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## LIST OF SYMBOL

$D, d$	-	diameter
$F$	-	Force
$G$	-	Gravity = 9.81 m/s
$I$	-	Moment of inertia
$L$	-	Length
$M$	-	Mass
$N$	-	Rotational velocity
$P$	-	Pressure
$Q$	-	Volumetric flow-rate
$r$	-	Radius
$T$	-	Torque
$Re$	-	Reynolds number
$V$	-	Velocity
$w$	-	Angular velocity
$x$	-	Displacement
$z$	-	Height
$q$	-	Angle
$\rho$	-	Density



## **ABSTRACT**

The projects on an autonomous Mini Smart Car (MSC) were implementing and design to become a fully autonomous robot. The robot was integrated with microcontroller to producing an embedded system that integrates hardware and software in this design. The essential components for a Mini Smart Car (MSC) is include an environment sensors, navigational intelligence and actuators (wheel). The Mini Smart Car was developed with incorporated with an infra red sensors input devices as environment sensors and two dc motors (which control the wheel) as an actuator.

## **ABSTRAK**

Kereta genius (Mini Smart Car) dibangun untuk menjadi fungsi automatic sepenuhnya tanpa menggunakan kekunci kawalan jauh bagi menggerakkannya. Robot ini telah dicipta dengan menggunakan microcontroller bagi menghasilkan pergerakan genius dengan mengabungkan komponent litar , struktur fizikal dan pengaturcaraan. Bagi melengkapkan pergerakan automatik untuk kereta ini (MSC), sensor jenis infra red ,pergerakan automatik dan pergerakan motor telah dibangun .

## **CHAPTER 1**

### **INTRODUCTION**

#### **1.1 Background**

The era of modern lifestyle and high expectation on technologies, the robot's technologies is exists like a rising star in robot's world. It is becoming reality that robot act in our environment, not only in special environment like factories but also in the office and home use. Robots are becoming increasingly useful machine with great potential in the future if there are improved computing capabilities and substantial progress in research.

The demand of the usage of robot is always depend on human factor. The human factor will contribute the highest percentage of mistake any process of work. For example, many of cases on factory that reported to the NIOSH (National Institute of Occupational Safety and Health) that large of number operator are injuries during their do the work. The other example, car accident is always happen and the accident is because of their mistake and carelessness. Due to this fact, robots and machine are taking part of human's work especially handling a complicated or repetitive task and ideal solutions to many different tasks in hazardous environment such as industry , mines weeping , etc. Some theory, says robots or machine does not make mistake but human do.

## **1.2 Problem Statement**

### **1.2.1 Environment**

The Mini Smart Car (MSC) is inspired by a several factors that have been discovered based on human needs. For example, this MSC can be designed for education purpose. The prototype is able to sending to the dangerous place such as outer space, volcano underground and North Pole to discover the geographical or data collection for a certain purpose without human involvement.

### **1.2.2 Construction**

The robot designer must own compendium skill from selected engineering field such as mechanical engineering, electrical engineering and computer science. Selecting and choosing the right equipment and component to meet the task by guide to minimize cost will be challenging. The sensor and mechanical design should be finalized to develop the program based upon its mechanism and the Mini Smart Car (MSC) will be able to avoid any obstacles thus prevent crash.

## **1.3 Objective**

The objective of Mini Smart Car (MSC) is to research, built and design a working prototype with features of able to avoid any obstacle around it while the prototype in moving condition. The microcontroller was used as a ‘brain’ to manipulate its movement.

## **1.4 Scope of Study**

Behavior of the MSC is the prototype automatically drive alone and able to operate like its feature, avoid an obstacle. The project is beginning with understanding the application of microcontroller and the reaction with the sensor. The scope of the study will cover the entire subject that concerns the building of Mini Smart Car (MSC) as follows:

### **1.41 Circuits**

- a. The circuit will control the sensors that located in difference part of the car. Such as in front, back, left side and right side.

### **1.42. Microcontroller**

- b. PIC 16F84A and Motorola MC68HC11A1 type was selected as microcontroller in this design. The reason on choosing both was to examine and evaluate its performance of stability. Microcontroller is the heart and brain of MSC which is contains a program/ software to make the MSC 'intelligent'. Besides that, many researches and experiments will be done especially to programming the microcontroller.

## REFERENCES

- i. Rudolf F.Graf & William Sheets ,Encyclopedia of Electronic Circuit, Volume 5, Mc Graw Hill
- ii. Myke Predko ,Handbook of Microcontrollers, Mc Graw Hill
- iii. Myke Predko ,PIC Micro Controller Pocket Reference , Mc Graw Hill
- iv. Hill John Iovine PIC Robotics, , Mc Graw Hill
- v. Fredrick M. Cady , Software and Hardware Engineering Motorola M68HC11, Oxford University Press,1997.
- vi. Mohd Sazri bin Zainuddin, Smart Guidance Robot, Universiti Teknologi Petronas,2004.
- vii. Joseph L.Jones ,Robot programming ( a practical guide to behavior-based robotics), , Mc Graw Hill
- viii. Thomas L.Floyd, Electronic Devices, Prentice Hall ,sixth edition,2002
- ix. Dan Tomal & Neal Widmer , Electronic Troubleshooting, Mc Graw Hill , Third Edition, 2003
- x. <http://electronics.howstuffworks.com/robot.htm>
- xi. <http://www.leang.com/robotics/info/articles/minison/>
- xii. <http://www.micorchip.com>
- xiii. <http://www.jdm.homepage.com>
- xiv. <http://www.commlinx.au.com>