Chapter 1

INTRODUCTION

1.1. LITRATURE SURVEY

Medication adherence is a growing concern throughout the healthcare industry with doctors, healthcare systems, and other stakeholders (insurance companies) since the elderly or senior patients' medication has a big issue of drugs misuse. It is very likely for them to forget to take their pills on time. Especially, those who take multiple medications at the same time. Also, they might take wrong dosage accidentally which may lead to unfortunate consequences such as death. This is a clear proof that it is a widespread problem and clearly related to adverse patient outcomes and higher healthcare costs.

According to a survey it is found that one-fourth of the total elderly population (approximately 26 million people) in India live alone. The United Nations Department of Economic and Social Affairs projected that the elderly population in India is going to rise from 8% in 2015 to 11.5% in 2025 and 19% in 2050.

1.2. AIM &OBJECTIVE

he main purpose of SMD system is to help the patients, primarily seniors, take their medications on time in an easy way without the possibility of missing pills. It can also reduce the risk of over or under dosing accidentally. The smart medicine dispenser (SMD) could solve such problems by informing and alerting the patients to take the appropriate dose at the right time.

CHAPTER 2

Working Principle and Functional Description

2.1 Block Diagram

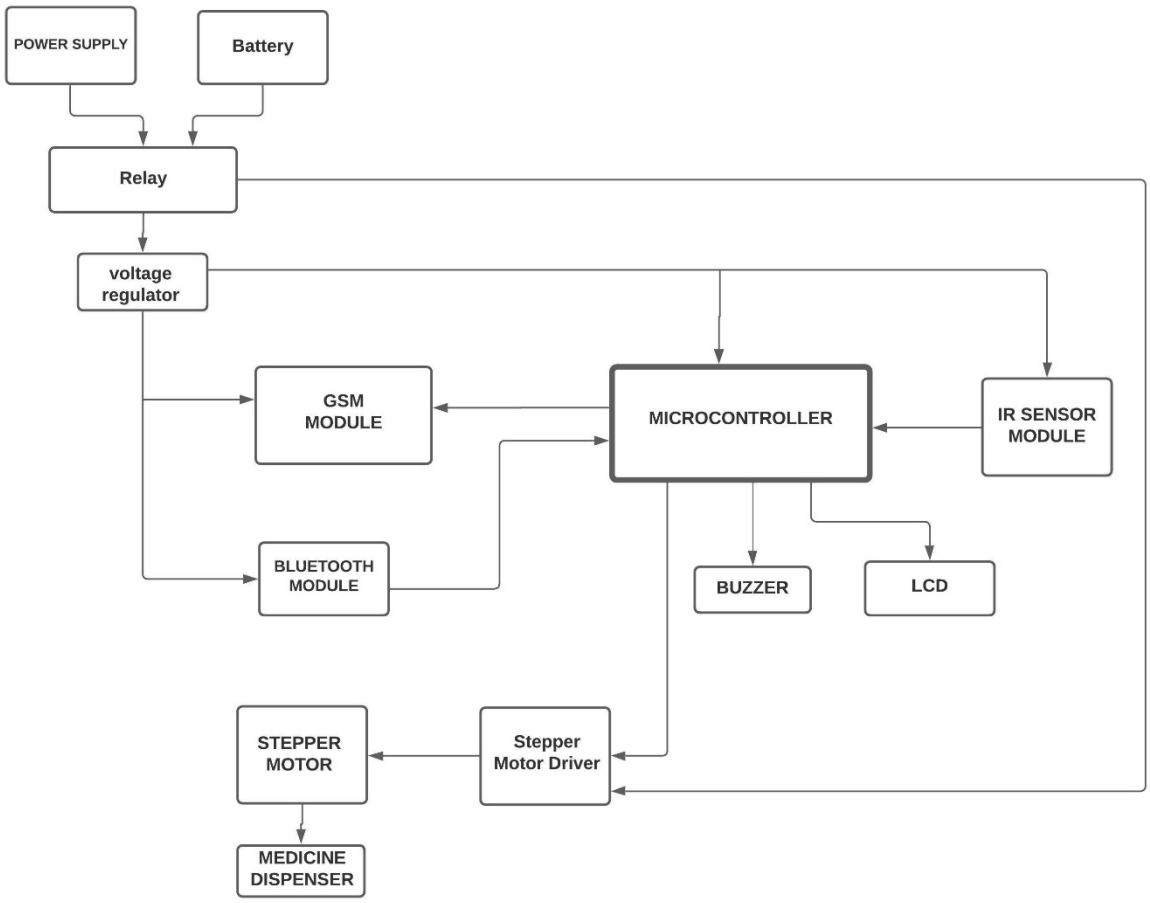

Figure x Block Diagram

2.2 Description of Block Diagram

2.2.1 Microcontroller

This is the main controller of device. And it controls sensors and modules connected to device.

It controls all the important timings of all the operations of the device.

2.2.2 GSM Module

When the patient fails to take the medicine on the prescribed time even after alerting him/her two times, the GSM module sends a missed call to the caretaker to alert them that medicine is yet not taken.

2.2.3 Bluetooth Module

Using this Bluetooth module the user can interface the device. The timing schedule of when the medicine is to be dispensed out to the patient is taken using this Bluetooth module.

2.2.4 Stepper Motor

The stepper motor is used to rotate the medicine compartments of the box at the time of dispensing the medicine.

2.2.5 IR Sensor Module

The IR sensor module is used to detect if the patient has arrived to collect the medicine at the prescribed time and indicate that the medicine has been taken successfully.

2.2.6 Buzzer

Buzzer is used to alert the patient at the time of medication.

2.2.7 LCD

It is used to display the present time. Also it displays the time entered by the user while configuring the medication schedule.

2.2.8 Relay

Relay is used to switch between the AC mains supply and the Battery during power failure.

2.3 List of Components

- AT89s52 Microcontroller
- IR Sensor
- SIM 800c Module
- Stepper Motor (M4SP-6NP)
- Stepper Motor Driver (L293D)
- Buzzer (5V)
- HC-05 Bluetooth Module
- Medicine Dispenser Box
- Battery (12V , 2.5AH)
- Relay (5-12 VDC 10A)
- 11.0592 MHz Crystal Oscillator
- Power Supply (12VDC, 2A)
- 7805 Voltage Regulator IC

2.4 Description of Components

2.4.1 At89S52

In this Project we required a microcontroller which had sufficient pins for interfacing various modules. Also, we needed a microcontroller which supported UART communication Protocol and had built in Timers in it. Enough memory is also required to store the program code as our program code exceeded 4KiB of memory.

Keeping the requirements in mind we decided to use AT89S52 microcontroller of the 8051 Family. This controller has 8 KiB in system programmable memory which is more than enough for our project code. Important specifications of AT89S52 are given below:

AT89S52

- 8K Bytes of In-System-Programmable (ISP) Flash Memory
- Operating frequency: 0 Hz to 33MHz
- 256 Bytes of RAM
- Three 16-bit Timers/Counters
- Full Duplex UART serial channel
- Four 8-bit I/O pins

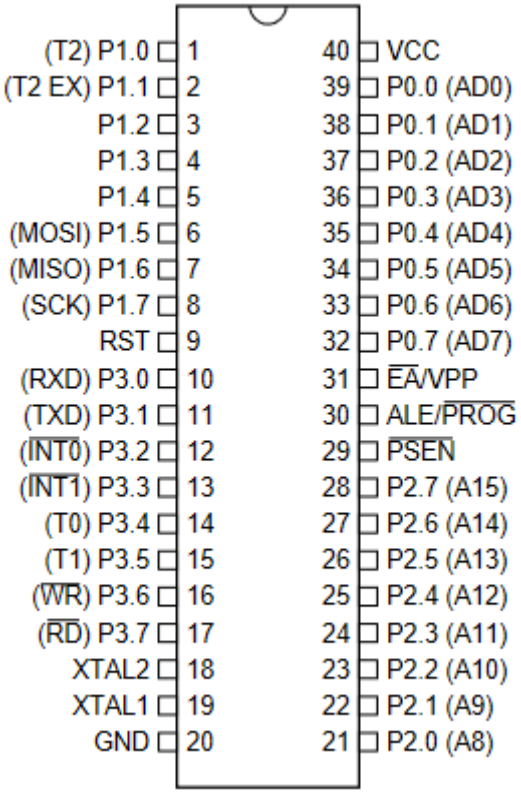

Figure x Pin Diagram of AT89S52

Pin Description:

PIN No.	Function of the pin		Pin Name
1	external count input to Timer/Counter 2, clock-out.		P1.0 / T2
2	Timer/Counter 2 capture/reload trigger and direction control		P1.1 / T2EX
3	I/O pins		P1.2
4			P1.3
5			P1.4
6	Used for In-System Programming		P1.5 / MOSI
7	Used for In-System Programming		P1.6 / MISO
8	Used for In-System Programming		P1.7 / SCK
9	Resets the controller when high		RST
10	Receiver for the serial UART Communication	I/O pins	P3.0 / RXD
11	Transmitter for the serial UART Communication		P3.1 / TXD
12	External Interrupt 0 (Active Low)		P3.2 / INT0
13	External Interrupt 1 (Active Low)		P3.3 / INT1
14	Counter 0 external input		P3.4 / T0
15	Counter 1 external input		P3.5/ T1
16	external data memory write strobe (Active Low)		P3.6/ WR
17	external data memory read strobe (Active Low)		P3.7 / RD
18	Output from the inverting oscillator amplifier		XTAL2
19	Input to the inverting oscillator amplifier and input to the internal clock operating circuit		XTAL1
20	Ground Pin (0 V)		GND
21	Higher order Address bits when using external memory	I/O pins	P2.0 / AD8
22			P2.1 / AD9
23			P2.2 / AD10
24			P2.3 / AD11
25			P2.4 / AD12
26			P2.5/ AD13
27			P2.6/ AD14
28			P2.7 / AD15
29	Program Store Enable; Used as read strobe for external memory		PSEN
30	Address Latch Enable		ALE/PROG
31	External Access enable; used when using external memory. (For internal memory operation strap it to Vcc)		EA/VPP
32	Higher order Address bits when using external memory	I/O pins	P0.0 / AD7
33			P0.1 / AD6
34			P0.2 / AD5
35			P0.3 / AD4

36			P0.4 / AD3
37			P0.5/ AD2
38			P0.6/ AD1
39			P0.7 / AD0
40	Supply Voltage (5V)		Vcc

Table x Pin Description of AT89S52

2.4.2 Sim800c GSM module

The GSM module is used to send a missed call to the caretaker when the patient fails to take the medicine on time.

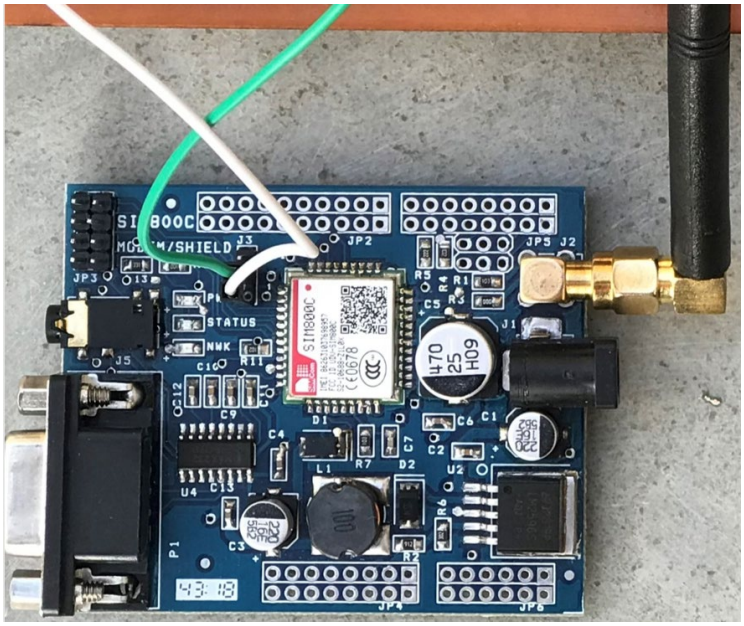

Figure x Sim800C GSM Module

The GSM 800C module is equipped with RS-232 connector for use and also supports UART serial communication Protocol. It has fully integrated sim card holder, power supply regulator, audio jack, etc.

It is easy to use with many low-cost microcontrollers as it supports UART communication. SIM800C is a quad-band GSM/GPRS module, that works on frequencies GSM850MHz, EGSM900MHz, DCS1800MHz and PCS1900MHz. SIM800H features GPRS multi-slot class 12/ class 10 (optional) and supports the GPRS coding schemes CS-1, CS-2, CS-3 and CS-4.

The module can be configured easily by sending the AT Commands to the module via the Tx pin of Controller connected to the Rx pin of the module. The module has three led indicators namely PWR, Status and NWK.

PWR led glows when the module receives the 5V power supply.

NWK led indicates if the module is yet registered to the network or not. When registered to a network the led is ON for 64ms and OFF for 3000ms.

Status led indicates if the module is ready to function or not.

2.4.3 HC-05 Bluetooth Module

Using this Bluetooth module the user can interface the device. The timing schedule of when the medicine is to be dispensed out to the patient is taken using this Bluetooth module.

2.4.4 28byj-48 Stepper Motor

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