PLC BASED AUTOMATIC MEDICINE SCHEDULAR

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ABSTRACT

In general, most of the patients forget to take the appropriate prescribed medication at the required time. There are occasions when patients remember to take medicines at the stipulated time but forget which pill has to be taken at that particular time. This poses a big problem as it affects the dosage quantum required for the patient that results in not yielding the right recovery result. It is difficult for doctors/paramedics/attenders to monitor patients round the clock. In order to avoid these problems, we have implemented this patient medicine reminder system. This project the advanced system which improves medical process like to detect the body temperature using lm 35, to detect the low saline dripper using photo electric sensor and automatic medicines to the patients by using tray operating mechanism using dc gear motor .the advanced autonomous system architecture give us the opportunity to developed a compete new range of medical equipment based on smart machine. Developed biomedical needs to find new ways to improve efficiency one approach is to utilize available information technology is form of more intelligent machine to reduce and target energy input in more effective ways that in the past. The whole algorithm, calculation processing, monitoring are design with motor, relay and sensor interfaced with plc. The result will obtain that we will maintain the ratio of low nurse to patient. This medical equipment based on small smart machine that can do the right thing, in right place at right time in the right way.

Keyword: - *PLC: Programmable logic controller, Relay, DC Motor, LM 35 Sensor, LDR Sensor*

1. INTRODUCTION

Now a day's automation is applied everywhere. Most of work around us whether in homes or industries are trying to do automatically, which will reduce human efforts. We are well aware that, today there is scarcity of electricity. Approximately 40% of electricity gets wasted due to lack of automation. For the same reason some countries like japan, china have made laws regarding use of electricity. At most public places like seminar hall, street lights, wedding hall electricity get wasted unnecessarily, so at such places automation plays vital role for saving electricity.

1.1 **Objective**

Electronics has played many important roles in the field of medical science. Electronic cardiogram machine (ECG), x-ray machine, hem dialysis machine etc are the gifts of electronics and bio-medical instrumentation to

medical science. In big hospitals number of patients is under treatment under the same physician. It is very difficult for the same physician to pay attention towards all of them. Various patient medicine schedule is various time, and we want to provide saline for different patient according to the need of them and Also the different patient having different temperature. All patient medicine schedules is no one time. All patient medicine schedules it is very difficult for the same physician or ward boy to pay attention towards all of them. Physician no workout medicine schedule in his mind. But we are developing the project automatic medicine scheduler with temperature detector and saline low liquid level detector. Automatic medicine scheduler with temperature detector and saline low liquid level detector is an innovative project, in which a simple siren system using commonly available PLCs and other IC's presented here for use in hospitals, offices, shops, and houses. The same system can be used as the automatic time scheduler for the educational institute and factory organization's also. The tray loading and opening system is based on the electromechanical principle.

1.3 Organization Report

- The report of auditorium automation with smart security system include total five chapter the very first chapter contains introductions of project and how we get motivated to do this project.
- The second chapter contains literature survey. Which include the previous workdone.
- The third chapter is system module in which the block diagram is explained along with each separate block. Each block of the block diagram is explained with their feature, specifications, advantages, application etc.
- The fourth chapter is the conclusion of the project.

2. LITERATURE SURVEY

Review of Literature:

The same are various, the most common reason. We can observe the most common reason are that nurse/ward boy is engaged the with another patient, because that the patient are not receiving medicine on schedule time. The non-observing the scheduled of medicine has bad impact on recovery of patient. Hence we decided to find solution to this problem through project of automatic medicine scheduler. Automatic medicine scheduler is an innovative here for use project, in which a simple siren system using commonly available microcontroller and other IC's presented in hospital, offices, shops and houses. While working on project before scheduling in components, problem of a significant time was elapse between circuits was arises. To shoot out this trouble we take the trouble to read the article; the information is often given in a very condensed from. We tried to get most important point out of the decryption of the circuit, even if we don't understand exactly what is supposed to happen.

At finally our project of automatic medicine scheduler is tested as working properly without any trouble, then we take project lest in hospital and it was found working properly and was appreciated as new revolution in the history use of electronic in medical field. In biomedical fields special units are used, say medicine scheduler. All of these units are designed to offer the advantage of the low nurse - patient ratio. Hence we decided to find solution to this problem through project of automatic medicine scheduler along with we have taken 2 bio-medical transducers and the relative parameters say body temperature, low saline dripper. First and foremost, no automation could have been built to completion without a strong hold on the PLC used. Most of the basic, intermediate, and advanced literature about the PLC was found in the book "hand book of design, manufacturing and automation" by Richards c. Doff, Andrew Kodiaks. His detailed explanation of every topic made it possible to overcome many problems which were encountered during design and implementation. The book also provided a programmer for the PLC which was an indispensable tool helping me experiment with algorithms rather than blindly copy code from the net. The next resource for the PLC was the introduction to PLC (3111 edition) by- Garry dunning, which provides a detailed explanation of each and every hardware feature.

3 SYSTEM MODELING

3.1 System Block Diagram

Block diagram consist of PLC which having inbuilt memory. The time and the specific medicine is programmed inside the PLC's inbuilt memory. The time can be changed by changing the data in PLCs with the help of keyboard. It sounds the audio siren automatically at the program's times. After listening the audio siren, one has to acknowledge it. After acknowledgement, the particular tray from the cupboard, having the same medicine comes

out. One can have it. After the specified time the tray closes automatically. This happens sequentially for all the times as per programming and thus working as a medicine scheduler.

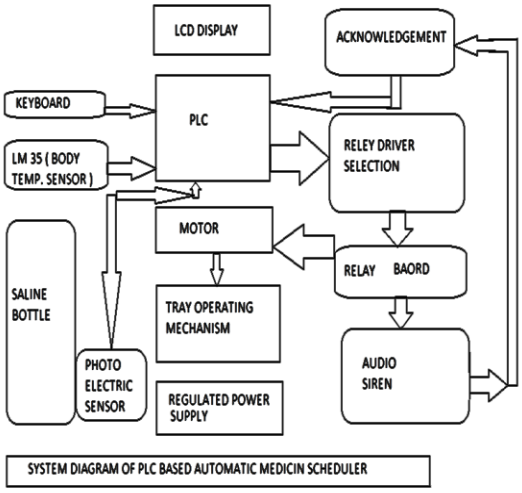


Fig 3.1 Block Diagram of PLC Based Automatic Medicine Scheduler Process

3.2 Block Diagram Description:

The PLC are connected to key board. The keyboard is used time set. When the system power on LCD display welcome message. Then keyboard help set the medicine scheduler time. Set time is display on LCD. We write this program when the set time is come microcontroller send high pulse to ULN 2003 (relay driver this is inbuilt 7 transistorized Darlington pair). These IC is driving the relay. High pulse gets ULN 2003 the driver the relay 1 means relay 1 is on relay 1 are connected buzzer and buzzer is on. Later the buzzer is accept key press these relay 1 off and buzzer off parallel tray operating mechanism motor on forward direction. Tray box in medicine packet. Tray is open but this medicine is not collect buzzer is repeated on when medicine is collect tray close. Repeat this cycle next time.

Normally body temperature increase up to 40-50°C. So, very higher range transducers are not required. The transducers with bigger size and heavy weights arc also not preferable. Pt-100, thermocouple temperature sensors are very popularly used. But, in this particular application these are not adequate. Hence we use newly and recently developed transducers. I.e. LM 35 - it is small in size in plastic pack.The saline dripper is the most important elements of this system. We are using an photo emitter sensor/light dependent register sensor type of sensor. It detects the light rays coming out of the low saline. The sensor is of photo electric type. After detecting the low saline, the sensor sends a pulse to the switching circuit. The output of the sensor may or may not be compatible with the plc. Hence it becomes necessary to convert the pulse in the form which PLC can accept. This is done by the Opto-Isolator or digitizer.

3.3 content of block diagram

• PLC

• Power Supply

• Relay's

• Relay Driver

• LCD Display and Sensor

• DC Gear Motor.

3.3.1 Structure of PLC:

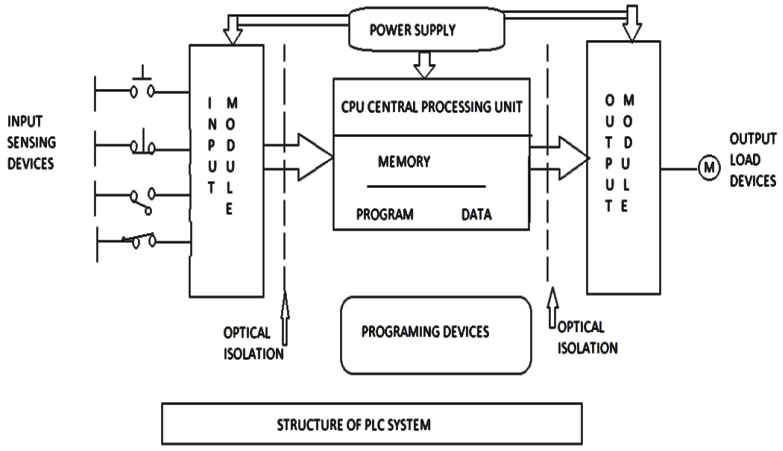


Fig.3.2 Structure of PLC Programming

3.3.1.1 Hio 140 PLC specification:

• Keys	14
• Memory	6 Mb
• Com Port	com1: RS232/RS485/RS422
• USB port	1 USB device & I USB host
• ETHERNET	For connecting to PLC, programming of HMI
• Digital Input	16
• Digital Output	12
• Analog Input	4
• Analog Output	2
• Software	Prizem3.14
• Part Number	Hio00-0010- 0000-B-R-00
• Display	128x64 Px. (3" Graphical)
• LEDs	4

3.3.1.2 System Components

A programmable controller is a solid slate user programmable control system with functions to control logic, sequencing, timing, arithmetic data manipulation and counting capabilities. H can be viewed as an industrial

computer that has a central processor unit, memory, input output interface and a programming device. The central processing unit provides the intelligence of the controller. It accepts data, status information from various sensing devices like limit switches, proximity switches, executes the user control program store in the memory and gives appropriate output commands to devices like solenoid valves, switches etc. Input output interface is the communication link between field devices and the controllers; field devices are wired to the i/o interfaces. Through these interfaces the processor can sense and measure physical quantities regarding a machine or process, such as, proximity, position, motion, level,

Temperature, pressure etc. Based on status sensed, the CPU issues command to output devices such as valves, motors, alarms, etc. Programmer unit provides the man machine interface. It is used to enter the application program, which often uses a simple user-friendly logic.

3.3.2 PLCs Contain Three Basic Sections:

1. Central processing unit (CPU).

2. Memory: EPROM, RAM, and so on.

3. Input/output section for communication with peripherals (ADC, DAC).

A PLC is basically a black box with a number of inputs from, and a number of outputs to, the outside world. It can make decisions, store data, do timing cycles, do simple arithmetic, convert codes, and so on. The basic difference between this black box and a hardware logic system using IC chips or a relay controlled system, is that specific coded messages are stored in areas

called program memory, which are prom or rom and ram chips. It is, however, much easier to change a program when a different process is required than to rewire the control system. For example, it may take electricians a couple of weeks to require a pipe mill, whereas a programmer will spend only a fraction of this time to reprogram a PLC since no wires will have to be changed. In addition, various recipes can be stored in memory and accessed when required, making the program extremely flexible. The system operates through interaction with the processor and program memory. When the power to the system is turned on, the processor reads the first instruction stored in memory and acts on this instruction. When completed, it goes back to the memory for the next instruction, and so on until task is complete. This operation is called the fetch-execute cycle. The processor communicates with the outside world via input and output modules.

3.3.3 Gear Motor:

Gear motors have an integrated gear the motor output is used to drive the gears. There are two main types of gear motors ac and dc gear motors. Other types of gear motors are: single, multiphase, servo, universal, induction and synchronous.

Ac Gear Motors:

These types of motors run on alternating current. They have three windings in series for the stator, a rotor and an integral gearbox. A changing magnetic field makes the rotor rotate on the motor axis. Dc gear motors: they come in two types, brushless and servo. It has a rotor, a stator with permanent magnets and a gearbox. The magnetic field is generated by permanent or Electromagnets. They are used in applications with variable torque and speed. Gear motors are selected by: the speed of the shaft, continuous torque, current, output power and other specifications. Other specifications include the gear ratio, types of gears and the maximum torque transferred at the output shaft.

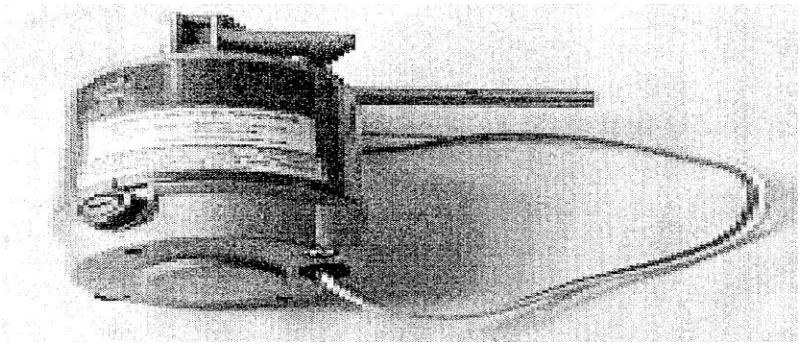


Fig.3.3: Gear Motor

Weight-	32 gm.
Gear ratio-	22:13, 1.62:1
Voltage-	5 V
No load current-	48 mA
Max stall/saturation current-	670 mA
Max torque-	43 Nm
Rpm-	10

3.3.4 Relay:

A relay is an electrical switch that opens and closes under the control of another electrical circuit. In the original form, the switch is operated by an electromagnet to open or close one or many sets of contacts. It was invented by joseph henry in 1835. Because a relay is able to control an output circuit of higher power than the input circuit, it can be considered to be, in a broad sense, a form of an electrical amplifier.

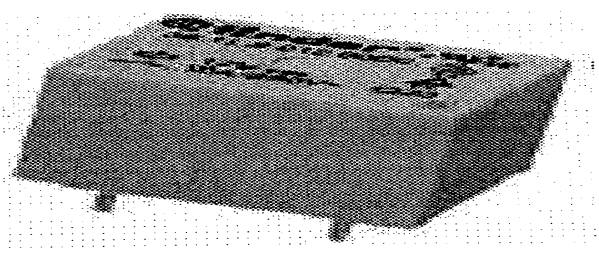


Fig.3.4: Sugar Cube Relay

Despite the speed of technological developments, some products prove so popular that their key parameters and design features remain virtually unchanged for years. One such product is the 'sugar cube' relay, shown in the figure above, which has proved useful to many designers who needed to switch up to 10a, whilst using relatively little PCB area since relays are switches, the terminology applied to switches is also applied to relay

3.3.4.1 Reed Relay:

Reed relays consist of a coil surrounding a reed switch. Reed switches are normally operated with a magnet, but in a reed relay current flows through the coil to create a magnetic field and close the reed switch.

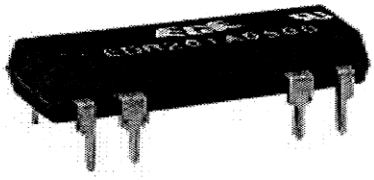


Fig. 3.5(a): Reed Relay

Reed relays generally have higher coil resistances than standard relays (1000 ohm for example) and a wide range of supply voltages (9-20v for example). They are capable of switching much more rapidly than standard relays, up to several hundred times per second; but they can only switch low currents (500ma maximum for example). Relays can have several poles and contacts. The types of contacts could be normally open and normally closed. On e closure of the relay can turn on the same normally open contacts; can turn off the other normally closed contacts. Relay requires a current through their coils, for which a voltage is applied. This voltage for a relay can be D.C. low voltages up to 24v or could be 240v A.C.

3.4 Temp Sensor (LM35)

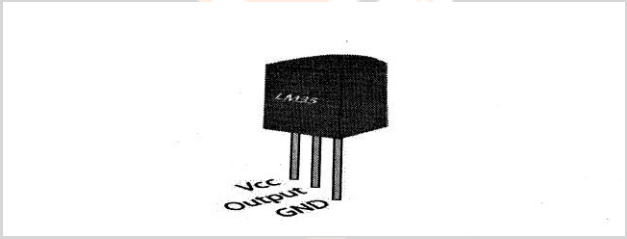


Fig 3.6 LM 35

IC LM 35 is a three terminal precision temperature sensor with output voltage linearly proportional to the Celsius temperature of with +/-i0.0mv/c scale factor. The lm 35 does not required external calibration or trimming to provide typical accuracies. It is rated full -55 c to 150c range and operated on 4v-30v input. It gives 0V output for 0°C temperature. The analog output (V) at pin2 of LM 35 is given to v. (+) pin is connected to ground.

- Temperature Range: -55° to +150°C
- Operating Voltage: From 4 to 30 Volts
- Current Drain: Less Than 60 micro-amp
- Accuracy Guarrantable: 0.5°C
- Scale Factor: Linear + 10.0 mV/°C

3.4.1. Working of LM35:

> It has an output voltage that is proportional to the Celsius temperature.

> The scale factor is .01 v/°c

> The lm35 does not require any external calibration or trimming and maintains an accuracy of +/-0.4 °c at room temperature and +/- 0.8 °c over a range of o° c to+100°c.

> Another important characteristic of the lm35dz is that it draws only 60 micro amps from its supply and possesses a low self-heating capability. The sensor self-heating causes less than 0.1 °c temperature rise in still air.

3.4.2 LM35? Electrical connections:

> Here is a commonly used circuit. For c connections refer to the picture above.

> In this circuit, parameter values commonly used are:

> V_c= 4 to 30v

> 5V or 12 v are typical values used.

> $R_a = V_c/10^{-6}$

> Actually, it can range from 80K to 600 K , but most just use 80 K

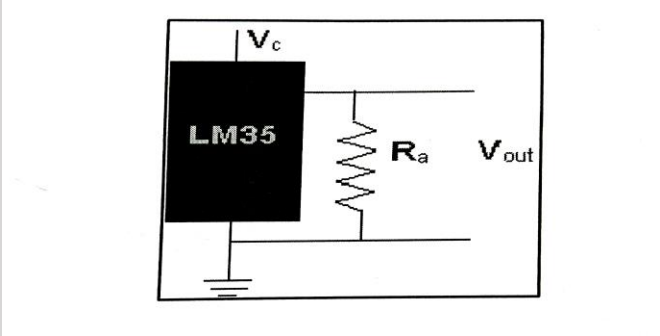


Fig 3.7 Electrical connection of LM35

3.5. LDR Sensor:

This is light dependent resistor. When light source is bright LDR resistor low resistance and when light source is dark LDR resistor high resistance.

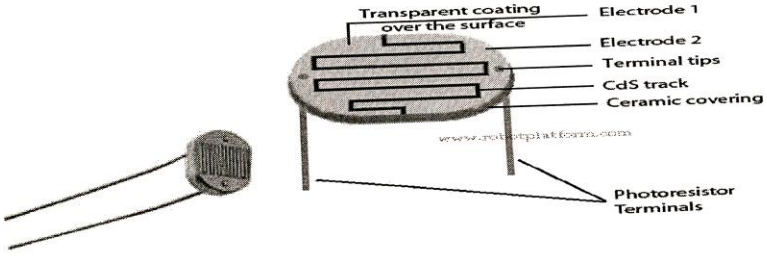


Fig 3.8: LDR Sensor

Light-dependent resistor alternatively called an LDR, photo resistor, photoconductor, or photocell, is a variable resistor whose value decreases with increasing incident light intensity. An LDR is made of a high-resistance semiconductor. If light falling on the device is of high enough frequency, photons absorbed by the semiconductor give bound electrons enough energy to jump into the conduction band. The resulting free electron (and its hole partner) conduct electricity, thereby lowering resistance. A photoelectric device can be either intrinsic or extrinsic. In intrinsic devices, the only available electrons are in the valence band, and hence the photon must have enough energy to excite the electron across the entire band gap. Extrinsic devices have impurities added, which have a ground state energy closer to the conduction band - since the electrons don't have as far to jump, lower energy photons (i.e. longer wavelengths and lower frequencies) are sufficient to trigger the device.

4 PERFORMANCE ANALYSIS:

4.1 Design Stages

Our project design consists of power supply section. Power supply section consist of step down transformer rectifier, filter circuit and voltage regulator. Detailed explanation of each block as follows:

4.1.1 Power Supply Design Details:

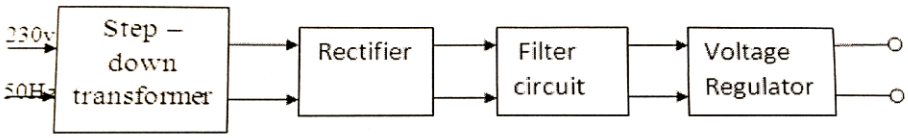


Fig.4.1 Block Diagram and circuit diagram Of Power Supply

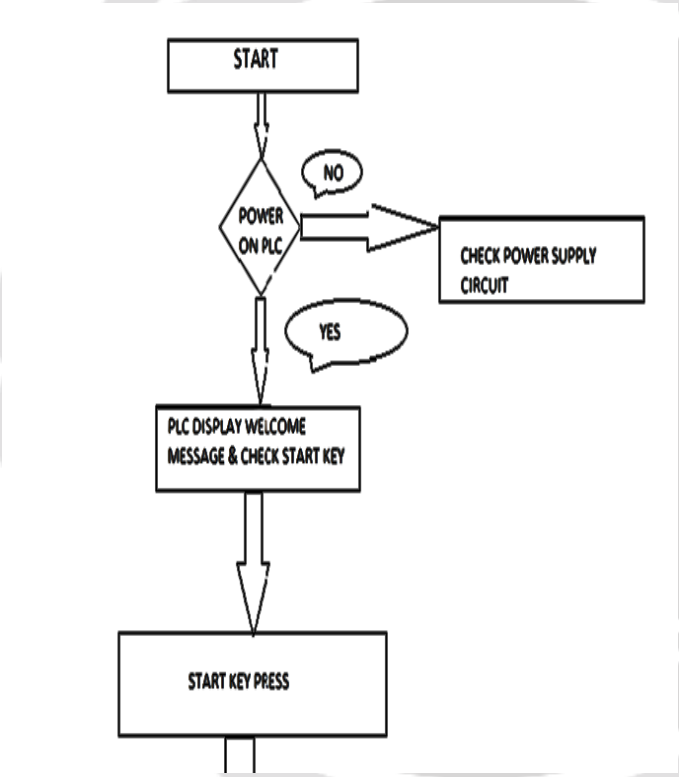
For our all IC we required 5 volt dc supply which can be generated by step down transformer, full wave bridge rectifier, filter condenser and voltage regulator IC 7805. 12 volt supply for relay is generated separately using the same procedure as above.

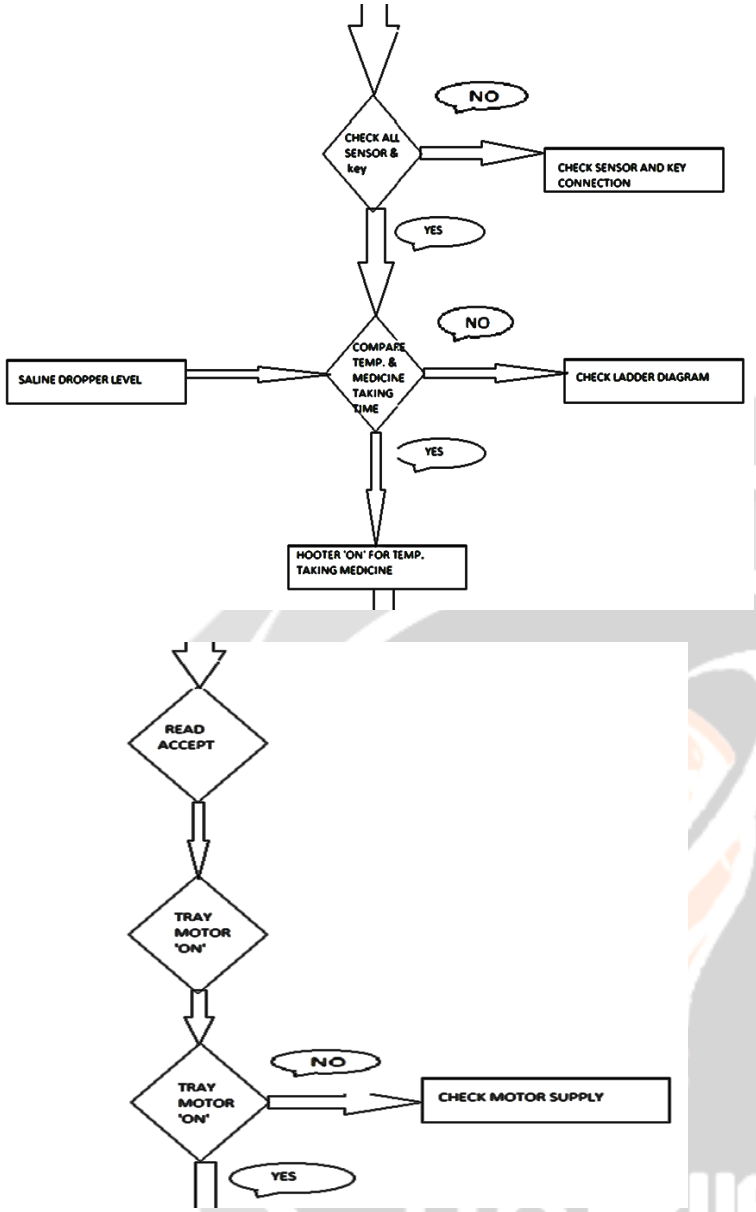
4.2 Algorithm:

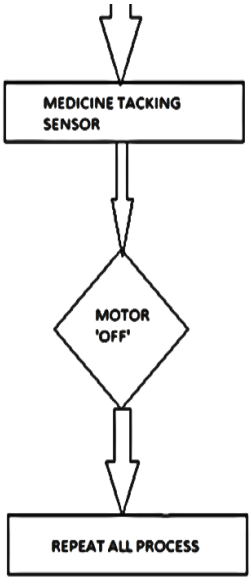
4.2.1 Software Algorithm:-

-Initially after power on, welcome message display on plc.
-Read start and stop key input pulse.
-Read on temperature sensor, saline dripper level
-On PLC set medicine taking time and body temperature
-Compare RTC time and set time
-Compare body temp. And set temp.
-Compare RTC then hooter relay on.
-Read accept key, when press key then hooter off.
-Tray out relay on, read medicine taking sensor.
-When medicine takes PLC input get pulse.
-When medicine tablet rest on tray, tray in relay on.
-Compare temp. When actual body temp. High set temp. Hooter relay is on.
-Saline dripper level is low then hooter level is on.
-Read saline dripper accept key.
-When these press hooter off.
-Repeat the step continuously.

4.2.2 Flow Chart




NO
CHECK ALL SENSOR & key
CHECK SENSOR AND KEY CONNECTION
YES
NO
COMPARE TEMP. & MEDICINE TAKING TIME
SALINE DROPPER LEVEL
CHECK LADDER DIAGRAM
YES
HOOTER 'ON' FOR TEMP. TAKING MEDICINE
READ ACCEPT
TRAY MOTOR 'ON'
TRAY MOTOR 'ON'
NO
CHECK MOTOR SUPPLY
YES



5 CONCLUSION

5.1 Concluding Remarks

"PLC based automatic medicine scheduler" This project is advanced system which improves medical processes like to detect the body temperature, to detect the low saline dripper and automatic medicine to the patient. This system is very marketable because of its simplicity, low cost, low power consumption and small size.

This type of system has application in private as well as govt. Hospitals, in educational institutes and biomedical research laboratories, military and defense hospitals, where the highly facilitated ICUs are provided.

Till now our project of automatic medicine scheduler is tested as working properly without any trouble, then we should be test project in hospital

5.2 Advantages

Changing the set time
Automatic tray open and close
When we accept the tablet then tray close
We used the PLC internal timer.

5.3 Applications

This type of system has application in private as well as govt. Hospitals.
In educational institutes and biomedical research laboratories.
In military and define hospitals, where the highly facilitated ICUs are provided.

5.4 Future Scope

Interfacing with pc for the storage of data.
We increase the parameter.

ACKNOWLEDGEMENT

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