ELECTRONIC VALVE SYSTEM WITH QUANTITATIVE CONTROL

Chandana S[1], Deepashree R[2], Hemavathi KG[3], Prathima.V[4], Sumitha Manoj[5]

[1]B.E Student, ECE, RRCE, Karnataka, India
[2]B.E Student, ECE, RRCE, Karnataka, India
[3]B.E Student, ECE, RRCE, Karnataka, India
[4]B.E Student, ECE, RRCE, Karnataka, India
[5]Asst Prof , ECE, RRCE, Karnataka, India

ABSTRACT

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. The System Consists of ARM LPC2148 microcontroller, Load Cell, Valve, Keypad, Relay, GSM 900 and ESP8266. Drip bottle weight is measured using a electronic load cell and information about it will be sent to the Doctor through GSM technology. For demonstration purpose we are Sending data to basic android Mobile App. When bottle gets to threshold level it intimates to doctor and hospital faculty. Doctor can control the flow rate by sending commands from phone. When the bottle weight gets completely empty ARM controller sends the command to Valve mechanism such that it will be blocked and there will be no reverse blood flow. Doctor can alter the value even in their absence by using the technology of GSM and IOT. For further extension the project is implemented with several sensors. Temperature Sensor is used to monitor the body temperature, Pulse sensor measures the heart rate, Blood Pressure sensor measures patients BP level, sugar level will be examined by Glucose sensor and Accelerometer in order to detect the different gestures of patient

KEYWORDS : *Patient monitoring , Electronic Valve Setup, GSM Technology, and Quantitative control.*

1. INTRODUCTION

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 Load 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 valve setup. 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 valve setup, dedicated valve setup also have some kind of special function or apply to some special occasions, such as gas valve setup, steam valve setup, oil valve setup, refrigeration valve setup, high temperature valve setup and explosion-proof valve setup and so on. In this project we are interfacing a load sensor to the ARM micro controller, 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 valve setup. In order to give more information about patient to the doctor, we are using sensors like Temperature sensor , BP sensor, Pulse sensor and Glucose sensor. This project 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).

1.1 PROBLEM STATEMENT

In existing system, monitoring of patients is done by manual process which might results to reverse flow of blood during drips process. When bottles get empty and if faculties are not aware of it, it might end up with reverse flow. Manual process cannot achieve accuracy especially in drips bottle management .Patients monitoring in late night is difficult and communication between doctor and patient is less.

1.2 PROPOSED SYSTEM

Interfacing of load sensor which measures the fluid weight in drips process and information about it is sent to Doctor, where Doctor can control the flow rate by sending commands from phone using IOT. Interfacing of electronic valve system, when the bottle weight gets completely empty , ARM controller sends the command to Valve mechanism such that it will be blocked and there will be no reverse blood flow solution. Interfacing of temperature sensor is used to monitor the body temperature after drip is injected to patient. If the temperature detects low values then also valve will be closed and it will be intimated to doctors. Interfacing of pulse sensor and Blood pressure sensor to check the patient BP and Heart rate which is also sent and displayed to attenders and Doctors digitally. Similarly Glucose sensor is used intimate sugar level .Interfacing of Accelerometer and Relay is used to detect live gestures of patients and controls appliances respectively. Interfacing of GSM for transferring the above parameters information for attenders and respective Doctors using basic android mobile app.

2. BLOCK DIAGRAM

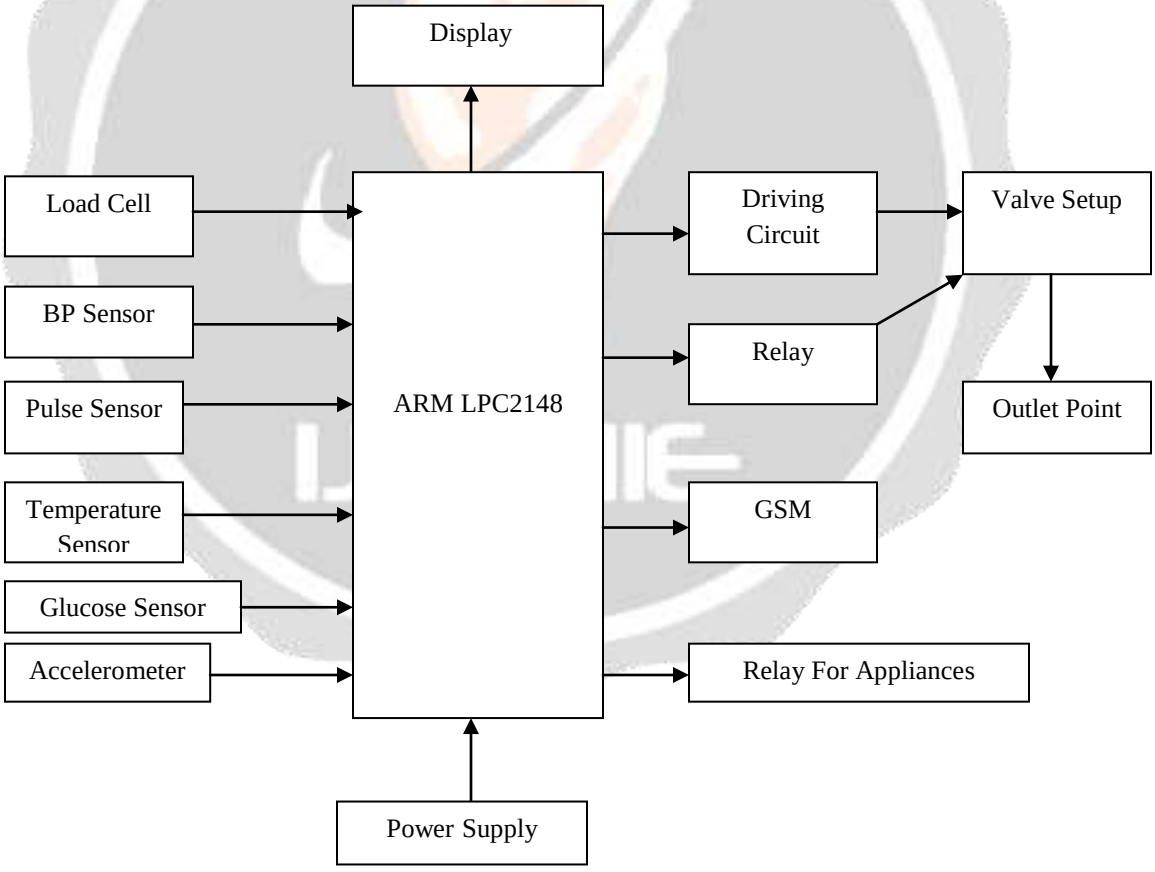

Fig-1: ELECTRONIC VALVE SYSTEM WITH QUANTITATIVE CONTROL

3. RECEIVER

Fig-1: Reciever

This block diagram consists of ARM micro controller, a GSM MODEM, LCD Display, Relay and sensors. The LPC2148 microcontrollers are based on a 16-bit/32-bit ARM7TDMI-S CPU with real-time emulation and embedded trace support, that combine microcontroller with embedded high speed flash memory ranging from 32 KB to 512 KB. Load cell is a type of transducer which performs the functionality of converting force into an electric output which can be measured. It makes use of different operating principles namely pneumatic ,strain gauge and hydraulic load cells. These load cell are usually attached to support beam or structural bearing of an application which endures pressures and stresses. The SIM900 is a complete Quad-band GSM/GPRS solution in a SMT module which can be embedded in the customer applications. Featuring an industry-standard interface, the SIM900 delivers GSM/GPRS 850/900/1800/1900MHz performance for voice, SMS, Data and Fax in a small form factor and with low power consumption. With a tiny configuration of 24mm x 24mm x 3mm, SIM900 can fit almost all the space requirements in your M2M application, especially for slim and compact demand of design.

The LM35 is an integrated circuit sensor that can be used to measure temperature with an electrical output proportional to the temperature (in °C). The LM35 does not require any external calibration or trimming and maintains an accuracy of +/-0.4°C at room temperature. Another important characteristic of the LM35 is that it draws only 60 micro amps from its supply and possesses a low self-heating capability. You can measure temperature more accurately than using a thermistor. The LM35 generates a higher output voltage than thermocouples and may not require that the output voltage be amplified. An accelerometer is an electromechanical device used to measure acceleration forces. Such forces may be static, like the continuous force of gravity or, as in the case with many mobile devices, dynamic to sense movement or vibrations he piezoelectric effect is the most common form of accelerometer and uses microscopic crystal structures that become stressed due to accelerative forces. These crystals create a voltage from the stress, and the accelerometer interprets the voltage to determine velocity and orientation. Typical accelerometers are made up of multiple axes, two to determine most two dimensional movement with the opinion of a third for 3D positioning .Pulse sensor is used to test heart rate sensors or mobile terminal developers can develop heart-related and interactive works. Sensors can be worn on the finger or earlobe, it also has an open-source app program, you can put your real-time heart rate displayed by the graph. Power supply voltage: 3V/5V . The blood pressure sensor is a non-invasive sensor designed to measure human blood pressure. It measures systolic, diastolic and mean arterial pressure utilizing the oscillometric technique. A relay is an electrically operated switch. Relays are used where it is necessary to control a circuit by a separate low power signal, or where several circuits must be controlled by one signal.

2.1 WORKING PRINCIPLE

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 I.e. 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. BP sensor senses

the patient's blood pressure and this information is sent to the ARM and from there it gets displayed on the LCD. Accelerometer is connected to the patient's body and based on the movement of the device, ARM sends instructions to the relay which operates the appliances and thus, operation of power devices becomes easier for the patient. Communication between the doctor and the device i.e. sending and receiving of messages happen through GSM.

3. CONCLUSION

The quantitative control electronic valve system designed in this paper collects the flow information by the load sensor and converts it to pulse frequency information. ARM microcontroller is used to process the pulse signal and control the electronic valve. Quantitative control according to the default flow value and the display of the real-time flow value are achieved. Meanwhile, this system also builds a communication network between doctor and the patient through the GSM. The experiment described in this paper is carried out in cold water supply system. It shows that the control error of this quantitative control system is very small. Therefore, this system can be used in most industrial and medical applications.

4. REFERENCES

[1] Takalkar Atul S, Lenin Babu M C "Characterization of Valveless Micropump for Drug Delivery by Using Piezoelectric Effect" IEEE International Conference on Advances in Computing, Communications and Informatics 2016.

[2]. Fan Yang, Yu Wang "Research of the New Electronic Valve System with Quantitative Control" IEEE Third Global Congress on Intelligent Systems, 2012.

[3]. Jingguo Wen, Zisheng Lian " Electro-Hydraulic Control System for Hydraulic Supports About the Study on Solenoid Valve Driver" IEEE International Conference on Computing, Measurement, Control and Sensor Network ,2012

[4]. Lu Quan, Sen Bao, Hong Li Jun " Research on Embedded Electro-hydraulic Proportional Valve Controller" IEEE Third International Symposium on Intelligent Information Technology Application,2009.

[5]. Shuxi ng Guo, Jian Wang, Qinxue Pan and Jian Guo "Solenoid Actuator based Novel Type of Micropump" IEEE International Conference on Robotics and Biomimetics,2006