PORTABLE PROGRAMMABLE MEDICATION REMINDER

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To my beloved father, mother and siblings.

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ABSTRACT

Portable Programmable Medication Reminder is a device that can remind user to take the medicine on the time on sequence and correct amount of dosage. Nowadays, some kinds of disease which require more than one type of medicine intake in order to cure the disease or to prevent it from getting worse. This will be troublesome especially for elder people where their memory become weak and sometime will forget to take medicine on the time and confuse take which medicine. Besides that, the worker will also forget to take medicine as schedule due to busy on works. The purpose of this project is to design and develop a low cost device that can remind the user to take correct medicine on time as scheduled. A program will be write for microcontroller that included real time system and input for user to enter the time for medicine intake. When it reach the time for medicine intake, a buzzer will sound, a LCD will display a statement to alert user and a LED indicator will light up on which medicine should take in the box. Furthermore, a notification will be send to smartphone via internet where it is used for nearest person to monitor the user if they take their medicine on time. Therefore, with this device the user will not forget take their medication on time with the right medicine. The medication reminder apps can be used to monitor the medication intake activities of the user.

ABSTRAK

Peringatan ubat mudah alih yang boleh diprogramkan adalah alat yang boleh mengingatkan pengguna untuk mengambil ubat pada masa yang ditetapkan dan pengambilan dos yang betul. Pada masa kini, terdapat beberapa jenis penyakit yang memerlukan lebih daripada satu jenis ubat untuk menyembuhkan penyakit atau mengelakkan penyakit tersebut menjadi lebih teruk. Ini akan menyusahkan terutamanya bagi golongan warga tua di mana ingatan mereka menjadi lemah dan kadang-kadang akan lupa untuk mengambil ubat pada tepat masa dan keliru untuk mengambil ubat yang mana satu. Selain itu, pekerja juga akan lupa untuk mengambil ubat mengikut jadual kerana sibuk dengan kerja-kerja mereka. Tujuan projek ini adalah untuk mereka bentuk dan membangunkan peranti kos rendah yang boleh mengingatkan pengguna untuk mengambil ubat yang betul pada masa yang ditetapkan. Satu program akan direka untuk mikropengawal yang termasuk dengan sistem masa sebenar dan input untuk pengguna memasuki masa pengambilan ubat yang dijadualkan. Apabila ia mencapai masa untuk pengambilan ubat, buzzer akan berbunyi, LCD akan memaparkan ayat untuk memberi amaran kepada pengguna dan penunjuk LED akan menyala di mana perubatan yang perlu diambil dalam kotak. Tambahan pula, pemberitahuan akan dihantar ke telefon pintar melalui internet di mana ia adalah diguna oleh orang terdekat untuk memantau pengguna jika mereka mengambil ubat pada masa yang ditetapkan. Oleh itu, dengan peranti ini pengguna tidak akan lupa mengambil ubat-ubatan mereka pada waktu yang ditetapkan dengan ubat yang betul. Aplikasi peringatan ubat boleh digunakan untuk memantau aktiviti pengambilan ubat oleh pengguna.

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ABBREVIATIONS

LCD	-	Liquid Crystal Display
LED	-	Light-emitting Diode
ICSP	-	In-Circuit Serial Programming
PWM	-	Pulse Width Modulation
USB	-	Universal Serial Bus
AC	-	Alternating Current
DC	-	Direct Current
UART	-	Universal Asynchronous Receiver/Transmitter
I/O	-	Input/Output
SRAM	-	Static Random-access Memory
EEPROM	-	Electrically Erasable Programmable Read-only Memory
FTDI	-	Future Technology Devices International
GND	-	Ground
TTL	-	Transistor-transistor Logic
SPI	-	Serial Peripheral Interface
MISO	-	Master In Slave Out
MOSI	-	Master Out Slave In
SCK	-	Serial Clock
SS	-	Slave Select
SDA	-	Serial Data input/output
SCL	-	Serial Clock input
TWI	-	Two Wire Interface
SDIO	-	Secure Digital Input Output
AHB	-	Advanced High-performance Bus
GPIO	-	General Purpose Input/Output
PCB	-	Printed Circuit Board
VoIP	-	Voice over Internet Protocol
DDR	-	Double Data Rate
LVDS	-	Low-voltage Differential Signaling

P2P	-	Peer-to-Peer
AP	-	Access Point
TCP/IP	-	Transmission Control Protocol/Internet Protocol
TR	-	Transmit-receive
LNA	-	Low-noise Amplifier
PLL	-	Phase-locked Loop
STBC	-	Space–time Block Code
MIMO	-	Multiple-input and Multiple-output
MPDU	-	Media access control protocol data unit
MSDU	-	Media access control service data unit
CPU	-	Central Processing Unit
SI	-	Serial Interface
I2C	-	Inter-Integrated Circuit
BCD	-	Binary-coded Decimal
CMOS	-	Complementary metal–oxide–semiconductor
RTC	-	Real Time Clock

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CHAPTER 1

INTRODUCTION

1.1 Project Background

Portable Programmable Medication Reminder is a device that can remind user to take the correct medication on the time as scheduled. Portable Programmable Medication Reminder is a project that consists of hardware and software. This project is using Arduino Mega which is a microcontroller board based on the ATmega1280 to control overall operation. The LCD display is used to display time and menu items. When the time reaches for medication intake, the buzzer will alert the user and LED indicator will indicate which medication box should selected by the user. The project has WIFI feature which can send notification to a smartphone that registered when the medication is taken by the user. This is very useful that can be monitored by the nearest person of the user.

1.2 Problem Statement

Nowadays a lot of diseases required intake many different kinds of medicine in order to prevent it getting worse. Some people with poor memory or busy with their works will face this difficulty to take right medication in the right time. They may face with over taking their medicine as they forget if they already consumed the medicine or may also not taking their medicine purposely because they not sure if they have already taken the medicine.

The project is focused on helping elder people where most have poor remembering ability and workers who busy with their works. Sometimes people around also not realize that these people need their help to make sure they can

continue doing their daily activities. This project will take care these kinds of people to take correct medication on time.

Therefore, I proposed this project called 'Portable Programmable Medication Reminder'. It is able to store medicines and reminds the user to take medicine on time with right medicine. Hence, with this project, people who have remembering problem especially elder people can take medicine on time without worries.

1.3 Objectives

The objectives of this project are as the following:

a. To design structure of medication storages that contains security function which can be controlled by microcontroller.
b. To develop a program with real time clock system that can alert user to take medication on time through outputs response.
c. To develop a program that can receives and transmits data between microcontroller and smartphone via wireless communication.
d. To design low cost medication reminder.

1.4 Scope

The scope of this project includes:

a. Construct three medicine storages with solenoid lock to secure medication.
b. A program that reminds the user about the time for medication intake is limited to be schedule for one week repeatedly.
c. Use existed software from internet resources to help in developing the program for this project.
d. Android smartphone application will be used to transmit and receive information to and from the microcontroller through WIFI.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In Chapter 2, the related background of the project will be discussed. The discussion includes the past researches that had same idea and the features of the project. The literature review about similar previous inventions is made in order to make sure this project comes out with a better invention. The features also will be covered on the hardware and software that will be used in this project. Based on the research that had been done previously, this project will be focused more on people that have poor remembering ability especially elder people on their medication intake time that can lead to worst health condition. That is why this project will introduce a portable medicine box complete with an alerting system and can be monitoring the medication intake condition by using smartphone. This idea then leads to a project named as Portable Programmable Medication Reminder.

2.2 Automatic Pill Dispenser

This report is about designing and building an automatic pill dispenser. The product consists of a circular base with 22 fan-like blades that rotate about the central axis. The pills can manually put at the compartments which form by the blades for dispensing at predetermined time. A microprocessor that interfaces with LED display is used to control the dispenser and an alphanumeric keypad that will be used as a source for inputting of data and selecting from pre-programmed menu items. The user can insert the time(s) of day that pills will be dispensed. The patient must follow any warnings and/or precautions when takes his or her pills. Lastly, the dispenser will audibly and visually notify the patient took his or her medications. The dispenser

will automatically adjust the time of the next medication dispersal if necessary, to avoid amount of medication being taken too closely together. This project is realized with the development of a pill-dispensing unit and a microprocessor unit that will control whole system.[1]

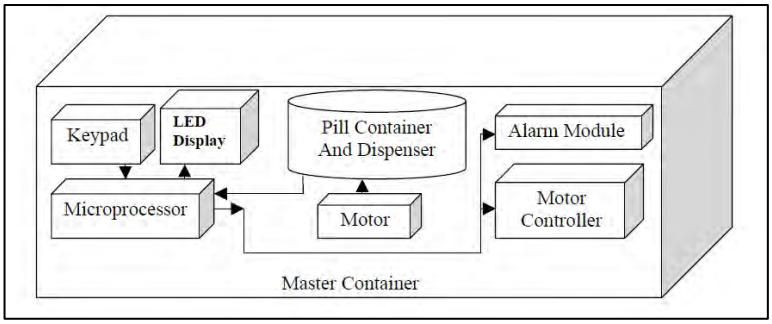

Figure 2.1: Programmable medication dispenser block diagram.[1]

2.3 Weekly Electronic Pills Dispenser with Circular Containers

This report is about design and implementation of an automatic weekly pill dispenser. This device can release the medication at certain time intervals according to the doctor's prescription. When the medication has to be taken, the device will automatically activates the dose of drugs into a small compartment which can be easily open, hearing a beep which indicates the fact that the medication has to be administrated. This device offers an easily used service which reminds through an easy and efficient time when the medication has to be administrated. At a simple pressing of a button, the desired medication is obtained at the prescribed hours or prescribed time intervals.[2]

Particular characteristics of weekly electronics pills dispenser with circular containers includes: the compartments for the medication which will be distributed at regular time intervals and audible warning. The electronics pills dispenser is controlled by a microcontroller which has an interface with the user, realized with an LCD and a keypad, which is going to be used as a source for introducing data and selecting elements from a pre-programmed menu. The user is able to introduce the hours when the pills will be released. The dispenser will generate a visual and audio alarm when the pills are distributed and will save the moments from the day when the patient takes the medication.[2]

2.4 Type of Medicine Pill Box

Medicine Pillbox will be dividing to another type, function and size. At the western country, the similar invention with this project has a variety in shape, size and also their function. But, the design majorly is not user friendly as the alerting system is simple and does not have monitoring system about medication intake. This feature cannot guarantee the elder will take their medicine on time. Besides that, some of the medicine pill box may be too large to be carried along together. Furthermore, some of the cost required for the invention is quite high. With this project, the three problems that occur may be fixed as this project will consists efficient alerting and monitoring system, provide low cost design and also easy to carry along everywhere and anywhere.

2.4.1 Pillmate Day Out

Pillmate Day Out is a simple and cheap with four compartments pill box which can be used to organize pills for only a day medication time. This pill box is good for users who know what pills have to take at specified time. Without having an alerting system, it will be disadvantage to the users who has difficulty in understanding to take the right pills on time.[3]

Pill Box Rating:
Easy to use: High
Easy to understand how it works: Low
Easy to fill: Medium
Secure (if dropped): High

Figure 2.2: Pillmate Day Out [3]

2.4.2 Pillmate Large 7 Day

Pillmate Large 7 Day is also a simple and cheap with seven compartments pill box. It can organize the pills for a week where it is only taken once a day. This type of pill box is suitable for daily supplements consumes and perhaps brings on holiday. However, this pill box does not has alerting system to alert users to take medication on time and not suitable for users have weak hand.[3]

Pill Box Rating:
Easy to use: Medium
Easy to understand how it works: High
Easy to fill: High
Secure (if dropped): Low

Figure 2.3: Pillmate Large 7 Day [3]

2.4.3 Pillmate Twice A Day

Pillmate Twice A Day is also a simple and cheap with 7x2 compartments pill box. It can organize the pills for a week where the pills taken twice a day. This type of pill box is suitable for users to be carried along when at outside. Though this pill box does not has alerting system, not suitable for users have weak hand and visual impairment.[3]

Pill Box Rating:
Easy to use: High
Easy to understand how it works: Low
Easy to fill: Medium
Secure (if dropped): High