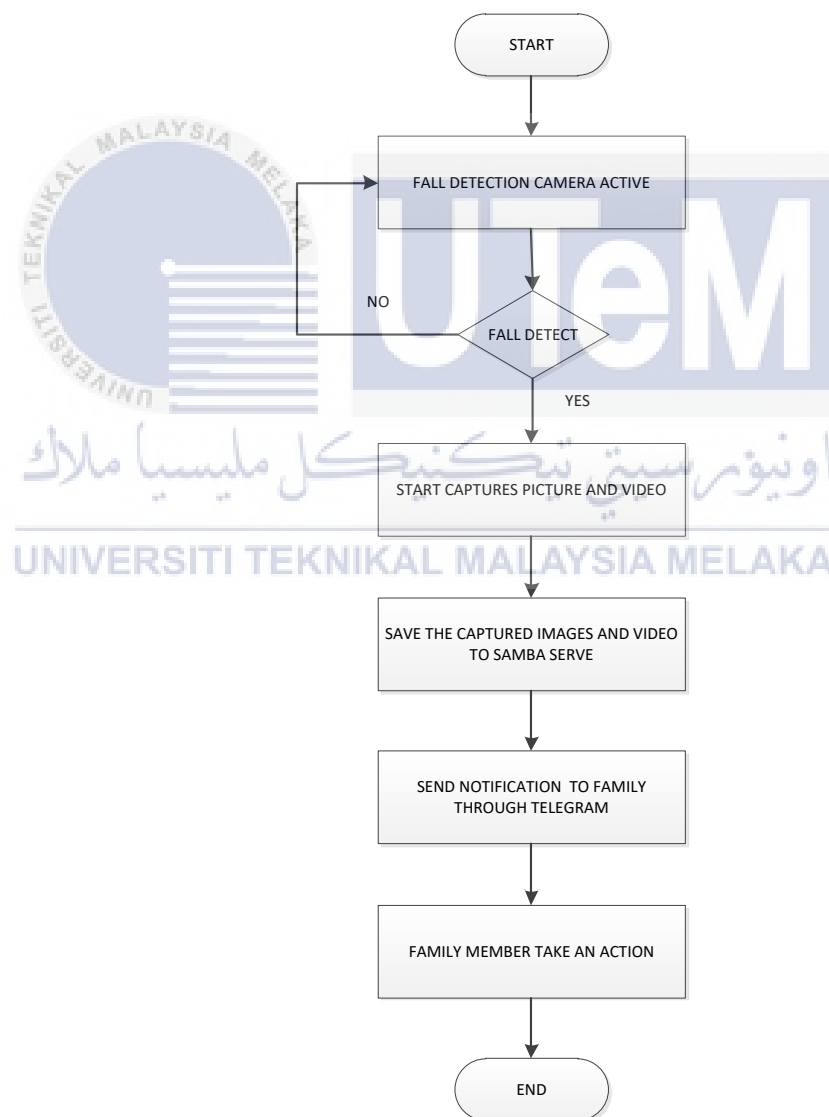

Figure 6.2 : The flow chart

6.4   Test Design

Test design is a part of system testing where the developer designs the testing cases for the system. Each test case specifies the step-by-step procedures in order to validate the system.

6.4.1   Test Description
In test description, we will the all the function in this project. The important part in this project is fall detection algorithm, notification to the Telegram, save the video and picture in the samba server as the database for the owner and the overall system.

Table 6.1 : Fall Detection Algorithm Testing

Test	Fall Detetction Algorithm test
Test purpose	To test the integration between Raspberry Pi and Webcam to detect fall.
Test environment	To test this prototype, one person need to pretend to fall and stay in static posture around 10 second.
Test setup	i. Download the zip file of fall detection from this https://github.com/infr/falldetector-public.git
	ii. Start terminal and change the directory that contain extract file.
	iii. Install the Opencv with the version 2.4.X and the python version 2.7.X
	iv. It take the time to install the opencv and need the strong internet connection to avoid from missed packege installed.
Expected result	Please refer the figure 6.3 and 6.4

Table 6.2 : Notification To Telegram Testing

Test	Notification To Telegram test
Test purpose	To test the integration between Raspberry Pi and Telegram Application to receive and send notification.
Test environment	To test this prototype, one person need to pretend to fall and when the program detect fall, the system will send the notication to Telegram.
Test setup	v. Download the Telegram into the mobile phone i. Search the BotFather at search tool. i. Configure and setting the Telegram Bot. Please refer the figure 5.5 . i. After get the chat id and token, configure the Telegram at Raspberry Pi. Please refer the figure 5.7 . i. Then, open the video.py in the file fall detection to write the Telegram coding to link the Telegram and the system.
Expected result	i. When fall detect, the Raspberry Pi automatically send the notification to Telegram.

Table 6.3 : Samba Server test

Test	Samba server test
Test purpose	To test the integration between Raspberry Pi and Window share that is Samba server.
Test environment	To test this prototype, owner can access the file in the Raspberry Pi using Samba Server
Test setup	i. Install the samba in the Raspberry Pi. ii. Configure the samba to access from Raspberry Pi and Window. iii. All the recorded video and captured picture will save in this file share.
Expected result	v. Owner can access the file share to see the videos and pictures.

Table 6.4 : Overall system test

Test	Smart Monitoring Device For Elderly
Test purpose	To test the whole system
Test environment	To test this prototype fuctionally
Test setup	i. Fall the coding file must in the one folder file to ease to run the system. ii. Run the main.py in the folder to test the functional of the system.
Expected result	i. Please refer the figure 6.7

6.5   Result and Analysis

6.5.1   Functionality Test

6.5.1.1 Fall Detection Algorithm Test

The Fall Detection Algorithm test is related to table. The figure shows the movement of person detect in the green box that in the area.

Figure 6.3 : Person Walk in the specific area

The figure show the moving thing in the background or detect any movement other than person.

Figure 6.4 : Moving thing in specific area

The figure show the coding keep running or update the detection when there any movment detect in the camera.

Figure 6.5. : Command update background

Next, the figure show when person is not moving or there nothing any movement on these person. The red box will be alert at the person that not moving
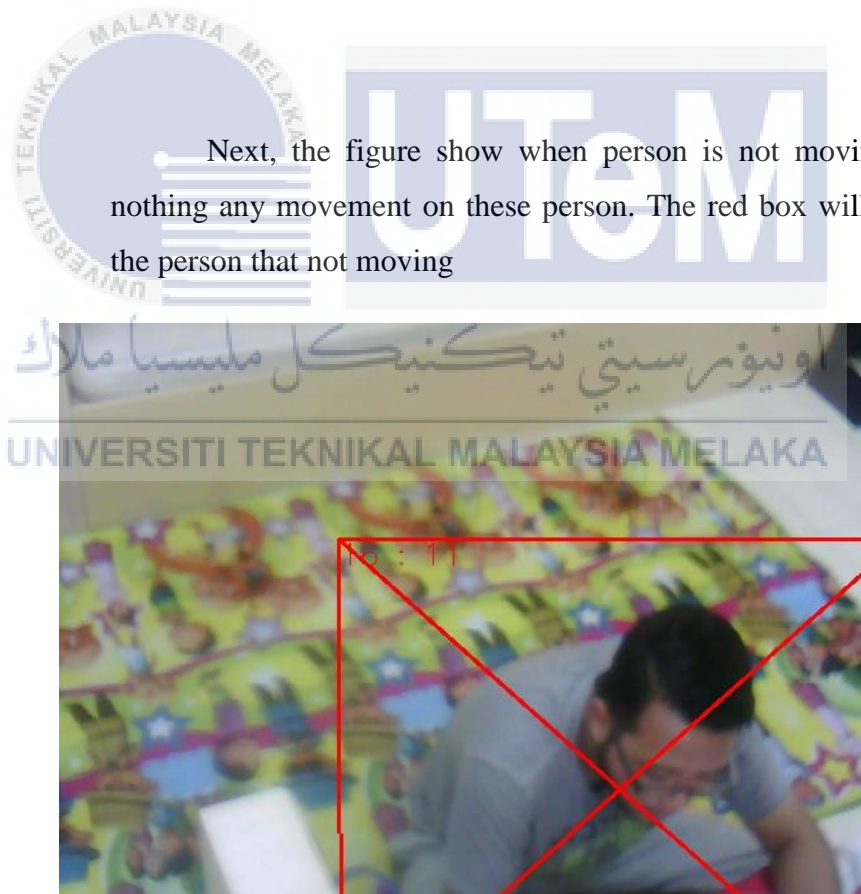
Figure 6.6 : Not moving detect

6.5.1.2 Notification To Telegram Test

The notification to Telegram test is related to table. To test this part, the person must pretend to fall. The figure show the not moving person in the area and in the red box.

Figure 6.7 : Person Fall posture

Figure show the notification receive in the Telegram that send from the system.

Figure 6.8 : Notification receive

6.5.1.3 Samba Server Test

The Samba Server test is related to table. The figure show the file in the Raspberry Pi that have been create to save the video and picture when fall detect.
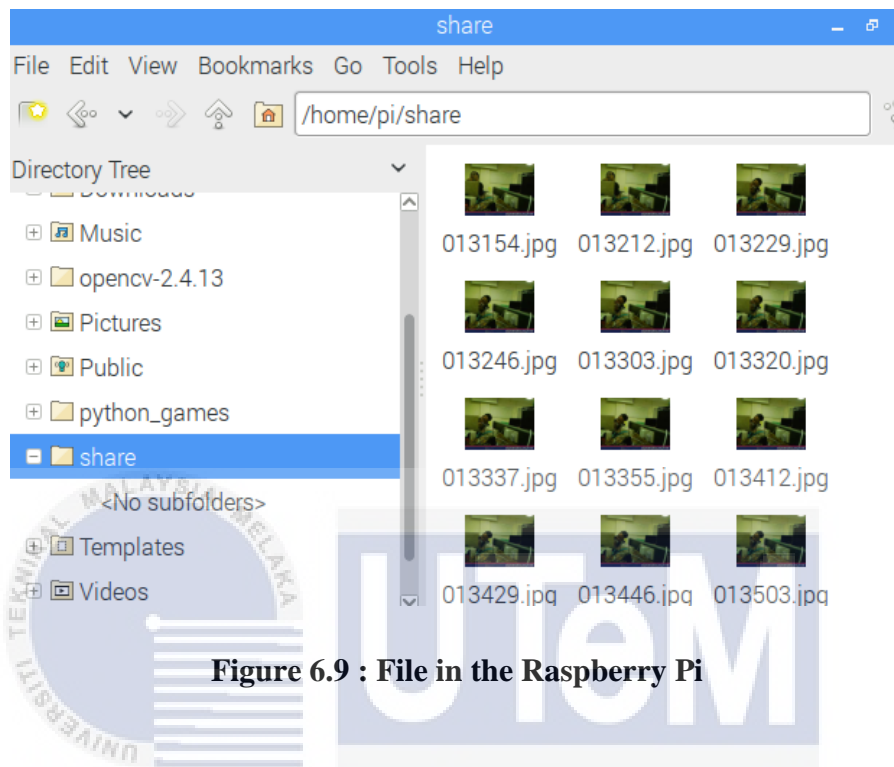
Figure 6.9 : File in the Raspberry Pi

The figure show the Windows can access file from the Raspberry Pi to review the picture and video that have been recorded and captured.
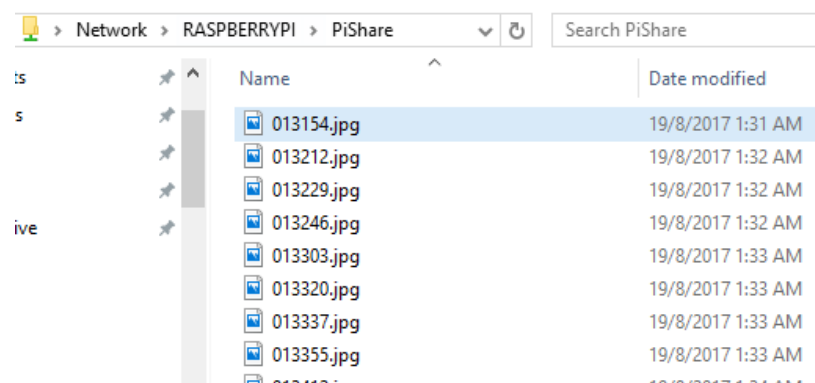
Figure 6.10 : File in WIndows

6.5.2   False Test

6.5.2.1 No Internet Connection

In this project, the internet connection must be strong to run this project. This figure show the system has not running when the connection is slow.

Figure 6.11 : When lost internet connection

Figure show the Telegram keep connecting to find the internet connection.

Figure 6.12 : Waiting for network

6.6   Conclusion

As the conclusion, the testing phase is conducted to test the functionality of the prototype which is the Raspberry Pi, Fall Detection Algorithm, Samba Server and overall project. In the next chapter, the project conclusion will be discussed. It includes information such as project summarization, limitation and future works.

CHAPTER 7

PROJECT CONCLUSION

7.1   Introduction

This chapter will discuss about project conclusion. This project will summarize of the project which is include project objective, project weakness and strength, project contribution, project limitation and future woks.

7.2 ProjectSummarization

7.2.1 Project Objective

This project, there are three project objectives that can be used to complete this project. Below is the list of project objective in this project.

i) To design a fall detector device that can ease family to monitor elderly person from outside and received notification when detected fall.

This project, we designed the project function of Raspberry Pi and Webcam in developing a safety camera.

ii) To develop a fall detector device that can ease family to monitor elderly person from outside and receive notification when detected fall.

This project, we developed a camera detect not moving motion algorithm with sending the notification function to Telegram using Raspberry pi and Webcam which in low cost.

iii) To verify a fall detector device that can ease family to monitor elderly person from outside and receive notification when detected fall.

This project, we have tested the functionality of this product. The test include the camera streaming video that not moving motion. After camera detects not moving motion that mean fall, this system will send the notification to Telegram. The safety camera. Camera isinstalled at main living room. This

place is suitable to be test because; most elderly are resting and walking there.

7.2.2 Project Weakness and Strength.

7.2.2.1 Project Weakness

In this product, we use Telegram as the notification. This product totally depends on internet connection. When the internet connection is slow it may cause the failure and affecting time to send the notification.

7.2.2.2 Project Strength

In this project, our product isdeveloping using the low cost of Raspberry Pi and Webcam. Total cost for our product is below RM500.00. Besides, the power supply for Raspberry pi is about 5Volt/ 2 Ampere power supply which is using less power and used less electricity. Next, in Telegram we just send the notification sentences when fall detection. In this case, we can save the space of mobile memory cause no need to download the pictures and videos. Lastly, IoT are implementing in our project because we used Telegram as send notification to user and it suitable to use in the future.

7.3   Project Contribution

This project has been developed to ease the owner monitor their parents or elderly at home. With this project, it can save more money because Raspberry pi and Webcam is cheaper than another safety camera. Besides, the installation for algorithm is easy and cheap compare to another safety camera that used sensor mostly. This project also making a user friendly because uses Telegram Application and mostly user have own Telegram Application.

This project also suitable to monitor in small area. When camera isdetecting the not moving algorithm, the Telegram will send the notification to owner. Moreover, this product eases to the owner monitor from the outside.

7.4   ProjectLimitation

The limitation for this project is when elderly falling not in the coverage area. It quite difficult to trace the fall among the elderly. Besides, when elderly sleep at the camera area. In that case also will detect not moving person and will send the notification. From that, we propose solution with told the elderly not sleep at camera area. Moreover, the delay of notification in project will based the internet connection speed.

7.5   Future work

This project can be upgrade for better performance and function. The future works that can be considered are:

i)   Add more cameras which can have a better vision to live stream video.

ii)   Add the alert to wake up the elderly when they sleep at camera area.

iii)   Using the SMS as notification when detect fall.

iv)   Detect the door when elderly take long time on the toilet.

v)   Used different algorithm when elderly fall on the stair.

7.6   Conclusion

As the conclusion, this project is successfully meets my objectives that I identified earlier when start this project. Hopefully, The Smart Monitoring Device for Elderly can help people to prevent fall happen among the elderly. Our project also uses low cost budget and ease to use. I am pretty sure and confident that this project can be useful to the people.

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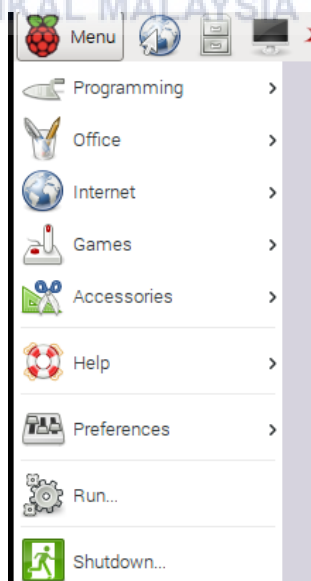
APPENDIX

USER MANUAL

This is user manual for implementation of Smart Monitoring Device for Elderly.

RASPBERRY PI WINDOWS GUIDELINES
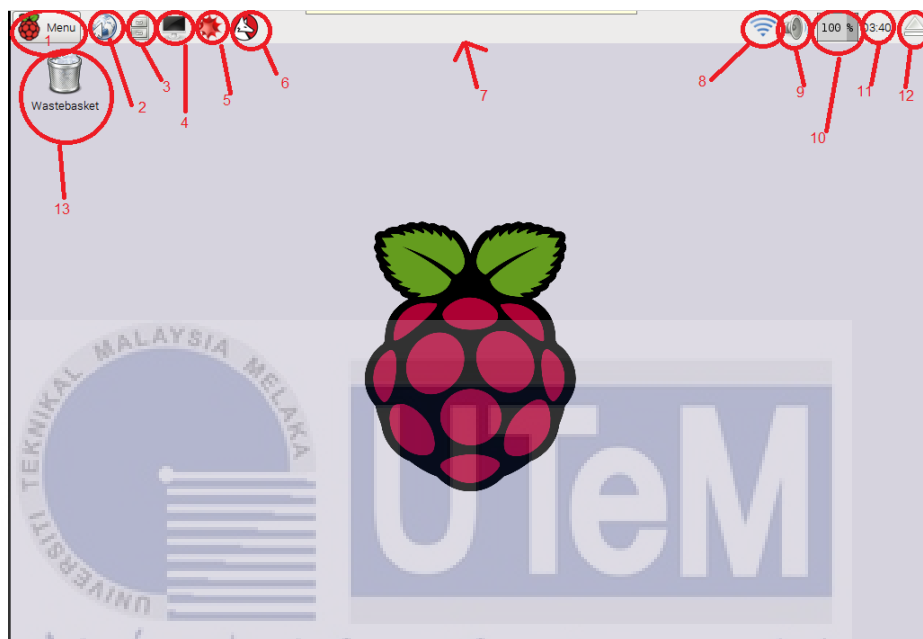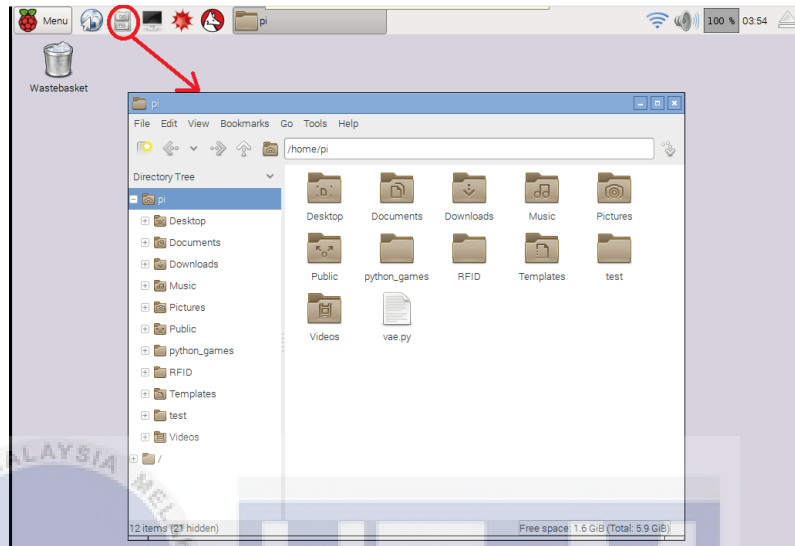

1. Menu:
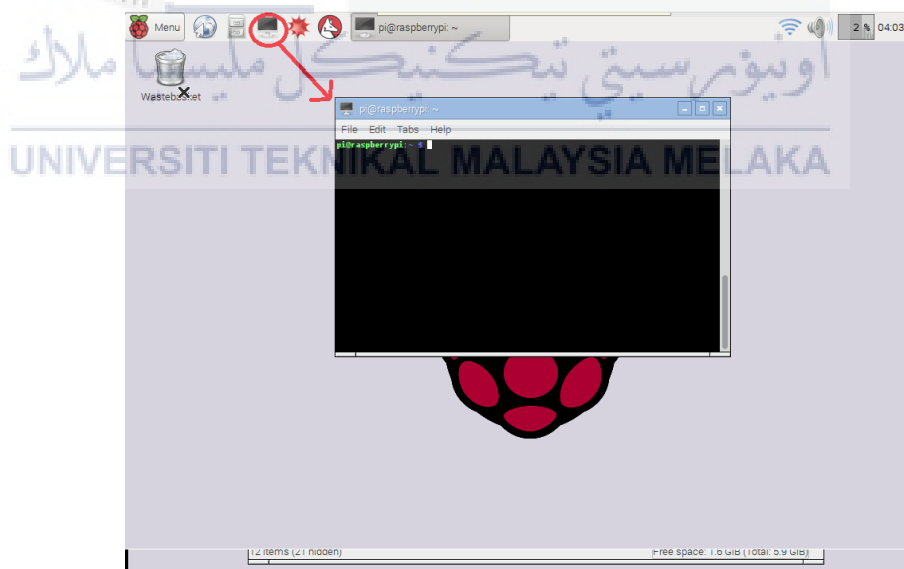
2. Epiphany web browser:

   Same function with Mozilla, chrome and etc.

3. File manager

4. Terminal

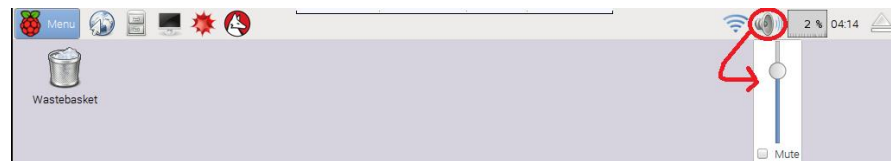   To run the script or config file

5. Task bar

6. Wireless and Ethernet icon

   To connect and check the internet connection

7. Volume control

   To adjust volume.

8. CPU usage monitor

   CPU usage performance is to monitor the performance of Raspberry pi

9. Clock and calendar

   To check time and date. Same function in Windows.

10. Drive ejected

    To safety eject the removable drive

11. Wastebasket

   All unwanted file will delete and store in wastebasket is a same function with recycle bin in Windows

INSTALLATION

The system need to install several applications software before it can be executed.

Raspbian installation

Step 1: Format SD card to make sure the SD Card empty and has enough space to install Raspbian Operating system. Raspbian is a Linux based operating system so all the installation commands will be based on Linux installation commands.
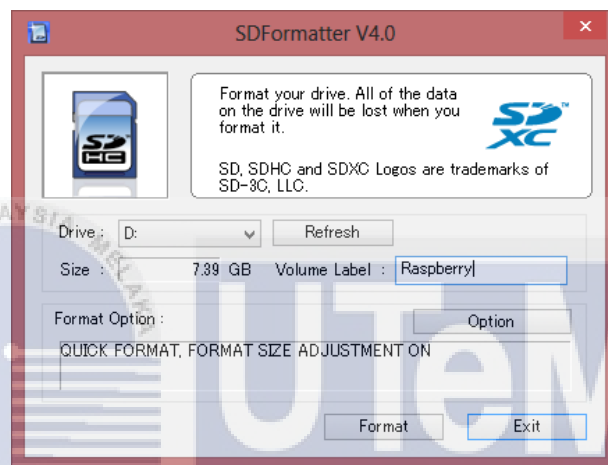
Finish format SD Card and ready to been use for install Raspbian OS.
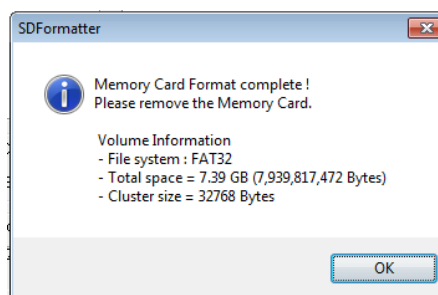
Step 2: After finished SD Card format, download the NOOBS zip file from Raspberry Pi website: https://www.raspberrypi.org /downloads /. After finish downloaded, need to copy the content to a formatted SD Card on computer.

Step 3: Combine the mouse, keyboard, HDMI cable with the Raspberry Pi. Make sure the HDMI cable is connected with Monitor.

Step 4: Plug Power supply into the Raspberry Pi to boot the computer. When the Pi already boots, select the third option to enable boot desktop/Scratch. Then choose the Raspbian as the Operating System. Choose Language as English (UK) and Keyboard (gb).
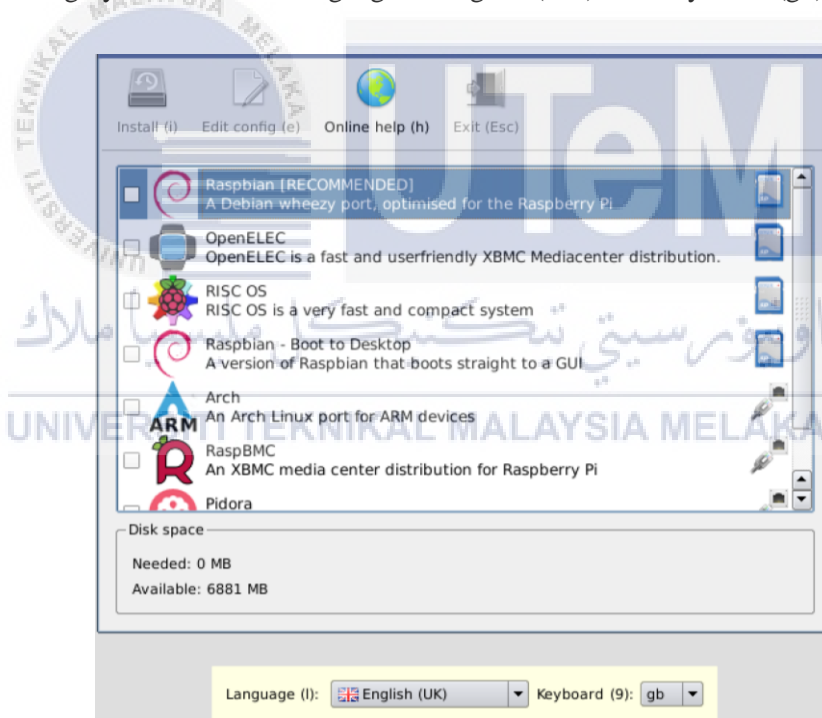
Step 5: Confirmation box will appear to make the OS install and the data in SD Card will overwritten. Click Yes to continue.

After that, waiting for the OS install complete.

Code

Main.py

```python
import video
import time
import sys


video = video.Video(0)
time.sleep(1.0) # let camera autofocus + autosaturation settle
video.nextFrame()
video.testBackgroundFrame()


while 1:
        video.nextFrame()
        video.testBackgroundFrame()
        video.updateBackground()
        video.compare()
        video.showFrame()
        video.testSettings()
        if video.testDestroy():
                sys.exit()
```

person.py

```python
class Person(object):
        """Person"""
        amount = 0

        def __init__(self, x, y, w, h, movementMaximum, movementMinimum,
        movementTime):
                self.x = x
                self.y = y
                self.w = w
                self.h = h
                self.movementTime = movementTime
                self.movementMaximum = movementMaximum
                self.movementMinimum = movementMinimum
                self.lastmoveTime = 0
                self.alert = 0
                self.alarmReported = 0
                self.lastseenTime = 0
                self.remove = 0
                Person.amount += 1
                if Person.amount > 1000:
                        Person.amount = 0
                self.id = Person.amount

        def samePerson(self, x, y, w, h):
                same = 0
                if x+self.movementMaximum > self.x and x-
self.movementMaximum < self.x:
                        if y+self.movementMaximum > self.y and y-
self.movementMaximum < self.y:
                                same = 1
                return same
```

Setting.py

```
class Settings(object):

        def __init__(self):
            self.minArea = 50*50 # minimum area to be considered as a person
            self.thresholdLimit = 20
            self.dilationPixels = 30
            self.useGaussian = 1 # yes/no (boolean)
            self.gaussianPixels = 31
            self.movementMaximum = 75 # amount to move to still be the same
person
            self.movementMinimum = 3 # minimum amount to move to not
trigger alarm
            self.movementTime = 50 # number of frames after the alarm is
```