SERO- The Nurse Robot

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***Abstract*- The main aim of the project is to describe the techniques for analyzing, designing, controlling and improving the health care management system. A line following robot carrying medicine has been designed for providing the medicine to the patient whenever they need it. A-Line follower robot is an electronic system that can detect and follow the line drawn on the floor. Generally, the line is specified a predefined path that can be either visible like a black line on a white surface with a high contrasting colour. IR sensor has been attached to the robot. The line following robot follows the line and got reached near the patient and provide the medicine to the patient with the help of dc motor. An IR sensor also has been attached with the robot so that robot can detect any obstacle on their ways and can alarm. The ability to get someone around the clock is the best thing that this system can do. A unit placed in the patient side measures the patient's body temperature and heartbeat and any variation found there is an emergency message sent to the doctor .the doctor can view the patient's body temperature and heartbeat by an android app and emergency medicine sent to the patient by the robot. This technology focused on the delivery of safe, timely, efficient, effective, patient-centered and equitable health care.**

Index Terms- ATMEGA 2560, ATMEGA 328, Line follower robotics

I. INTRODUCTION

A health care system is defined as the organization of the people, resources and the institute to provide the health care services to the person or population. The goal of health care management system is to provide good health. For maintaining the health different organization, institutes, charities, religious and the government are planning around the world. This health care system also includes the hospitals, health care institution or clinics either these are operated by government, private for profit organization and the fee for the medical practitioners depends on the service, medicine, capitation and the salary of the personnel. And also it is very difficult to continuous monitoring of the patients. Around the world there were thousands of patients are not getting proper health care.

There are around 3.72 lakh nurses in the country and the nurses-population ratio comes to 1:2950.As per the latest data, India stands at 67th rank amongst around 133 developing countries with regard to the number of doctors while in respect of number of nurses, India is at 75th rank the government bodies try to implement various strategies to increase the potency of the health care system but they fail due to some reasons.

So to increase the potency of health care system the continues monitoring of patients are needed. Robot based health care management system can be very efficient to continuous monitoring to the patients, whenever they need any help or medicine Robotics deals with the design, construction, operation, and use of robots, as well as computer systems for their control, sensory feedback, and processing. Robotic technology has gradually penetrated both personal and professional aspects of human lives. Robots have already been used in manufacturing industries, in dangerous environments .Also robotics technologies are used in medical field. For continuous monitoring of the patients, health care system needs many personnel. From which the fee for the medical practitioner will hike. That robot based health care management system can reduce the fee for the patients so that they can easily pay that amount of money.

The medical robot system is designed in such a way to assist bed ridden persons with simple services and such robot is typically confined to patients room in the hospitals. When compared to humans robotic nurses are quicker to train, cheaper to maintain, easier to refuel and repair, able to do very odd and repetitive task. So in this project we are implementing a line follower robot, with the help of

the line follower robot the monitoring of patients can be done for 24 hrs.

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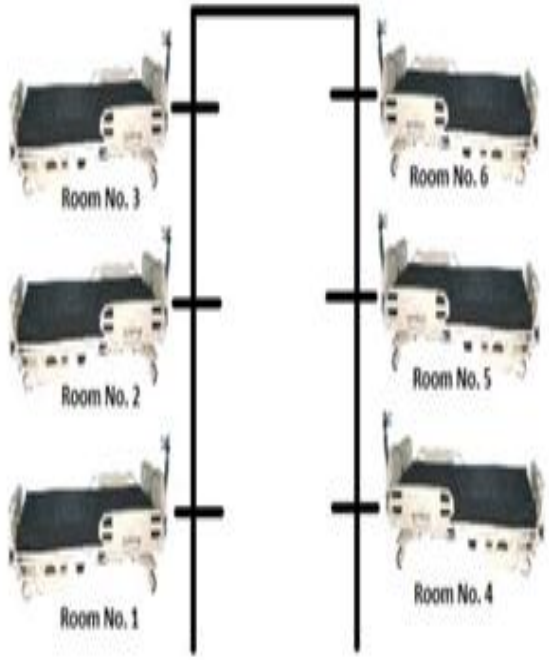

Figure 1:line drawn in hospital wards

got reached near the patient and provide the medicine to the patient with the help of dc motor An IR sensor also has attached with the robot so that robot can detect any obstacle on their ways and can alarm. The ability to get someone around the clock is the best thing that this system can do. A unit placed in the patient side measures the patient's body temperature and heartbeat and any variation found there is an emergency message sent to the doctor.

II .SYSTEM OVERVIEW

The basic circuit of the microcontroller consist of a power supply unit , External Crystal oscillator and a reset circuitry . The power supply consist of a voltage regulator which is used to regulate the voltage to a fixed voltage of 5v .Normally 7805 voltage regulators are used for this purpose. Normally the crystal oscillator provided with the microcontrollers are of 16MHz and to 22pf capacitors are used with the microcontroller as decoupling capacitors for decreasing the noise. The reset circuitry used here consist of a switch and a resistor normally a HIGH signal is present in the mCLR pin of the microcontroller when the switch is pressed a LOW presents at the pin and microcontroller gets reset and as there is a resistor provided in circuit the Vcc and Ground never get direct short while resetting.

The microcontroller consists of an internal ADC module this ADC module is used to convert the ADC reading from the sensor to a digital value. The ADC provided with microcontroller is of 10 bit resolution. which reads value from 0-1023..The Devices which output the analog variation can communicate with controller using this module .The LCD is an external module used to display the details to the user. The LCD communicates with the microcontroller using parallel communication of the data .The data lines are connected to a port of the microcontroller and the control lines RS (register select),E(enable),R/W (read /write),are connected to the corresponding pins

The DS1307 operates as a slave device on the serial bus. Access is obtained by implementing a START condition and providing a device identification code followed by a register address. Subsequent registers can be accessed sequentially until a STOP condition is executed. When VCC falls below 1.25 x VBAT the device terminates an access in progress and resets the device address counter. Inputs to the device will not be recognized at this time to prevent erroneous data from being written to the device from an out of tolerance system. When VCC falls below VBAT the device switches into a low-current battery backup mode. Upon power-up, the device switches from battery to VCC when VCC is greater than VBAT + 0.2V and recognizes inputs when VCC is greater than 1.25 x VBAT. For line sensing and bed detection IR sensors are used

An infrared sensor is an electronic device, that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion.

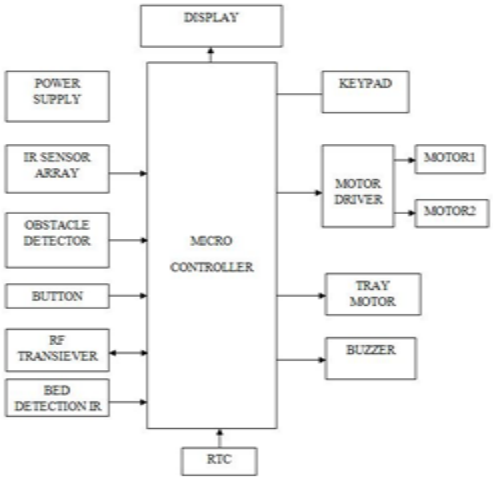

Figure 2: block diagram of robot side

These types of sensors measures only infrared radiation, rather than emitting it that is called as a passive IR sensor. Usually in the infrared spectrum, all the objects radiate some form of thermal radiations. These types of radiations are invisible to our eyes, that can be detected by an infrared sensor. The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode which is sensitive to IR light of the same wavelength as that emitted by the IR LED. When IR light falls on the photodiode, The resistances and these output voltages, change in proportion to the magnitude of the IR light received. Concept of working of line follower is related to light. We use here the behavior of light at black and white surface. When light fall on a white surface it is almost full reflected and in case of black surface light is completely absorbed. This behavior of light is used in building a line follower robot.

If it mostly contains numbers then it can also be called a numeric keypad. Keypads are found on many alphanumeric keyboards and on other devices The rows R0 to R3 are connected to Input lines of Microcontroller. The i/o pins where they are connected are made Input. The column C0 to C3 are also connected to MCUs output line. . We can read the Value of R0 to R3 to get their pressed status. If they are high the button is NOT pressed. As we have enabled internal pull-ups on them, these pull-ups keep their value high when they are floating (that means NOT connected to anything). But when a key is pressed it is connected to LOW line from the column thus making it LOW. After that we make the C0 High Z again and make C1 LOW. And read R0 to R3 again. This gives us status of the second column of keys. Similarly we scan all columns. When this function is called, it waits until some key is pressed and released. When released it returns number corresponding (1– 16) to the pressed key. If no key is pressed, it will return 0. If more than one key is pressed, the function waits until all pressed keys are released and returns number corresponds to first pressed key. Port need to be initialized before calling this function.

Here L293D is used as motor driver. The L293 and L293Dare quadruple high-current half-H drivers. The L293 is designed to provide bidirectional drive currents of up to 1 A at voltages from 4.5 V to 36 V. The L293D is designed to provide bidirectional drive currents of up to 600-mA at voltages from 4.5 V to 36 V. Both devices are designed to drive inductive loads such as relays, solenoids, dc and bipolar stepping motors, as well as other high-current/high-voltage loads in positive- supply applications.

All inputs are TTL compatible. 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 (orbridge) reversible drive suitable for solenoid or motor applications.

L293D contains two inbuilt H-bridge driver circuits. In its common mode of operation, two DC motors can be driven simultaneously, both in forward and reverse direction. The motor operations of two motors can be controlled by input logic at pins 2 & 7 and 10 & 15.Input logic 00 or 11 will stop the corresponding motor. Logic 01and 10 will rotate it in clockwise andanticlockwise directions, respectively.

Enable pins 1 and 9 (corresponding to the two motors) must be high for motors to start operating. When an enable input is high, the associated driver gets enabled. As a result, the outputs become active and work in phase with their inputs. Similarly, when

the enable input is low, that driver is disabled, and their outputs are offand in the high-impedance state

Piezo buzzer is an electronic device commonly used to produce sound. Light weight, simple construction and low price make it usable in various applications like car/truck reversing indicator, computers, call bells etc. Piezo buzzer is based on the inverse principle of piezo electricity discovered in 1880 by Jacques and Pierre Curie. It is the phenomena of generating electricity when mechanical pressure is applied to certain materials and the vice versa is also true. Such materials are called piezo electric materials. Piezo electric materials are either naturally available or manmade Piezoceramic is class of manmade material, which poses piezo electric effect and is widely used to make disc, the heart of piezo buzzer.

A temperature sensor is a device that gathers data concerning the temperature from a source and converts it to a form that can be understood either by an observer or another device. These sensors come in many different forms and are used for a wide variety of purposes, from simple home use to extremely accurate and precise scientific use. They play a very important role almost everywhere that they are applied; knowing the temperature helps people to pick their clothing before a walk outside just as it helps chemists to understand the data collected from a complex chemical reaction .The best known example is the mercury-in-glass thermometer. Mercury expands and contracts based on changes in temperature; when these volume changes are quantified, temperature can be measured with a fair degree of accuracy. The outside temperature is the source of the measurements and the position of the mercury in the glass tube is the observable quantification of temperature that can be understood by observers. Typically, mercury-in-glass thermometers are only used for nonscientific purposes.

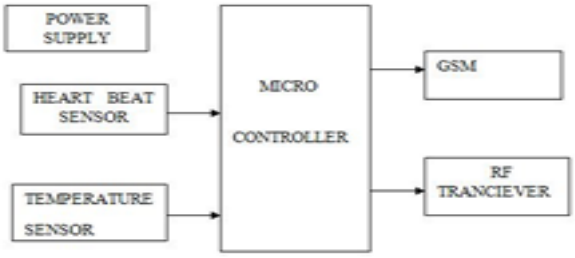

Figure 3:block diagram of patient side

III. ANALYSIS AND EXPERIMENTAL RESULTS

A prototype of the system architecture is developed with microcontrollers,2 wheels(DC stepper motor), set of sensors and obstacle detection unit .The patient side system continuously measuring the heartbeat , blood pressure and temperature of the respective patients and sending emergency alert message to the doctor if any emergency condition is occurred. By using motor driver it follows the line drawn on the floor.. DC motor must be controlled by the motor driver for movement of the robot. For left movement the left side dc motor should be stop and the right side dc motor should be run in forward direction. When the system detects any obstacle in its path then the dc motor stop rotating and a buzzer is activated with the help of microcontroller unit. Microcontroller can be use for controlling the health care system in every possible case. The robot sensing the black line drawn in the white surface with the help of 5 IR sensors and moving through the black line and providing medicines to respective patients according to the default settings given by the assistant.

Robot and patient sides are connected through wireless, if any emergency condition occurs the patient side unit give alert to doctor as well as the robot, thus the robot starts to move and provide emergency medicine to the patient.

Figure 4: prototype of robot

Figure 4: prototype of patient side

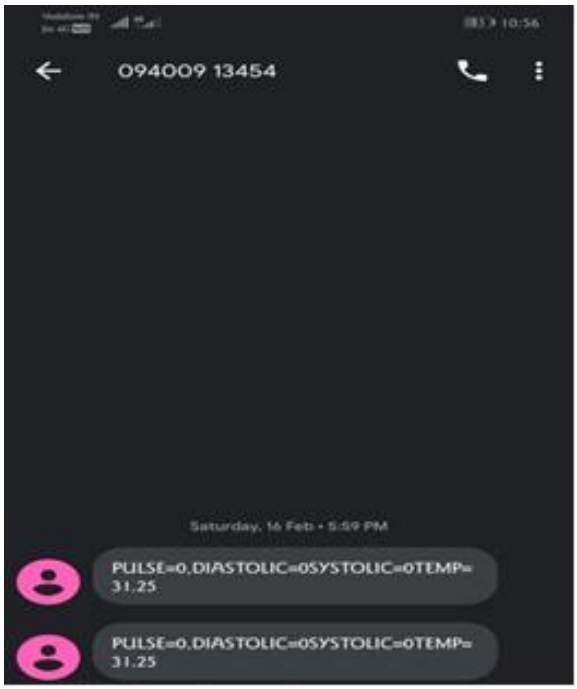

Figure 6: sample emergency message

IV. RELEVANCE

To improve the overall efficiency of the health care system our robot plays a relevant role .it helps to reduce the workload of nurses and give the emergency alarms in proper manner. And this helps to get the patient condition in a period of time so that the nurses and doctors can monitor the patient condition continuously.

V.CONCLUSION

The cost of health care majorly depends upon the expensive machinery, land and building and round the clock staff to maintain and use that machinery. In a country like India where the population is humongous and resources are scarce. It becomes really difficult to set up such a capital extensive project at each and every location with availability of skilled staff. So what this system provides is an alternate to the existing system by replacing skilled labor with robotic machinery, which in turn can handle more patients in less time with better accuracy and a lower per capita cost.

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VII. ACKNOWLEDGEMENTS

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