SUPERVISOR DECLARATION

"I hereby declare that I have read this thesis and in my opinion this report is sufficient in terms of scope and quality for the award of the degree of Bachelor of Mechanical Engineering (Structure and Material)"

Signature : .....
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Date : .....

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Date : .....

DECLARATION

"I declared that this project report entitled Design and Development Of Automatic Fire-Fighting Robot " is the result of my own result except as cited in the references."

Signature : ……

Name of Candidate : Muhamad Bukhari Al-Mukmin Bin Mohamad Zahar

Date : ……

DEDICATION

For my beloved father and mother,
Dearest family members and next of kin,
Lecturer and friend

ACKNOWLEGEMENT

Assalammualaikum and Salam Satu Malaysia

Thanks to Allah, for giving me permission to complete this project. In here I would like to record my graceful thank to all the support, encouragement and inspirations that I have received during completing this project.

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ABSTRACT

A robot can be controlled by a human operator, sometimes from a great distance. But most robots are controlled by computer, and fall into either of two categories: autonomous robots and insect robots. An autonomous robot acts as a stand-alone system, complete with its own computer (called the controller). Insect robots work in fleets ranging in number from a few to thousands, with all fleet members under the supervision of a single controller. The term insect arises from the similarity of the system to a colony of insects, where the individuals are simple but the fleet as a whole can be sophisticated. Recently, it has sometimes been impossible for fire-fighting personnel to access the site of a fire, even as the fire causes tremendous property damage and loss of human life, due to high temperatures or the presence of explosive materials. Therefore, designing the fire fighting robot can overcome this problem with reduce the human injury. This project includes the specification and design for firefighting robot.

ABSTRAK

Sebuah robot boleh dikendalikan oleh manusia walaupun dalam keadaan yang jauh. Tetapi kebanyakan robot dikendalikan oleh komputer, dan terdapat dari dua kategori iaitu robot autonomi dan robot serangga. Autonomi robot bertindak dalam sistem yang berfungsi sendiri, lengkap dengan komputer sendiri (disebut pengawal). Sebuah robot berfungsi di kumpulan berkisar pada angka dari beberapa ribuan, dengan di bawah pengawasan pengawal tunggal. Istilah serangga muncul dari kesamaan sistem untuk tanah jajahan serangga, di mana individu yang sederhana tetapi secara keseluruhan boleh canggih. Baru-baru ini, itu kadang-kadang mustahil untuk tindakan bomba untuk mengatasi kemusnahan daripada kebakaran, bahkan kebakaran menyebabkan kecederaan ke atas ramai manusia , kerana suhu yang tinggi atau adanya bahan letupan. Oleh kerana itu, mereka bentuk robot pemadam kebakaran boleh mengatasi masalah ini dengan mengurangkan kecederaan manusia. Projek ini merangkumi spesifikasi dan rekebentuk untuk robot pemadam kebakaran.

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DESIGN AND DEVELOPMENT OF AUTOMATIC FIRE FIGHTING ROBOT

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DESIGN AND DEVELOPMENT OF AUTOMATIC FIRE FIGHTING ROBOT

MUHAMAD BUKHARI AL-MUKMIN BIN MOHAMAD ZAHAR

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CHAPTER I

INTRODUCTION

1.1 Background

Robots are meant to aid people, making a task easier or aiding a person who wants or needs help. The main use of robots has so far been in the automation of mass production industries, where the same definable tasks must be performed repeatedly in exactly the same fashion. Also, domestic robots are now available that perform simple tasks such as vacuum cleaning and grass cutting.

Recently, there has been interest in sending robots into situations that are too dangerous to send a person. Some examples of these situations are buildings on fire and buildings that are partially collapsed after an earthquake. In these situations, it is safer to send a robot into the building to investigate it, before the rescue team enters. Some other robots are used in other dangerous situations such as bomb disposal, mining, or cleaning of toxic waste.

In order to control the robot, a tether may be used. The problem with using a tether is that it can become snagged; the tether may also be heavy or inflexible. For these reasons, robots could use wireless communication as an alternative. A problem with wireless communication is that it is not always reliable when attempting to control a robot from outside a building. For these reasons, robots in these situations need to operate autonomously. Autonomy is the degree of ability the robot has to

make decisions without external control input but instead use information gathered from onboard sensors.

In this project is to build a Fire fighting robot device that can response or detect and extinguish a fire on its own is long past due. Many house fires originate when someone is either sleeping or not home. With the invention of such a device, people and property can be saved at a much higher rate with relatively minimal damage caused by the fire. The motivation behind of fire fighting robot is the desire to save human lives. Currently, we rely on human beings to enter burning buildings and extinguish fires. Using a robot to put out fires will eliminate the risk of injury or death to the fire fighter.

1.2 Problem statement

Recently, it has sometimes been impossible for fire-fighting personnel to access the site of a fire, even as the fire causes tremendous property damage and loss of human life, due to high temperatures or the presence of explosive materials. In such environments, fire-fighting robots can be useful for extinguishing a fire. Thus, Fire-fighting robots are operated in places where fire fighters are unable to work. Besides that, fire fighting robot can be use for protecting fire fighters from extreme danger in petrochemical, chemical dangerous product, toxicity or exploder fire accidents. Therefore, it also can reduce the human injury from a fire burning.

1.3 Objective

The main objective is state below:

1. Design and development of low cost fire fighting robot.

1.4 Scope

The main scopes are state below:

1. Design a fire fighting robot using numerical approach.
2. Select the suitable material to develop the robot.
3. The developing of programming is necessary to develop a mechanism of the robot.

1.5 Research contribution

This project would do researched about a design and development of fire fighting robot. All research about how the fire fighting robot can reduce the injury of people and also fire fighting from fire burning damage. Besides that, the motivation of this project to make an AI robot that can operate in places where fire fighters are unable to work. Therefore, fire fighting robot can be use for protecting fire fighters from extreme danger.

1.6 Project outline

Chapter 2 is the literature review for this project. This chapter will describe the theory of robotic and fire fighting robot. All materials that used in this project will completely explain to give more understanding about this project.

Chapter 3 is the research methodology of this project. Methodology is a process where a project is done from an idea. This is possible with proper planning, research, analysis of the project's progress and experiment to collect data for the project.

Chapter 4 is describes the module in modelling of robot in order of their importance to the project. It includes the design illustration using solid work for

designing of the fire fighting robot. It also will describe the arrangement of all part at a good position.

Chapter 5 is describing the analysis result for fire fighting robot. This chapter first discusses the final programming that had been created. Then it discusses the robot capabilities after testing.

Chapter 6 is the conclusion and recommendation of this project. This chapter will concludes all results discussion, decision and also recommendation for the future work to further this study.

CHAPTER II

LITERATURE REVIEW

2.1 Introduction

In this chapter will describe the theory and application of robot that relate in this project. All materials such as hardware that used in this project will completely explain to give more understanding about this project. In this chapter also include the theory of software or programming that can be using for controlling the operation of robotic.

2.2 A brief history of robots

Robotics is based on two enabling technologies: Telemanipulators and the ability of numerical control of machines.

Telemanipulators are remotely controlled machines which usually consist of an arm and a gripper. The movements of arm and gripper follow the instructions the human gives through his control device. First telemanipulators have been used to deal with radio-active material.

Numeric control allows controlling machines very precisely in relation to a given coordinate system. It was first used in 1952 at the MIT and lead to the first programming language for machines (called APT: Automatic Programmed Tools).

The combination of both of these techniques leads to the first programmable telemanipulator. The first industrial robot using these principles was installed in 1961. These are the robots one knows from industrial facilities like car construction plants.

The development of mobile robots was driven by the desire to automate transportation in production processes and autonomous transport systems.New forms of mobile robots have been constructed lately like insectoid robots with many legs modelled after examples nature gave us or autonomous robots for underwater usage.

Humanoid robots are being developed since 1975 when Wabot-I was presented in Japan. The current Wabot-III already has some minor cognitive capabilities. Another humanoid robot is "Cog", developed in the MIT-AI-Lab since 1994. Honda's humanoid robot became well known in the public when presented back in 1999. Although it is remote controlled by humans it can walk autonomously (on the floor and stairs).

In science fiction robots are already human's best friend but in reality we will only see robots for specific jobs as universal programmable machine slave in the near futuThree Laws of Robotics
Asimov also proposed his three "Laws of Robotics", and he later added a 'zeroth law'.

1. Law Zero: A robot may not injure humanity, or, through inaction, allow humanity to come to harm.
2. Law One: A robot may not injure a human being, or, through inaction, allow a human being to come to harm, unless this would violate a higher order law.
3. Law Two: A robot must obey orders given it by human beings, except where such orders would conflict with a higher order law.
4. Law Three: A robot must protect its own existence as long as such protection does not conflict with a higher order law.

2.3 Definition: What is a Robot?

Robots are physical agents that perform tasks by manipulating the physical world. They are equipped with sensors to perceive their environment and effectors to assert physical forces on it (covered in more detail in next section). As mentioned before Robots can be put into three main categories: manipulators, mobile robots and humanoid robots.

2.4 Robotics and AI

Artificial intelligence is a theory. The base object is the agent who is the "actor". It is realized in software. Robots are manufactured as hardware. The connection between those two is that the control of the robot is a software agent that reads data from the sensors decides what to do next and then directs the effectors to act in the physical world.

2.4.1 Sensor

A sensor is a device that measures a physical quantity and converts it into a signal which can be read by an observer or by an instrument. For example, a mercury-in-glass thermometer converts the measured temperature into expansion and contraction of a liquid which can be read on a calibrated glass tube. A thermocouple converts temperature to an output voltage which can be read by a voltmeter. For accuracy, most sensors are calibrated against known standards.

2.4.2 Effectors

Effectors are the means by which robots manipulate the environment, move and change the shape of their bodies

In robotics, end effector is the device at the end of a robotic arm, designed to interact with the environment. The exact nature of this device depends on the application of the robot.

In the strict definition, which originates from serial robotic manipulators, the end effectors means the last link (or end) of the robot. At this endpoint the tools are attached. In a wider sense, end effectors can be seen as the part of a robot that interacts with the work environment. This does not refer to the wheels of a mobile robot or the feet of a humanoid robot which are also not end effectors—they are part of the robot's mobility.

2.5 Characteristic of robot

A robot has these essential characteristics:

- Sensing First of all your robot would have to be able to sense its surroundings. It would do this in ways that are not unsimilar to the way that you sense your surroundings. Giving your robot sensors: light sensors (eyes), touch and pressure sensors (hands), chemical sensors (nose), hearing and sonar sensors (ears), and taste (tongue) will give your robot awareness of its environment.
- Movement a robot needs to be able to move around its environment. Whether rolling on wheels, walking on legs or propelling by thrusters a robot needs to be able to move. To count as a robot either the whole robot moves, like the Sojourner or just parts of the robot moves, like the Canada Arm.