IOT Based Electronic Valve System with Quantitative Control And Patient Monitoring

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Abstract- *The Automated glucose flow control and monitoring system is about monitoring the flow of glucose automatically. Whenever if patients got too much tiredness that time nurse will put the glucose bottle for the recovery patients. While putting the glucose bottle she only has to control the flow of glucose amount. If the glucose bottle got empty means nurse should be there to replace or remove the bottle. But this won't happen every time. In case nurse is not there that time patient body blood will have chances to flow in reverse direction into the bottle. By using this monitoring system we can monitor the glucose flow. In this system we will take glucose bottle weight into consideration. For taking the weight of the bottle we use Weighing scale. According to the weighing scale reading tamper will control the flow of glucose. If the bottle got empty means stopper will close the bottle nozzle so blood won't come in reverse direction into the bottle. In this paper we are monitoring the Glucose monitoring system and also some applications of patient monitoring system.*

Keywords- ARM LPC2148, Temperature sensor, Pulse sensor, Flex sensor, Load cell, Wi-Fi, Solenoid valve

I. INTRODUCTION

Health monitoring systems integrated into a telemedicine system are novel information technology that will be able to support early detection of abnormal conditions and prevention of its serious consequences. Many patients can benefit from continuous ambulatory monitoring as a part of a diagnostic procedure, optimal maintenance of a chronic condition or during supervised recovery from an acute event or surgical procedure. Even there are situation that the patients should be monitored continuously for certain parameters. Electrocardiograph is a transthoracic interpretation of the electrical activity of the heart over a period of time, as detected by electrodes attached to the surface of the skin and recorded by a device external to the body.

In order to achieve the function of the quantitative control in a variety of flow systems, a new type of electronic valve with quantitative control is designed. The valve collects flow pulse signal from the impeller Hall flow sensor. Micro controller chip is used to calculate the flow value and cumulate the total value. It`s also used to control relay in order to real-time control solenoid valve. Electronic valves have been widely used in production and daily life. Now electronic valves are moving towards four directions of streamlining, intelligent, generalization and customization. Except for switch function of basic solenoid valve, dedicated solenoid valves also have some kind of special function or apply to some special occasions, such as gas solenoid valves, steam solenoid valves, oil solenoid valves, refrigeration solenoid valves, high temperature solenoid valves and explosion-proof solenoid valves and so on.

The wearable health monitoring system provides the communication between the wearable sensor nodes and relay nodes in the proximity even during the movement of the user, allowing for real-time monitoring of biometric signals. The overall system is depicted in block diagram and it consists of three components: the wearable vital sensor node, a relay node, and host computer monitoring the user. The wearable vital sensor node measures and processes the ECG signal, removing the noise and transmitting the processed signal. The relay nodes are used to increase the limited communication range of the wearable vital node, and they are installed on the ceiling of the room.

In this paper we are interfacing a load sensor to the ARM microcontroller; this load sensor will sense the weight of the chemicals and displayed it on the LCD display. In the next stage we are giving a flow input in ml/sec, in one second a particular quantity of chemical should go to the outlet this will be controlled by a solenoid valve.

This paper can be implemented in automatic flow control of glucose in hospital, in physical vapour deposition, in chemical supply control of plants which grows in water (hydroponics).

II. LITERATURE SURVEY

Prof. Fan Yang, described the proper research In order to achieve the function of the quantitative control in a variety of flow systems, a new type of electronic valve with quantitative control is designed. The valve collects flow pulse signal from the impeller Hall flow sensor. STM32 chip is used to calculate the flow value and cumulate the total value. It's also used to control relay in order to real-time control solenoid valve. The communication network of upper and lower computer is built through the serial port of STM32, which achieves remote real-time monitoring between the upper computer and multiple quantitative control valves. Experiment results show that the electronic valve has a high precision and the error is less than 2.5%.

Prof. shuxiang Guo describes about the solenoid actuator based novel type micro pump, In the medical field and in biotechnology, a new type of micro pump that can supply micro liquid flow has urgently been demanded. It is our purpose to develop a novel type of micro pump that has the characteristics of flexibility, driven by a low voltage, good response and safety in body. In this paper, we propose a new prototype model of a micro pump using solenoid actuator as the servo actuator. This paper describes the new structure and the motion mechanism of a micro pump using a solenoid actuator and discusses the possibility of the micro pump. This micro pump consists of two one-way valves, a pump chamber made of elastic tube, and a casing. The overall size of this micro pump prototype is 18mm in diameter and 54mm in length. Characteristic of the micro pump is measured. The experimental results indicate that the micro pump has the satisfactory responses, and the proposed micro pump is able to make a micro flow and is suitable for the use in medical applications and in biotechnology.

Prof Jingguo wen describes the demonstrates an example of the solenoid valve driver scored on AVR microcontroller. With a discussion over the system's hardware architecture, we further explain the communication protocol between the module and system controller, as well as the corresponding software control process. Besides, we illustrate the reliability and flexibility of our design in both the software and hardware phases. The driver module has proved effective and satisfying in practices on related projects.

Prof. Takalkar Atual S describes about This paper deals with design of nozzle/diffuser and the use of piezoelectric effect for the actuation of diaphragm of valve-less micro pump which has application in medical field for drug delivery. A three dimensional FE model of nozzle/diffuser and actuator is used for numerical simulation. Fluid flow analysis of nozzle/diffuser is performedtocalculatetheirefficiencyandfrequency.Thesimulati onisperformedforvariableconverginganddivergingangle by varying their length and width to calculate steady flow rate. Analysis of actuator unit is also carried out by using the COMSOL multi-physic software. The simulation of actuator unit depends on mechanical properties of material such as Young's modulus, Poisson's ratio. The numerical result used to predict the actual behavior of actuator unit for higher frequency range which helps in proper selection of material. The comparison between analytical and numerical results is done which helps in predicting the flow rate and actual working of micro pump.

III. OBJECTIVE

Monitoring temperature and pulse of the patient, transmitting patient related parameters to PC using LORA sensor. In existing system, patient monitoring in late nights is difficult. Reverse flow of blood occurs when bottle gets empty and there will be no communication between doctor and patient. In proposed system Interfacing of load sensor, LCD, keypad and measuring the weight of fluid in milliliter. Interfacing of relay, solenoid valve and verifying the functionality, Interfacing hall flow sensor and inlet, outlet and verifying the flow rate and verifying flow rate for different cases.

IV. BLOCK DIAGRAM

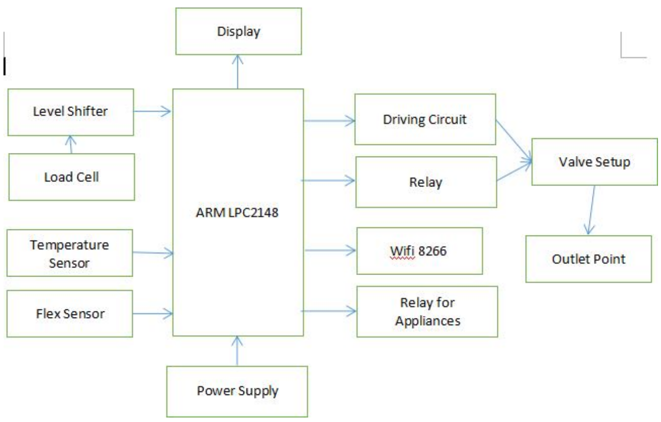


Fig 1: Block Diagram

As shown in Fig 1 the diagram consists of a ARM LPC2148, Temperature sensor, Pulse sensor, Flex sensor, Solenoid valve and ESP8266 WIFI module. In this Electronic valve system we interface the load sensor, LCD, keypad and measuring the weight of fluid in mill-liter. The relay and solenoid valve will be used to verify the functionality. The hall flow sensor and inlet, outlet will verify the flow rate for the different flow rate cases. Then all the information is displayed on the LCD screen and it sends all the data to the Android app through the WIFI Module. When drips is given to the patient, load cell continuously measures the weight of the fluid present in the bottle and sends it to the ARM controller. ARM controller processes the data obtained from the load cell and updates the doctor continuously and also receives commands from the doctor and invokes the driving circuit by sending instructions that is either to reduce the flow rate or to completely close the valve when the bottle is empty and it doesn't receive any command from the doctor**.** Temperature sensor senses the patient's body temperature. Blood Pressure senses the patient's blood pressure and this information is sent to the ARM and from there it gets displayed on the LCD. Communication between the doctor and the device i.e. sending and receiving of messages happen through Wi-Fi.

V. METHODOLOGY

Hardware requirements: ARM7, LPC2148, Relay, Temperature sensor, Pulse sensor, Flex sensor, Solenoid valve, ESP 8266 WIFI communicator, Load sensor.

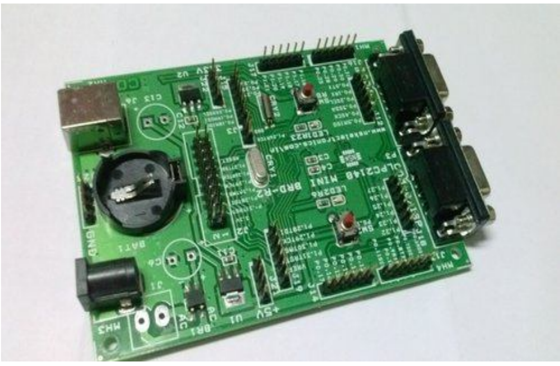


Fig 2: ARM

Software requirements: Kiel an ARM Company makes C compilers, macro assemblers, real-time kernels, debuggers, simulators, integrated environments, evaluation boards, and emulators for ARM7. Kiel development tools for the 8051 Microcontroller Architecture support every level of software developer from the professional applications engineer to the student just learning about embedded software development. When starting a new paper, simply select the microcontroller you use from the Device Database and the µVision IDE sets all compiler, assembler, linker, and memory options for you. Kiel is a cross compiler.

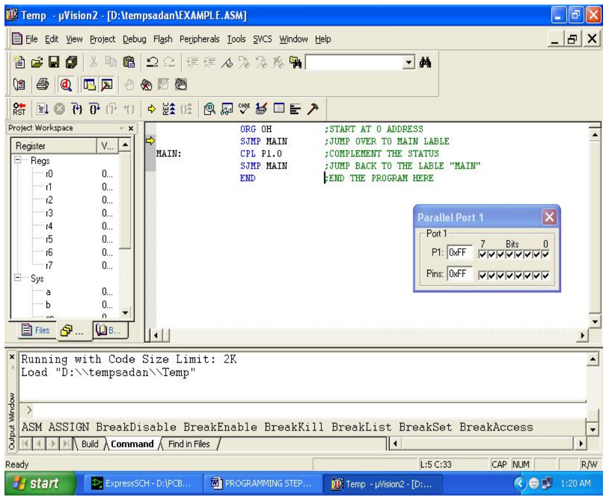
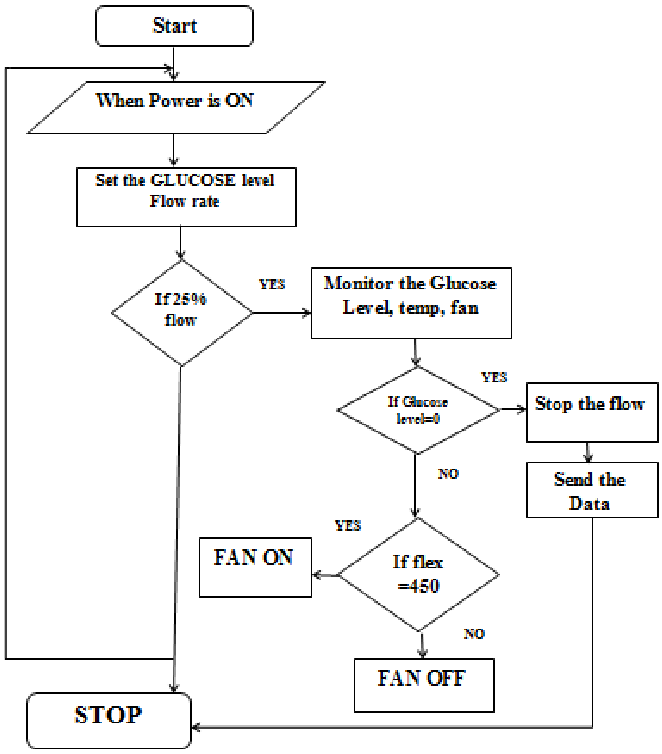


Fig 3: Keil Software

VI. FLOW CHART



VII. PROPOSED MODEL

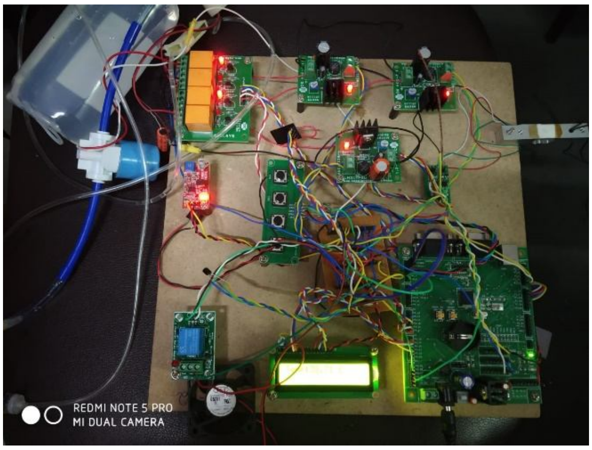


Fig 4: Proposed Model

In this paper, the weight of the glucose bottle is measured by using a load cell and displays the output on LCD. If the weight of the glucose bottle is below 30ml the flow of the liquid in a bottle is stopped. And we measure the body temperature of the patient and the output displays on LCD. Flex sensor is used for switching application like fan on and off etc. We design a electronic valve to control the flow of liquid in a different flow rates.

VIII. TEST CASE OF PROPOSED MODEL

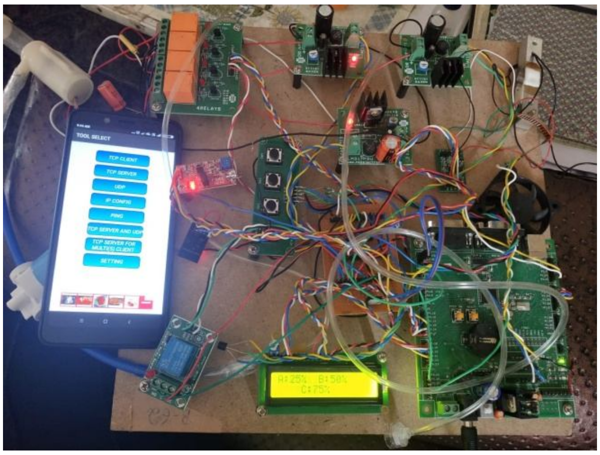


Fig 5: Input case of proposed model

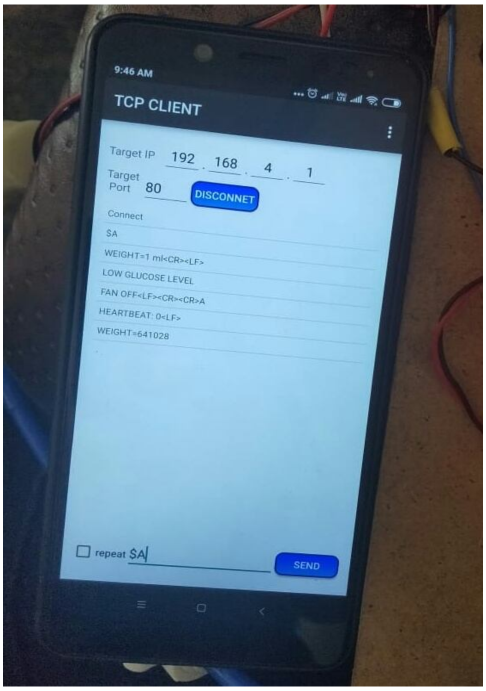
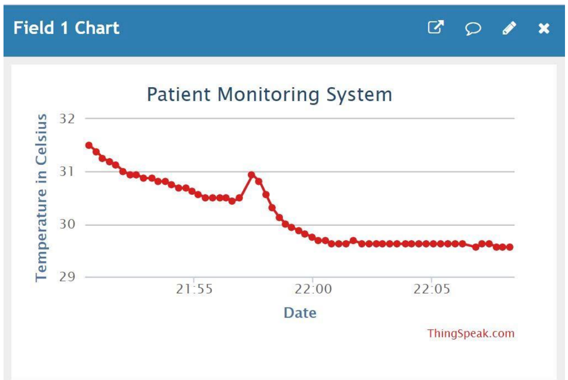


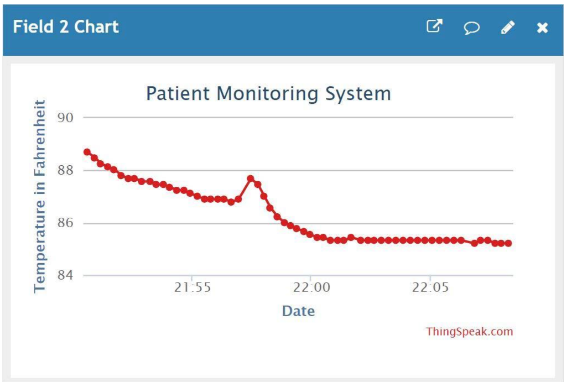
Fig 6: Android App outcomes

IX. RESULT

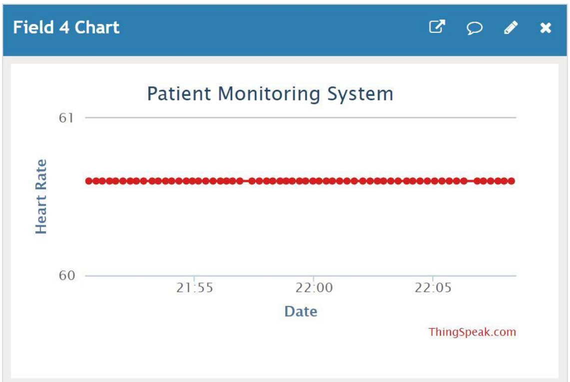
The system works perfectly with the below mention setup. Fig.6 shows the graphs generated in cloud from the readings taken from the sensors. It also analyses the values of the temperature and heart rate.



(a)



(b)



(c)

Fig: 7 (a) Temperature in Celsius, (b) Temperature in Fahrenheit, (c) Heart rate.

X. APPLICATIONS AND ADVANTAGES

APPLICATIONS: In hospitals, it is used in measurement of glucose level, Measuring pulse rate along with monitoring and transferring the patient data to doctor. In industries, it is used in emergency conditions and in any process control system.

ADVANTAGES: Quantitative control, Automatic control of valves, Available with different flow rate, Less power consumption, portable, Good precision.

XI. CONCLUSION

This proposed system basically controls the Electronic valve with Quantitative control system, In order to realize the flow control in drip, as a small, compact and advanced technology in the medical field. Here the continuous flow of medicine through drip to the patient is automatically controlled for three different flow rates that is 25 %, 50%, 75% of the cannel pipe. The proposed model implemented using manual switches to control the flow rate of saline, the same model can be achieved using IOT concepts. Here IOT replaces manual switches by software like user friendly mobile apps so that doctors can control flow rate by sitting at place. IOT concept models can be implemented for remote destinations like villages. Doctors can sit in a different city, different floor of a building or in their house and patient can be anywhere, monitoring and flow rate controlling can be done. Using same IOT concepts one doctor can monitor several patients report on the mobile app or computer screen so one doctor can monitor several patients.

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