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An Efficient System for Medication: Smart MEDIKIT

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ABSTRACT: Smart Medikit (SM) is an efficient system that replaces current problem of aged peoples that takes medicines daily. This paper introduces a new idea or a new system that helps aged peoples to take their medicines on time without taking the help of another person. It is a box type small system that can be carried by the people where ever they want and it consist of four chambers. Medicines are provided in the chambers and there is a facility to set the time in which the person has to take the medicine. According to the time that set on the device there will be a buzzer to announce to take the medicine and chamber in which the medicine kept will automatically opens. This is the basic idea of this Smart Medikit. System is implemented using AVR microcontroller.

I. INTRODUCTION

Now a day's certain diseases are common in every people after the age 50.Diseases such as blood pressure, diabetes, cholesterol, heart diseases, Alzheimer's are common in now a days after the age of 50.These diseases cannot be cured immediately by taking one or two courses of medicine, it can be only controlled by taking medicines for a long period of time in one or two times daily. In such a situations this smart medikit can help those peoples to take medicines on time. This kit will announce to take medicines according to the time set on the system and peoples can take medicines on time without the help of another person. This system is more beneficial to patients who suffering from the Alzheimer's disease or it can help peoples in urban areas those who left their aged parents in home alone for their work and cannot give their medicines on time.

Smart Medikit is simply a small device that can be carried to any place easily. It consists of many chambers in to which medicines can be provided according to the course. Time can be set in this system and when the time reaches the chambers in which we placed the medicines will open automatically with a buzzer announcement and this announcement will remain until somebody takes the medicines from the chamber. It is provided with an LCD display to notify the dosage and name of the medicines and it also provided with an emergency switch that will help the patient in any emergency situation. The emergency switch is associated with a GSM module through which nearest hospitals and ambulance can be informed that there is a person needs help in a particular region.

II. SYSTEM MODEL AND ASSUMPTIONS

The system consist of an AVR microcontroller which is the main part of the system, a keypad reader in order to set time for which medicines can be taken, an LCD display to give proper information about the dosage and type of medicine, a buzzer to give announcement to take the medicine, an emergency switch to inform that there is an emergency situation occurred in home, GSM module to pass necessary messages to hospitals and necessary ambulance centres. The system is secured with password so that any unauthorized person cannot make any changes in the system. It also contains a real time clock to evaluate a bell time that we set on the system with the real time. When the bell time

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and the real time matches buzzer will announce to take medicine and the buzzer sound will remain as long as the medicine is taken from the automatically opened chamber. This is all about the model of the proposed system.

There two external switches are provided in this system, one is emergency switch and another one is the reset switch. Emergency switch is provided in order to inform ambulance service and hospital authorities via GSM interfaced to the system. Reset switch is provided to bring back the system to the initial condition when there occurs any confusion during the setting of time or if you have to reset the time. The most priority switch is the emergency switch. When an emergency switch is pressed an emergency chamber provided with an emergency medicine will be opened. Medicine can be taken and at the same time emergency messages will be sending through the GSM module interfaced to it.

III. BLOCK DIAGRAM

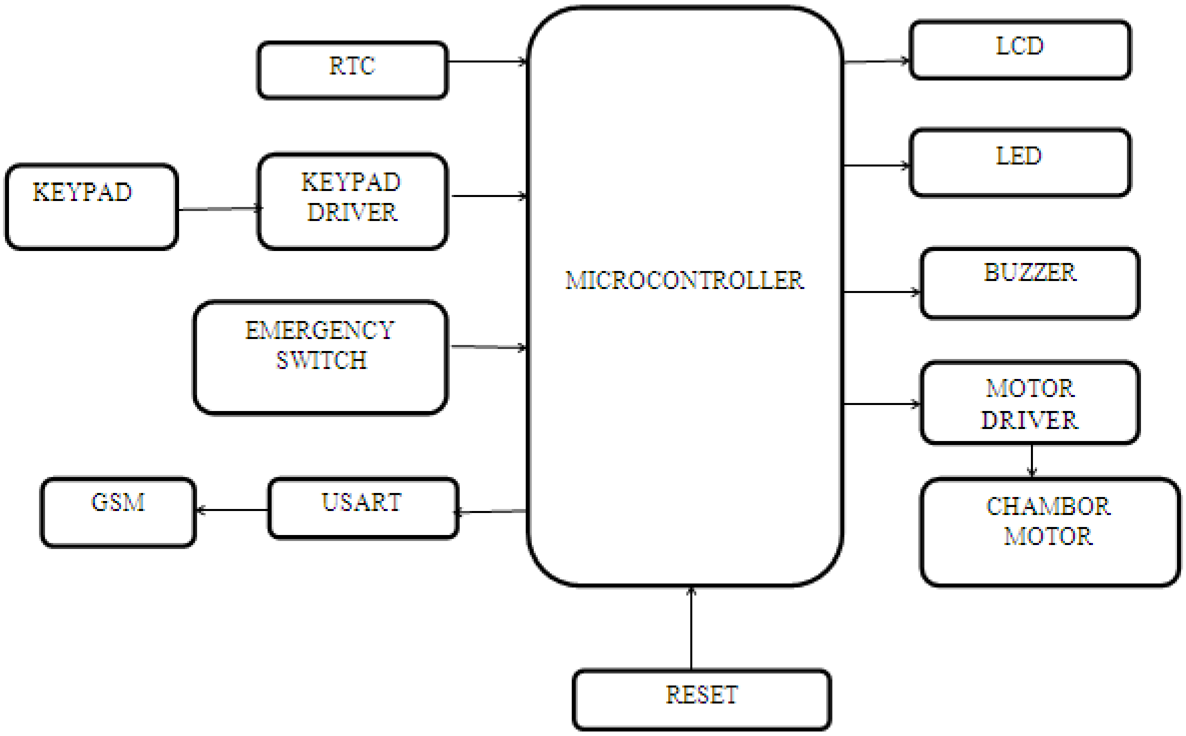

Fig. 1: Block Diagram of Smart MEDIKIT

Microcontroller: AVR is the microcontroller used in this project. The major heart of this project is AVR microcontroller, it has more features like 16bit timer, 10-bit ADC, USART, SPI, I2C, 256 bytes of EEPROM memory, and 32kbytes of flash program memory, then at last its speed of program execution is about to 1 microsecond or 10 MIPS (10 Million Instructions per second), etc. However, compare to other microcontroller it is fast and very ease to program in C language because of huge support can gain from the manufacturer for programming. The special IDE offered by the manufacture, it is named as AVR Studio IDE for it code generation purpose.
LCD: A liquid-crystal display (LCD) is a flat panel display, electronic visual display, or video display that uses the light modulating properties of liquid crystals. Liquid crystals do not emit light directly. We are using 16*2 LCD in this project.
Reset switch: Reset is used for putting the microcontroller into a 'known' condition. That practically means that microcontroller can behave rather inaccurately under certain undesirable conditions. In order to continue its proper

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functioning it has to be reset, meaning all registers would be placed in a starting position. Reset is not only used when microcontroller doesn't behave the way we want it to, but can also be used when trying out a device as an interrupt in program execution, or to get a microcontroller ready when loading a program.

Buzzer: A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric. Typical uses of buzzers and beepers include alarm devices, timers and confirmation of user input such as a mouse click or keystroke.

Electronic filters are analog circuits which perform signal processing functions, specifically to remove unwanted frequency components from the signal, to enhance wanted ones, or both. The most common types of electronic filters are linear filters, regardless of other aspects of their design.

A **power supply** is a device that supplies electric power to an electrical load. The term is most commonly applied to electric power converters that convert one form of electrical energy to another, though it may also refer to devices that convert another form of energy (mechanical, chemical, solar) to electrical energy. A regulated power supply is one that controls the output voltage or current to a specific value; the controlled value is held nearly constant despite variations in either load current or the voltage supplied by the power supply's energy source.

Step down transformers are designed to reduce electrical voltage. Their primary voltage is greater than their secondary voltage. This kind of transformer "steps down" the voltage applied to it. Step down transformers convert electrical voltage from one level or phase configuration usually down to a lower level.

IV. RESULT AND DISCUSSION

Main part of the board is AVR microcontroller. We are using atmega32 microcontroller the operating voltage of ATmega32 is 4.5V. Crystal (XTAL1 &XTAL2) is for providing external clock to the board. The crystal we are using in 4 MHz i.e;

$$\mathbf{T} = \frac{1}{f} = \frac{1}{4}\boldsymbol{Mhz} = \mathbf{0.00025ms}$$

Thus speed is 0.00025ms.

That much accuracy is possible. The capacitor 22ρF 2 each is for reducing the noise i.e., it act as a filtering capacitor. Switch we are using in push button switch connected to pin number 9 for resetting and pull up by a 10 K resistor i.e. when we press button switch only it can reset. W10 , bridge for AC to DC conversion and an voltage regulator is 7805 used for regulating analog voltage to 5v output is given to a filter capacitor 1000 µF and 470 µF capacitor for avoiding reset condition when load is increase from 7805 to 1K resistor and LED to indicate power. 16 pin berge where LCD is connected. The 2.2K resistor near the Berge male (16 pin) is for contrast for LCD the 104 capacitor for preventing against reset. 1Ω resistor is jumper. AVR ATmega32 controller is used to control all operations. The keypad which gives input to the microcontroller is connected to PORT A. The emergency switch, chamber motor and the buzzer are connected to the PORT B of the microcontroller.

The demo model is designed with a four chamber device. Three chambers are used for giving regular medicines in a day and the fourth chamber is used for providing emergency medicine when emergency switch is pressed.

The circuit diagram is designed using software which is called Proteus. The circuit diagram indicates both software and hardware section. The software section purely achieved by using AVR coding is done by embedded C. In this circuit we use 4 MHz crystal for ATmega32 frequency. There is a power supply section for provide supply for the circuit. LCD is used for display the output from the keypad to notify the information about the medicine.

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Real-time clock continuously evaluate the real time with the bell time that we set .When these two matches buzzer will announce and chamber that contain medicine will automatically open. Patient can take that medicine on time by repeating this procedure. In the demo model we are giving time on a particular day, i.e. we are setting the times on a morning, afternoon and evening.

V. CONCLUSION

It is necessary to provide medication to the aged in time. The smart medi-kit care taking system is designed specifically for users who take medications 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 medication 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 by lighting an LED and the other by providing a beep sound. 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 system is also provided with an emergency switch which is associated with an emergency chamber. When an emergency switch press is detected a chamber with patient's emergency medicine is opened and a message is sent to a relative's mobile number indicating the emergency situation. It can also send message to ambulance center if required. 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.

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