Design of Automatic Medicine Dispenser

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Abstract— It is necessary to provide medicine to the aged in time. Automatic medication dispenser is designed specifically for users who take medicines without close professional supervision. It relieves the user of the error-prone tasks of administering wrong medicine at wrong time. The major components of this medicine dispenser are a microcontroller interfaced with an alphanumeric keypad, an LED display, a Motor Controller, an Alarm system, a multiple pill container and dispenser. The overall operation is to facilitate the user to set the timings to dispense multiple pills at required timings. The Alarm system is designed to provide two types of indications – one is, when the pre-set time is reached and second is the snooze time alarm. The user is required to press a button to get the pill and reset the alarm button. The second alarm is to indicate the optimal availability of the pills in the container to warn the user to refill the dispenser with the required quantity of pills. The major objective is to keep the device simple and cost efficient. The software used is reliable and stable. Elderly population can benefit from this device as it avoids expensive in-home medical care.

Keywords: Medicine Dispenser

I. INTRODUCTION

Caring of the aged is of a serious concern in the developing countries. Family members are responsible for the care and management of the old. In the modern age it is difficult for family members to be available all the time to support the aged. Today, in our society most families are nuclear. Elderly would prefer to remain independent and their desire for independence in nature, but it is a worry for their children. Sometimes despite their best effort, the aged fail to remember to take their medicine on time. Automatic Medicine dispenser is one such approach to help them take their medicines efficiently. As the cost of in-home medical care rises, it has become more and more incumbent among individuals to opt for a device that effectively takes care of their medicines. The automatic medicine dispenser serves the purpose.

II. LITERATURE REVIEW

There are a large variety of medicine administration assistance devices for non-professional users. Most of them are manual, providing multiple compartments called pill trays. The pill tray has a number of compartments that can be filled with medicine. Each compartment can hold different sizes and combination of medicines. The user is required to take the medicine from each tray each day for a maximum of 28 days. It does not provide any alarm to indicate the time of taking the medicine [1]. Pill-Mate-Medicine reminder is a gadget that uses both visual and audible signals to remind user. It reminds at a pre-set time to take medicines or attend certain events [2]. A smart phone application is designed to help patients to avoid mistakes. It reminds its users to take correct medicines on time and record the in-take schedules for later review by healthcare professionals [3].

III. METHODOLOGY

A. ATMEGA 16 Micro Controller

ATmega16 is an 8-bit high performance microcontroller of Atmel’s Mega AVR family with low power consumption. ATmega16 is based on enhanced RISC (Reduced Instruction Set Computing, Know more about rise and cisc architecture) architecture with 131 powerful instructions. Most of the instructions execute in one machine cycle. ATmega16 can work on a maximum frequency of 16MHz.

ATmega16 has 16 KB programmable flash memory, static RAM of 1 KB and EEPROM of 512 Bytes. The endurance cycle of flash memory and EEPROM is 10,000 and 100,000, respectively. ATmega16 is a 40 pin.

B. LCD Display

LCD (liquid crystal display) screen is an electronic display model and find a wide range of applications. A 16X2 LCD display is very basic module and is very commonly used in various devices and circuits. A 16X2 LCD means it can display 16 characters per line and there are 2 such lines.

C. Keypad

Key: This is a 2x16 line LCD Display

Keypad
This 16-button keypad provides a useful human interface component for microcontroller projects. Convenient adhesive backing provides a simple way to mount the keypad in a variety of applications. The Keypad 4x4 features a total of 16 buttons in Matrix form. This is a membrane keypad with no moving parts. It has a nice overlay depicting a telephone type keypad with additional four functional buttons. A female 8-pin berg connector is provided for interfacing it with your microcontroller circuits.

D. Buzzer

![Buzzer Image]

1) Features:
- sealed; yes
- operating power: 3-6V DC / 25mA
- extremely compact, ultrathin construction
- no electrical noise
- low current consumption yet high sound pressure level

E. GSM

GSM/GPRS TTL-Modem from rhydoLABZ is built with SIMCOM Make SIM900 Quad-band GSM/GPRS engine, works on frequencies 850 MHz, 900 MHz, 1800 MHz and 1900 MHz. It is very compact in size and easy to use as plug in GSM Modem. The Modem is designed with 3V3/5V TTL interfacing circuitry, which allows you to directly interface to 5V microcontrollers (PIC, Arduino, AVR etc) as well as 3V3 Microcontrollers (ARM, ARM Cortex XX, etc). The baud rate can be configurable from 9600-115200 through AT command. Initially Modem is in Autobaud mode. This GSM/GPRS TTL Modem is having internal TCP/IP stack to enable you to connect with internet via GPRS. It is suitable for SMS as well as DATA transfer application in M2M interface. The modem needed only two wires (Tx,Rx) except Power supply to interface with microcontroller/Host. The built in Low Dropout Linear voltage regulator allows you to connect wide range of unregulated power supply (4.2V - 13V). Yes, 5 V is in between !!!. Using this modem, you will be able to send & Read SMS connect to internet via GPRS through simple AT commands.

F. Motor driver IC

The L293 and L293D are quadruple high-current half-H drivers. These devices are designed to drive a wide array of inductive loads such as relays, solenoids, DC and bipolar stepping motors, as well as other high-current and high-voltage loads. All inputs are TTL compatible and tolerant up to 7 V. Each output is a complete totem-pole drive circuit, with a Darlington transistor sink and a pseudo-Darlington source.

Drivers are enabled in pairs, with drivers 1 and 2 enabled by 1,2EN and drivers 3 and 4 enabled by 3,4EN. When an enable input is high, the associated drivers are enabled, and their outputs are active and in phase with their inputs. When the enable input is low, those drivers are disabled, and their outputs are off and in the high-impedance state. With the proper data inputs, each pair of drivers forms a full-H (or bridge) reversible drive suitable for solenoid or motor applications. On the L293, external high-speed output clamp diodes should be used for inductive transient suppression. On the L293D, these diodes are integrated to reduce system complexity and overall system size. A VCC1 terminal, separate from VCC2, is provided for the logic inputs to minimize device power dissipation. The L293 and L293D are characterized for operation from 0°C to 70°C.

G. DC Geared Motor

Speed reduction by means of a gear box results in increased torque. The reduction/increase is determined by the gear ratio and efficiency of the gear box. Over-all efficiency depends on the number of reduction stages: one average is 90% per stage. Therefore: a two stage reduction gives 90x90=81% ; 3 stages will be 72.9% and a 4-stage reduction 66%. The above mechanical loss effects the stall torque as shown left. Stall torque of a geared motor can be calculated using the following formula: \[ \text{Motor stall torque} = \text{gear ratio} \times \text{gear ratio efficiency} \]. The output loading on a gear box must never exceed the manufactures “specified rated torque” as this will cause premature gear failure. It is particularly important to observe this at slow output speeds when the calculated output torque exceeds the specified rated torque.
IV. RESULT
- When real time and set time is matched then alarm is ON and message is displayed on LCD display.
- When user press the OK key on keypad then only pill box is available for user. If the user will not access the key, then that pill box is move towards collective unit after 2 minutes and text message is given to caretaker using GSM modem.

V. CONCLUSION
The Automatic Medicine Dispenser is working for pills and capsules of any size. It has been found that the dispenser can be programmed for 31 days for 21 different medicines. It has the facility to send alarms four times a day. It is possible programmable to dynamically change the number of times and the number of pills to be picked as per requirement.

REFERENCE