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A LOW COST AUTOMATED FLUID CONTROL DEVICE USING SMART PHONE FOR MEDICAL APPLICATION

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➢ ***Abstract*— The design and implementation of an automated liquid observation was analyzed in this paper. The PIC Microcontroller platform has been used as controlling unit for providing necessary control along with a 3×4 matrix keypad. Bluetooth module is used to control the drop per minute manually and by using an android phone. The designed flow sensor will be hooked up to the drip chamber of the saline container to determine the saline flow rate as well as an accurate number of a drop of the saline. The obtained outputs from the sensor are continuously checked with the given command and if any mismatch is found. The microcontroller moves the motor control to modify the circulation rate to balance with assigned command.**

Keywords—automatic fluid control; saline monitoring and controlling device; arduino mega; android

I. INTRODUCTION

In today's population there is a great concerned about our health. In medical world there is a tremendous success has been observed with rapid development in sensors, microcontrollers, and computers and prompt development. There are numerous technology are innovated for the advancement of already existing system. even though there are many researches and development of saline monitoring and controlling device for the betterment of people's health care. Some monitoring device has been developed using the android smartphone, ZigBee and IOT.

The main intension of this paper is to aid the regular life of a affected person developing through an automated price affordable saline tracking and control method because it is important to control the saline flow rate for different patients. The circulation flow rate depending on the physical condition of the patient such as heart rate as well as the pulse rate , body mass, blood pressure , heart range of the patient's body.

The technologies are transforming further than one's visualization. The main objective of this paper is to demonstrate an automated saline flow monitor which is able to measure the saline drop rate.it is a supervising method which is very helpful to physician to keep monitoring of the circulation rate by pressing keypad. It exactly gives the information about the rate flow and how many drops required per minute. This reduces the constant tracking of the physician.

Regular saline is usually called as a sterile solution of sodium chloride (NaCl) in standard water. The sodium chloride sterile solution is utilized to get nasal irritability, rinsing out contact lenses, into the vein infusion and to cleanse a fresh piercing. Regular Saline is frequently used in intravenous drips or the patients who are not able to have liquids by mouth as well as tend to be in threat of leading to dehydration or hypovolemia. Regular saline consists of 9 grams of NaCl, and also the osmotic agent of NaCl is usually 0.93. The quantity of Regular Saline consumption by the patient completely relies upon the physical state of the patient but usually, it is among 1.5 to 3 liters per day for a mature person.

In hospital the flow the saline drop is checked continuously by the nurse are health care worker. But the current method for controlling the saline level is automatically tracking and gives time annoying the main goal of the proposed system is to offer affordable price hassle-free, simple and easy to implement.

II. OVERVIEW OF PROPOSED SYSTEM

After many observation from many paper there is no automated control, of saline drop and it was seen that contains many complex modules and circuit that cost is much high. There is no automated flow control of saline in previous system. But now in the proposed system there is an automated control of the rate flow of the saline and it reduces the stress of the doctor or nurse to continuously observed the flow rate of saline.

The block diagram of proposed system is shown in figure 1. The system will be able to control the flow rate automatically

according to the command given to the device by the user. A flow sensor will be developed and employed to the drip chamber of the saline bottle to determine the circulation rate of the saline.

Once command will be given to the device it will continuously check the flow rate and balance with the command given by the user. A water drop flow detector sensor will detect the water drop accurately. Error reading can be determined by signal conditioning circuit and will be removed by an isolator circuit.

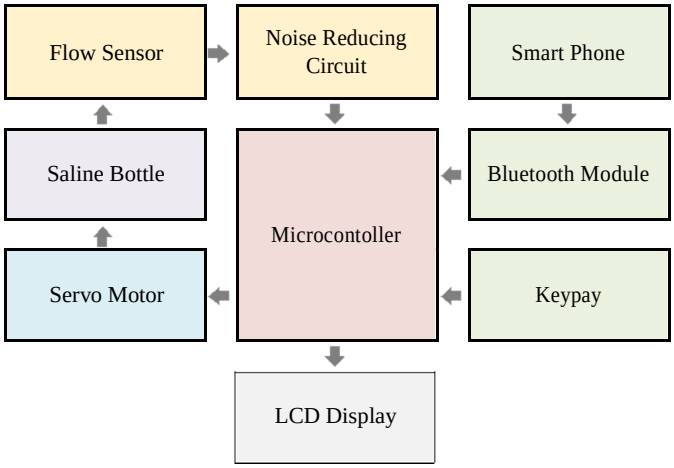

Fig. 1. Block diagram of proposed automated fluid control device

III. IMPLEMENTATION OF PROPOSED SYSTEM

In this model given in fig.2 we need to implementation one micro controller to control and monitor the flow of the signal. There are so many types of microcontrollers in this project we used PIC16F877A. There are so many PIC devices like PIC16F873A, PIC16F876A, PIC16F874A. The peripheral features of this PIC 16F877A is 3timer and is has a synchronous serial port with master and slave mode. It's a Universal Synchronous Asynchronous Receiver Transmitter(USART/SCI) and Parallel Slave Port(PSP)- 8 bits wide. VLN2803 has 18 pin in this 1-8 pins are used as input supply 9 pin ground, 10 pin VCC and the remaining pins are used as output.

Flow sensor will detect drops of liquid and the detected signal will be transmitted to the microcontroller. The microcontroller will calculate the time between two drops to determine drop per second and give the command to LCD display for displaying the fluid flow rate. According to the command given by the user via Android operated smartphone using Bluetooth or manual keypad, the microcontroller will compare the given command with the actual flow rate. According to the command, the microcontroller will control a servo to rotate a valve clockwise or anti-clockwise rotation to increase or decrease the gap between valve and pipe for controlling the liquid flow. The valve will be mounted on the shaft of the servo and able to increase its depth smoothly from 0^o and become about the diameter of the saline pipe at 180^o.When the servo will rotate from 0^o to 180^o the saline pipe will be pressed and released to control the liquid flow.

A. Circuit diagram of the proposed System

Figure 3 shows the implementation diagram of a fluid control device consists of the flow sensor, signal conditioning circuit, keypad, servo with valve, LCD display, Arduino Mega 2560 and Bluetooth module.

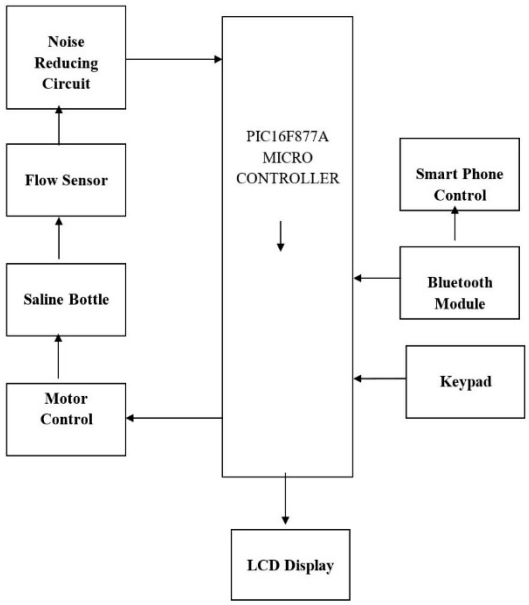

Fig .2 Proposed system circuit diagram

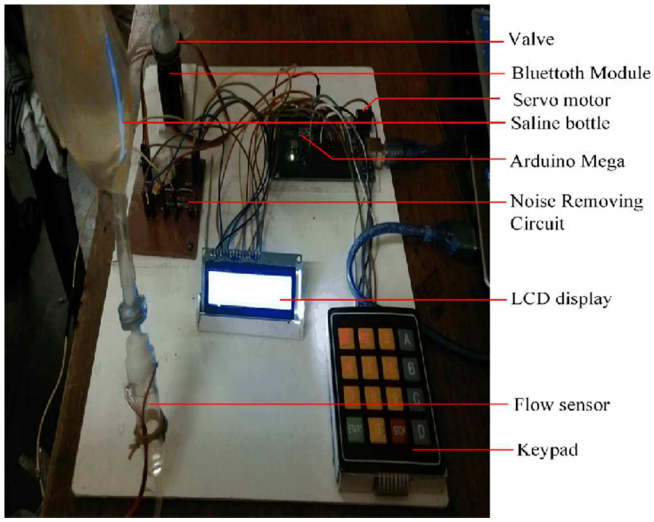

Fig. 3. Implementation of proposed Automated Fluid Control Device

D. Software Design

An android app has been developed using Android Studio for pairing the smartphone with the developed system. The user interface of the android app is illustrated in fig 4.

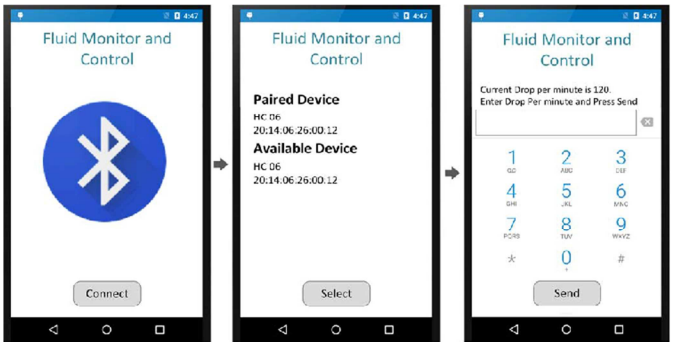

Fig. 4. User Interface of the android app

Programming of the microcontroller is developed based on the flow chart shown in Fig 5. The flow chart of fluid control device shows that at first, the PIC is needed to give the command to the display and Bluetooth module to show the text “Enter number of drop per minute” on an android phone so that user can enter the number of drop per minute as wish. After entering the number Arduino continuously reads the flow sensor. When the sensor detects the first drop, the timer starts time and when the next drop will be detected by sensor, the timer will stop the time. Time will be calculated per minute and it will be compared with the flow rate given by the user.

When actual flow rate has been greater than the command then servo has rotated anti-clockwise to reduce the flow rate and if the actual flow rate has been less than the command then servo has rotated clockwise to reduce the gap between valve and pipe. When both have been equal, servo has remained stop as well as the gap between valve and pipe to keep flow rate same. The loop has been continuously checked the actual flow rate of fluid and control the servo motor to rotate the valve along with wheel to control the flow of fluid automatically.

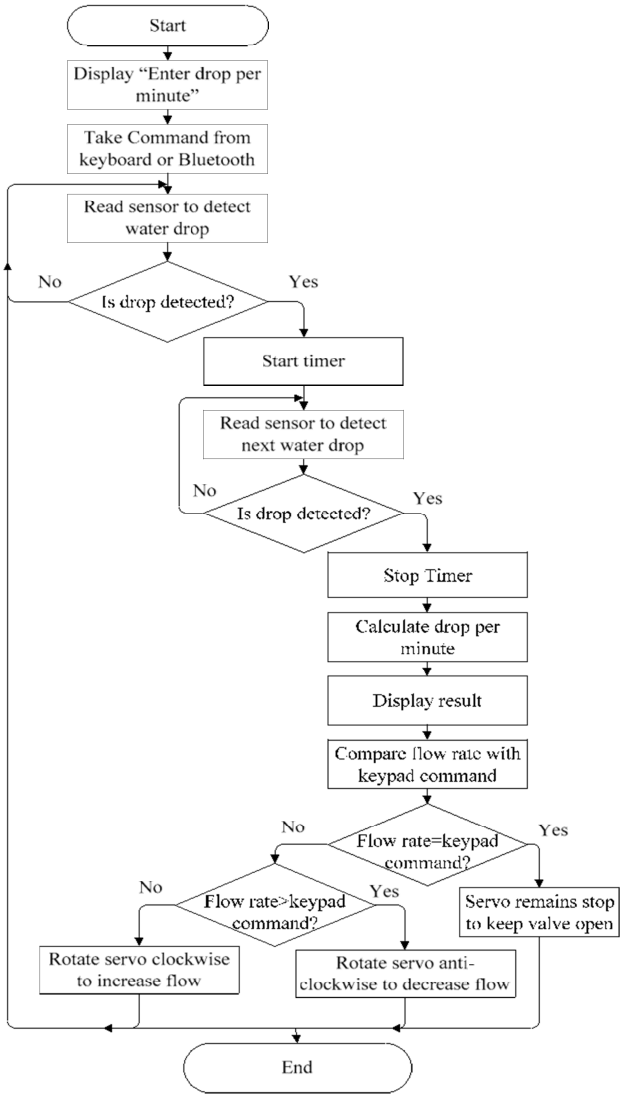

Fig. 5. Flowchart of Programming

IV. PERFORMANCE ANALYSIS OF DEVELOPED SYSTEM

The developed system has shown satisfactory results by performing applications properly. Monitoring of present liquid flow rate has been done using LCD monitor and also the flow rate information has been shown on the smartphone. Android phone and the keypad has shown the capability to input the command (drops per minute) by the user according to their requirement. Each number pressed by the user can be seen on the display so the user would able to confirm that the number has been pressed is correct. Initially, servo has remained at some angle so that a small water could flow through the saline pipe.

When the user has pressed the start button, the microcontroller has started to read the flow sensor. When the drop has been detected by the sensor, the timer has started to count time and at the same time microcontroller has started to read the sensor for detecting next drop. When next drop has been detected, timer has stopped and time between two drops has been calculated at the same time.

V CONCLUSION AND DISCUSSION

Due to a combination of the two important disciplines of medicine and engineering, the medical facility and treatment have achieved a rapid advancement and development. The progress in medical care has been rapid In order to design a fluid control device, the main difficult was to design a device which responses correctly as well as rapidly and design of sensor to detect the fluid drop. However in this project flow sensor which consists of two metal wires were placed much closer to each other. This sensor was very sensitive and was able to detect any types of fluid with different colors and responded very quickly as compared to the sensor available in the market. The device can be used in the medical application as well as in chemical lab where the very accurate flow of fluid is required. The device is reliable and therefore, can be used effectively. Once the command is given to the device it keeps the flow rate constant regardless of the level of water from the patient. This low-cost medical device may have potential use for patient health care, especially in developing countries like Bangladesh.

VI REFERENCES

[1] C.C. Gavimath, Krishnamurthy Bhat, C.L. Chayalakshmi, R. S. Hooli and B.E.Ravishankera, "Design And Development Of Versatile Saline Flow Rate Measuring System And Gsm Based Remote Monitoring Device", International Journal of Pharmaceutical Applications, vol. 3, no. 1, pp. 277-281, 2012.

[2] Manoj Kumar Swain, Santosh Kumar Mallick, Rati Ranjan Sabat, "Smart Saline Level Indicatorcum Controller", International Journal of Application or Innovation in Engineering & Management (IJAIEM), vol. 4, no. 3, pp. 299-301, 2015.

[3] Mansi G. Chidgopkar, Aruna P. Phatale, "Automatic and Low Cost Saline Level Monitoring System Using Wireless Bluetooth Module And Cc2500 Transreceiver", International Journal of Research in Engineering and Technology, vol. 04, no. 09, pp. 274-276, 2015.

[4] I.S.Tawade, M.S.Pendse, H.P.Chaudhari "Design and Development Of Saline Flow Rate Monitoring System Using Flow Sensor, Microcontroller and Rf Zigbee Module", International Journal Of Engineering Research And General Science, vol. 3, no. 3, pp. 472-478, 2015.

[5] Priyadharshini.R , Mithuna.S , Vasanth Kumar.U, Kalpana Devi.S , Dr. SuthanthiraVanitha.N,"Automatic Intravenous Fluid Level Indication System for Hospitals", International Journal for Research in Applied Science & Engineering Technology (IJRASET), vol. 3, no. 8, pp. 427-432, 2017.

[6] J. Singh, M. Tiwari and M. Shelar, "ZigBee based Patient Monitoring System", International Journal of Computer Applications, vol. 51, no. 22, pp. 17-20, 2012.

[7] A. P.P.Belgali, "Implementation of GSM Based Real Time Patient Monitoring System", International Journal of Innovative Research in Science, Engineering and Technology, vol. 4, no. 8, pp. 6875-6878, 2015.

[8] Anbumani.S , Kavin.R , Saranya.A, Dineshkumar.T, Premkumar.R"AN INTELLIGENT PATIENT TELE-MONITORING SYSTEM USING ANDROID TECHNOLOGY", International Journal of Research in Engineering and Technology, vol. 04, no. 02, pp. 477-482, 2015.

[9] "Normal Saline Solution", Paramedicine.com, 2017. [Online]. Available:http://www.paramedicine.com/pmc/Normal_Saline_Solution.html.

[10] "Property and composition of solutions", Intranet.tdmu.edu.ua, 2017.[Online].Available:http://intranet.tdmu.edu.ua/data/kafedra/internal/zag_him/classes_stud/en/med/lik/ptn/medical%20chemistry/1%20course/01.%20Solution.%20Properties%20of%20solution..htm.

[11] "Arduino – Arduino Board Mega2560", Arduino.cc [Online]. Available: www.arduino.cc/en/Main/ArduinoBoardMega2560.

[12] "HC-03/05 Embedded Bluetooth Serial Communication Module AT command set", http://www.linotux.ch/, 2011. [Online]. Available: http://www.linotux.ch/arduino/HC0305_serial_module_AT_commamdset_201104_revised.pdf.