SMART DRINK DISPENSER USING GSM MODEM

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" I hereby declare that I have read through this report entitle "Smart Drink Dispenser using GSM Modem" and found that it has comply the partial fulfillment for awarding the degree of Bachelor of Electrical Engineering (Power Industry)"

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A report submitted in partial fulfillment of the requirements for the degree
of Electrical Engineering (Power Industry)

Faculty of Electrical Engineering

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2009/2010

I declare that this report entitle "Smart Drink Dispenser using GSM Modem" is the result of my own research except as cited in the references. The report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

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ABSTRACT

The main objective for this project is to build an instrument which is capable to make drinks automatically without human intervention. The title of this project is Smart Drink Dispenser using GSM Modem. User is only required to send SMS to get their drinks done. SMS will be received by the GSM modem whereby the GSM modem will send the signal to the control circuit to trigger the system to make the drinks. The components used in this Smart Drink Dispenser are GSM modem, PIC18F4550, water heater, temperature sensor (LM35), relay, DC Motor, valve and servo motor. Smart Drink Dispenser is working by interfacing between the GSM Modem, valve, DC motor, temperature sensor, relays and water heater whereby all these equipments will be communicating and interacting to get the desired result, which is getting the drinks done. Smart Drink Dispenser is capable to produce four types of drinks, which are *Kopi O*, *Kopi*, *Sirap* and *Sirap bandung*. User can pick any desired drinks by just keying in the name of the drink and send it to the given destination number. A Simcard will be used in the GSM Modem to receive and to reply the SMS. User will be replied via SMS from the GSM Modem reporting that the drink is ready. In addition, Smart Drink Dispenser can also be operated manually whereby the user can press the buttons provided to select beverages.

ABSTRAK

Tujuan utama projek ini adalah untuk membina satu alat membuat minuman secara automatik tanpa memerlukan tenaga manusia. Tajuk projek ini adalah *Smart Drink Dispenser using GSM Modem*. Pengguna hanya perlu menghantar pesanan ringkas (SMS) untuk membuat minuman. SMS akan diterima oleh GSM modem kemudian GSM modem tersebut akan menghantar isyarat kepada litar kawalan untuk menggerakkan komponen. Antara komponen-komponen utama yang digunakan dalam *Smart Drink Dispenser* ini adalah GSM modem, PIC18F4550, pemanas air, pengesan suhu (LM35), geganti, motor DC, injap dan motor servo. *Smart Drink Dispenser* juga termasuk bagaimana GSM modem, injap, motor DC, pengesan suhu, geganti serta pemanas air boleh berkomunikasi antara satu sama lain untuk menghasilkan minuman. *Smart Drink Dispenser* dapat menghasilkan empat jenis minuman antaranya ialah kopi 'O', kopi, sirap dan sirap bandung. Pengguna boleh memesan jenis minuman yang diperlukan dengan hanya menaip SMS jenis minuman tersebut kemudian hantar ke nombor telefon yang disediakan. Satu Simkad akan dibekalkan pada GSM modem untuk menerima dan membalas SMS. Setelah minuman siap, pengguna akan menerima SMS daripada GSM modem yang menyatakan minuman telah siap. Selain itu, *Smart Drink Dispenser* juga boleh beroperasi secara manual dimana pengguna boleh menekan butang yang disediakan untuk memilih minuman.

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CHAPTER 1

INTRODUCTION

1.1   Project Background

Smart Drink Dispenser is a machine that helps people to make their life as easy as possible. This machine was build especially for people who like to drink hot water such as coffee. Sometimes people are lazy to go to the kitchen and for the water to get boiled for making the drink. To solve their problem this project has been developed. Only by sending SMS, their hot drink will be ready.

Smart Drink Dispenser is an automatic drink maker that is work by sending SMS that will be received by the GSM modem. The GSM modem will send signal to the controller circuit, its will automatically be run without any person to monitoring it.

There are several main devices used in Smart Drink Dispenser such as GSM modem, PIC18F4550, water heater and temperature sensor (LM35). In this project, GSM modem is selected as the communication medium. The main reason to choose GSM modem is the wide coverage of the system. PIC18F4550 were act as a brain that will control the components.

Smart Drink Dispenser also provides a manual selection button in case when user run out of credit to sent their massage. It has four selection buttons at the control panel that can be used to select the desired drink.

1.2   Problem Statement

The rapid growth and the fast developing era of Science and Technology has caused human to invent new and high-tech inventions to ease the life of humankind without any human intervention. Smart Drink Dispenser using GSM Modem is one of the machines that are purposely invented to act as human which has the capability to make drinks. The control circuit uses motor to replace the energy of the human that is required initially to stir the drinks.

According to the research that has been made, this type of machine can be suitably used in the office. Often, people are too busy with their assignments or works until they hardly have enough time to make drinks or to buy drinks in the cafe. This will probably consume their time and also to distract their concentration on their work. However, this is no longer a problem because by this machine people are be able to make drinks for only by sending SMS and no need for them leave their workplace.

1.3   Objectives and Scope of Project

The objectives of this project are:-

> To build a control circuit that is capable to carry out the required work via the transmission of the signal from GSM Modem.
> To invent a machine that will ease the burden of human, time-saving and user-friendly.
> To determine the best method using controlled valve to get the desired drinks.

The scopes of this project are:-

> To build a machines that are purposely invented to act as human, which has the capability to make drink.
> The control circuit used dc motor to replace the energy of the human that is required initially to stir the drinks.

> ➤ This Smart Drink Dispenser is only limited to four type of drinks.
>
> ➤ The design can be operated in two types of condition which are by sending SMS or manually push the menu's button.
>
> ➤ To integrated GSM modem with the controller circuit by using USB port.
>
> ➤ To used PIC18F4550 for control the circuit.

CHAPTER 2

LITERATURE REVIEW

2.1   Overview

Literature review is vital to every research, with the study of previous research it will provide essential information that can be used for this project. In other word, it can bring various idea and method to glorify this project. Moreover, it was used as case study for this project to generate new idea and different design compared to previous project. Literature review also used to develop the content of this project.

2.2   Coffee Maker

The paperwork Internet Enable Coffee Maker is about how user can control the coffee maker using internet in the future [1]. This has been proven with the model that has been created named as RFC2324. This coffee maker will be controlled by internet using Webrick version 6.1. To make sure the water always hot enough for coffee, a temperature sensor were put in the bottom of the water container and the sensor will be connected with the heater and its will on or off the heater for make sure the temperature is suitable for coffee. Webrick work as intermediaries between the coffee maker and user. It is help user to monitor the temperature of the water and also help user to choose the type of the coffee. By Webrick, it is all been done only by internet. There are several of benefit that user will get by this project such as user can make coffee using internet without waiting the water to get boil in the kitchen and make coffee by their self. Besides, Webrick can also be used to setup the table to make a coffee in anytime required especially in the morning. There are several risks in this project because of it only

emphasizes fully control the internet without manually control when internet lines cut off in the long term.

Multi Remote Appliance Controller is a project that automates the blinds of a window and a coffee maker though voice activation and infrared via remote control [2]. The inputs to all system components are via remote control and/or voice command. The systems enable the user to activate it using voice commands. The user has available a number of commands that result in a cup of coffee to almost anyone's liking. These commands are "Strong", "Weak", "Light" and "Dark". An activation word is also required for the Coffee Maker, the activation word being "Coffee". Although, the Coffee Maker is as fully automated, there still remain a few processes that must be accomplished by hand when using the device. The processes are placing a cup under the coffee maker and manual filling of the bins that contain the coffee grind. The Coffee Maker does however add the proper amount of water, coffee grind, cream, and sugar. The water supply is from the house water pipes via an electronic valve tapped into the line. Figure 2.1 show the design of this Coffee maker.
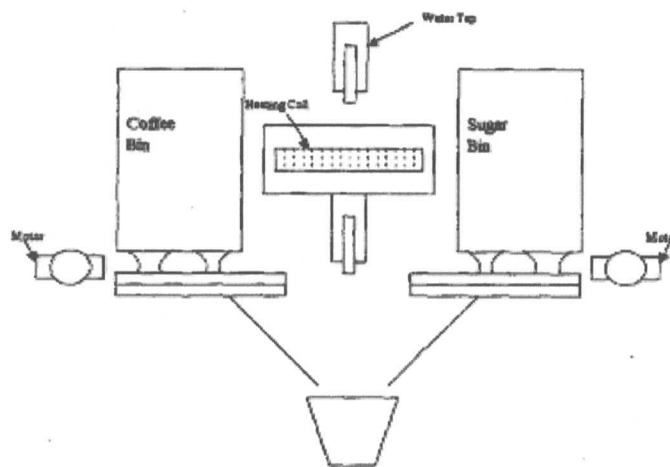

Figure 2.1: The Coffee Maker using voice command

The brewing process consists of the water flowing into a container housing a heating coil that heats the water. A sensor inside this first container checks for water level. The water, now heated, flows thru a second valve into the coffee cup. At the same time that the water

flows into the cup, the desired amount of coffee, sugar, and cream is also dispensed. The flowing water acts as the mechanism that mixes the dry components. Control of material dispensing is accomplished through the use of two circular disks mounted on top of each other. The center of the top disk is connected to a stepper motor.

Pembancuh Kopi Automatik is a Final Year Project managed by Shahril bin Ali [3]. The main objective of this project is to build a prototype of automatic coffee maker using Programmable Logic Controller (PLC). In this project, amount of water and coffee to make a cup of drink are controlled by water level sensor and timer. *Pembancuh Kopi Automatik* is develop to easier the people to create the coffee and tries to save the time based on automatically operation. Input device such as push button and sensor will sent a signal to PLC and PLC will make a choice to control the system. Figure 2.2 shows the design of this project. There are several suggestions outlined by him to improve the existing system:

- Using periodic heating system to ensure that coffee is always hot.
- Establish an automatically cleaning system to cleaning beverage container.
- Creating a filtration system that will filter out the remaining coffee to obtain the desired results.
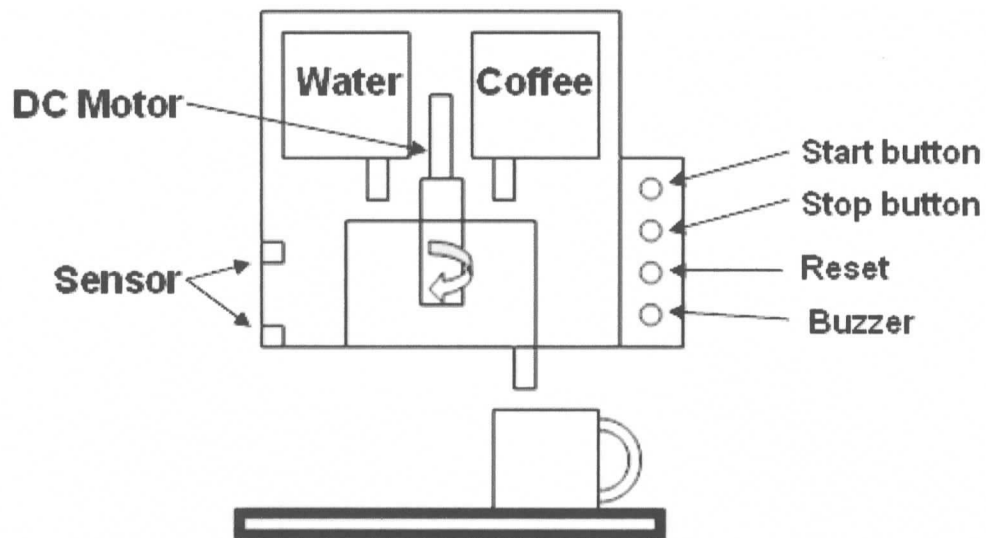- Using other systems such as PIC and Logic Fuzzy.

Figure 2.2: Model design of Coffee Maker using PLC system

2.3 GSM Modem

A GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. From the mobile operator perspective, a GSM modem looks just like a mobile phone.

A GSM modem exposes an interface that allows applications such as NowSMS to send and receive messages over the modem interface. The mobile operator charges for this message sending and receiving as if it was performed directly on a mobile phone. To perform these tasks, a GSM modem must support an "extended AT command set" for sending/receiving SMS messages.

GSM modems can be a quick and efficient way to get started with SMS, because a special subscription to an SMS service provider is not required. The mobile operator charges for this message sending and receiving as if it was performed directly on a mobile phone. In

most parts of the world, GSM modems are a cost effective solution for receiving SMS messages, because the sender is paying for the message delivery.

A GSM modem could also be a standard GSM mobile phone with the appropriate cable and software driver to connect to a serial port or USB port on computer. Any phone that supports the "extended AT command set" for sending/receiving SMS messages can be supported by the Now SMS/MMS Gateway. Note that not all mobile phones support this modem interface [4].

2.3.1 Applications of GSM Modem

There is an example application of GSM modem for project. Heartbeat Monitoring Alert via SMS is a project managed by Siti Fariduatul Aisyah Mohd Sahak, University Tun Hussein Onn Malaysia [5]. This project presented a system that being developed which able to monitor and alert the patient's and relatives and/or doctor about the patient's heartbeat conditions. A heartbeat sensor circuits which adopted photoplethysmograph (PPG) technique is designed using MPLAB software. Signals detected are then processed and analyzed before sent via SMS to alert medical experts or family members. It is beneficial in terms of cost, no complicated settings, save time and even very helpful for patient whom lives alone. Figure 2.3 shows the overall system block diagram in Heartbeat Monitoring Alert project.
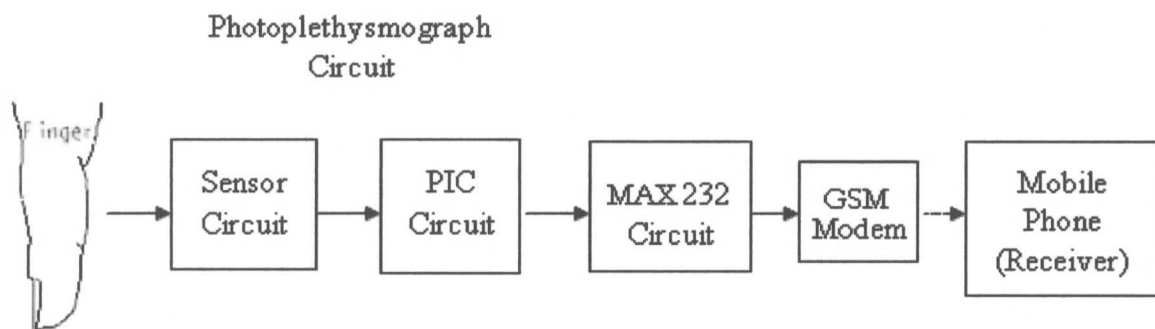

Figure 2.3: Overall System Block Diagram

2.4 Type of Temperature Sensor

2.4.1 LM35

The LM35 temperature sensor is the easiest of all the temperature sensors to use because it is an integrated circuit that outputs a voltage proportional to the temperature in degrees Celsius. The sensor itself takes care of the non-linear effects that occur with some other sensors so the sensor input circuitry is simplified. Another benefit is that the output voltage is higher than other sensors (such as thermocouples) and therefore an amplifier circuit is not necessary. The scale factor for a typical LM35 is 0.01V/$^\circ$C. It has a typical accuracy of ±1/4°C at room temperature and ±3/4°C over a full −55 to +150°C temperature range [9]. Figure 2.4(a) and Figure 2.4(b) shows the LM35 sensor and typical circuit of LM35.

Figure 2.4(a): LM35 Sensor
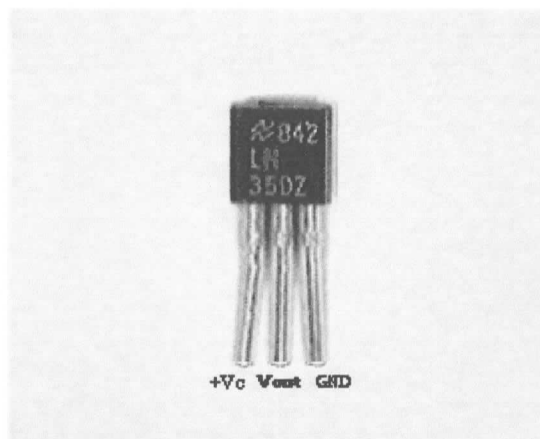
Figure 2.4(b): Typical Circuit of LM35

2.4.2   Resistive Temperature Device (RTD)

An RTD is a Resistive Temperature Device that takes advantage of the fact that a material's resistance changes as a function of temperature. Most RTD elements consist of a fine coiled wire wrapped around a ceramic or glass core. The RTD element is made from a pure material whose resistance at different temperatures is known. Since the material used has a predictable change in resistance based on temperature, this is used to accurately measure temperature. Typical materials used for RTD's include Platinum (most common), Nickel, Copper, Balco or Tungsten. RTDs are positive temperature coefficient (PTC) sensors which mean their resistance increases with temperature [9]. Figure 2.5 shows some of the RTD sensor.

Some benefits of RTDs are:

  • Wide temperature range (-200 to 850°C)

  • Good Accuracy (better than Thermocouples)

  • Repeatability and resistance to electrical noise

  • Long-Term stability

Figure 2.5: RTD Sensor

2.4.3 Thermistor

A Thermistor is an inexpensive and readily available temperature sensor that is most commonly used for simple temperature measurements less than 200°C. Like an RTD, a thermistor can be thought of as a resistor that is extra sensitive to changes in temperature. The semiconductor material that a thermistor is made from takes advantage of this property to produce a temperature measurement. However, since the change in resistance is not linear with respect to temperature - an equation must be used to extract the temperature based on the resistance. This is known as the Steinhardt-Hart equation. To get a temperature value from resistance, you can use the following formula:

$$T = 1/[A + B*\ln(R) + C*(\ln(R))\ 3]$$
where R is in Watts and T in °K.

Because the resistance characteristic drops down with increasing temperature they are called negative temperature coefficient (NTC) sensors [9]. Figure 2.6 shows the Thermistor sensor.
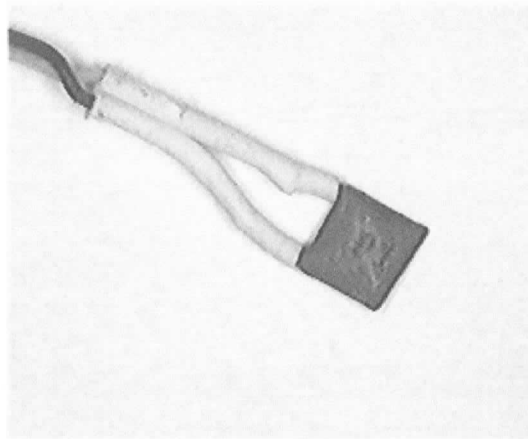
Figure 2.6: Thermistor Sensor

2.4.4 Thermocouple

A thermocouple is based on the thermoelectric effect which occurs when two different metals are connected together. A voltage is produced that is dependant on the type of metals used and the temperature. In order for the thermal voltage to produce a current, the metals must be connected together at both ends so that a closed circuit is formed. If the temperature is the same at both ends, there is no flow of current. Thus, a thermocouple can only measure temperature differences. For this reason, the reference junction temperature must be known for an accurate measurement to occur. Since the reference temperature point is generally lower than the measured temperature – it is generally called the cold junction. At the "cold junction" or reference junction, an RTD or similar temperature sensor is used to have an accurate reference temperature. The voltage produced by a thermocouple is very small and amounts to only a few microvolts per degree Celsius. Thermocouples are generally not used in applications in the range of 30 to 50°C because the difference between the reference temperature and the measurement temperature is too small to get accurate noise-free signals. However, compared with other sensors, thermocouples offer the clear advantage of a higher upper temperature limit (up to several thousand degrees Celsius) and are therefore frequently used to measure temperatures in ovens, furnaces [9]. Figure 2.7 shows the thermocouple sensors.
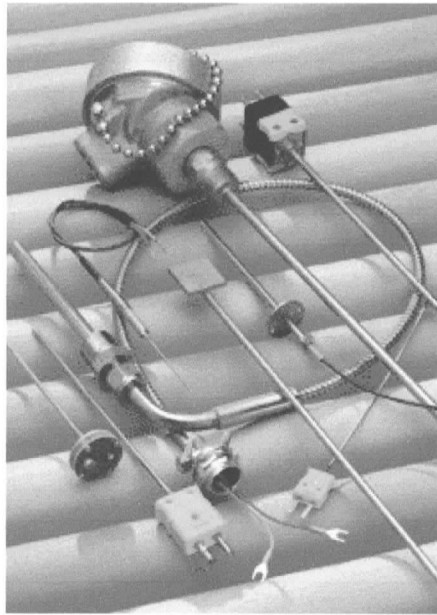
Figure 2.7: Thermocouple Sensors

As compared all of sensors, LM35 is suitable to use in the Smart Drink Dispenser to detect the temperature of water in the water tank. LM35 sensor is the easiest of all the temperature sensors to use because it is an integrated circuit that outputs a voltage proportional to the temperature in degrees Celsius.