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AUTOMATIC INDICATOR SYSTEM FOR WSN UTILIZATION IOT STUFFING MACHINE INFUSION WATER VOLUME DETECTOR

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Abstract: The use of intravenous infusion sets has greatly increased, but there are some problemscaused by various causes, namely negligence by nurses, lack ofsupervision by the patient's family and from the actions of the patient who caninterfere with the infusion system. The urgency expected to be madeone of the effective and efficient solutions in the automation system for detecting the volume of infusion water and this innovation is expected to help nurses in monitoring intravenous fluid replacement, reducing the risk of delays in replacing intravenous fluids for patients and the public to know the system is running out of infusion water with the sound of an alarm/buzzer. The purpose of this study was to design an infusion control device by detecting the volume of infusion water based on the weight of the infusion using a Wireless Sensor Network. The Wireless Sensor Network used by the load cell sensor functions to detect the weight value of the infusion water in the infusion bag. The buzzer becomes an indicator indicating that the infusion bag is ready to be replaced and also through the Stuffing Machine the Internet of Things will inform the nurse via the Telegram application to inform that the infusion bag is worth replacing. So that nurses can monitor the process of detecting the volume of infused water remotely.

Keywords: Arduino, Blind Detector, Indicator system, Prototype

Abstrak: Penggunaan infus set intravena sangat meningkat, namun ada beberapa masalah yang disebabkan oleh berbagai penyebab yaitu kelalaian oleh perawat, kurangnya pengawasan oleh keluarga pasien dan dari tindakan pasien yang dapat menghambat sistem kerja pada infus. Urgensi yang diharapkan agar dapat dijadikan salah satu solusi yang efektif dan efisien dalam sistem otomatisasi pendeteksian volume air infus dan inovasi ini diharapkan bisa membantu perawat dalam pemantauan penggantian cairan intravena, mengurangi resiko keterlambatan penggantian cairan intravena bagi pasien dan masyarakatpun mengetahui sistem habisnya air infus dengan bunyinya alarm/buzzer. Tujuan penelitian ini menghasilkan rancangan alat pengontrolan infus dengan cara mendeteksi volume air infus berdasarkan berat dari air infus dengan menggunakan *Wireless Sensor Network*. *Wireless Sensor Network* yang digunakan sensor *load cell* berfungsi untuk mendeteksi nilai berat air infus yang ada pada kantung infus. *Buzzer* menjadi sebuah indikator yang menandakan bahwa kantung airinfus sudah layak diganti dan juga melalui *Stuffing Machine Internet Of Things* akan menginformasikan ke perawat melalui aplikasi Telegram menginformasikan kantung air infus sudah layak diganti. Sehingga perawat dapat memonitoring proses pendeteksi volume air infus dari jarak jauh..

Kata kunci: Infused Water; Load Cells; Prototypes; Stuffing Machine Internet Of Things; Volume

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INTRODUCTION

Infusion is a method of administering medication that is carried out directly through a blood vessel. However, not all diseases require infusion, usually doctors will recommend infusion when the patient experiences a dangerous condition. Infusions are also used as a substitute for food or drink for patients [1]. The use of intravenous infusion sets has increased greatly, but there are several problems caused by various causes, namely negligence by nurses, lack of supervision by the patient's family and in monitoring the condition of the patient's infusion, usually the nurse also has to check the condition of the patient's infusion every time that has been previously estimated, so the nurse has to move around. -mandir checks the condition of the patient's infusion. However, this can also cause other complications, including blood being sucked up into the IV tube and freezing in the IV tube, thereby disrupting the smooth flow of IV fluids.

The solution to several of these causes is that the patient can be controlled and monitored by the nurse and the patient's family can also know that the IV water bag is suitable for replacement. Therefore, we need a tool that can make it easier to control infusion by detecting the volume of infusion water based on the weight of the infusion water.by using a wireless sensor network based on stuffing machine internet of things. Stuffing Internet of Things (IoT) technology is one of the applications of data and interface communication science. Internet of Things (IoT) is a technology that allows "things" to be embedded systems and have the function of exchanging information) [2]. Wireless Sensor Network (WSN), which is an embedded system equipment that communicates without cables which contains one or more sensors and is equipped with communication system equipment [3]. In this study, a wireless sensor network used a load cell sensor which functions to detect the weight value of the infusion water in the infusion bag. The intravenous infusion water bags that will be detected are hung on the infusion pole which has a load cell sensor installed, so that the weight of the infusion water will be detected by the load cell sensor.

Then the LCD (liquid crystal display) will display the weight value of the infused water and a buzzer as an indicator device that will give a warning when the weight of the infused water has reached == 250 ml for the first alert, == 200 ml for the second alert and <= 150 ml for last warning. The buzzer is an indicator indicating that the infusion bag is worth replacing. NodeMCU as a tool sends data to the server and this data can be controlled via Telegram. This tool can be monitored and controlled via the Telegram application. Telegram Messenger is a messaging application that works over the internet [4].

Several studies were also conducted [5],[6],[7] and [8]. The tool they developed also uses a sensor but uses a photodiode sensor where the photodiode sensor lacks interaction between prototypes and must be applied with infrared because the light intensity is lower. Based on the weaknesses and deficiencies in previous research, it is necessary to develop a tool with wireless sensor networks. The wireless sensor network capability does not have a maximum distance in interaction between the prototype and the application. From the research results it can be concluded that the load cell sensor can read the weight

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of the infused water and the buzzer can turn on at an accurate time according to the weight value of the infused water detected by the load cell sensor. predetermined limits. The load cell sensor was chosen because this sensor is a heavy sensor that will not reduce or affect the content of intravenous fluids[9], [10], [11].

By utilizing a wireless sensor network based on Internet of things stuffing that previously could not be done or was difficult to do, it can be handled well and more safely. The specific aim of this research is to produce a design for an automatic detection device for the volume of infusion water using wireless sensor network technology to assist nurses/patient families in detecting that IV water bags are suitable for replacement. The design and manufacture of this tool also aims to make it easier for nurses to monitor intravenous fluid replacement and reduce the risk of delays in intravenous fluid replacement for patients[12].

METHOD

The framework of this research can be seen in Image 1.

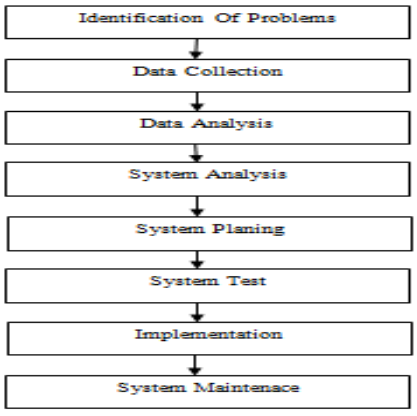

Image 1. Research Frameworks

Identification of problems

Identification of problems with the automatic indicator of the infusion water volume detection device, namely negligence by the nurse, lack of supervision by the patient's family and in monitoring the condition of the patient's infusion. Usually the nurse also has to check the condition of the patient's infusion at a pre-determined time, so the nurse has to go back and forth to check the condition of the infusion. patient..

Data collection

Data and information collection includes interviews with sources who are experts in their fields, in addition to literature studies to strengthen the information and data that have been collected through literature/journals related to this research.

Data analysis

By analyzing the data used or needed in this research.

System analysis

This system analysis studies and understands the components used in designing a prototype automatic indicator for infused water volume.

System planning

The stages of development are analysis, design, coding and testing

System Testing

By testing the prototype, are the electronic components working properly?

Implementation

At this stage using gloves to be implemented to detect objects that are passed.

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System Maintenance

By carrying out maintenance or maintenance on this tool, are there any problems with the components used or not.

RESULT AND DISCUSSION

At this analysis stage an analysis will be carried out based on the results of the tests that have been carried out and the author will carry out the advantages and disadvantages of the system.

After carrying out several tests carried out on the circuit and program of the infusion water volume detection system, it will be concluded that the designed infusion water volume detection system is fully running according to what the authors expect in this study.

This research has produced a design prototype for an infusion control device by detecting the volume of infusion water based on the weight of the infusion water using a Wireless Sensor Network. The Wireless Sensor Network used by the load cell sensor functions to detect the weight value of the infusion water in the infusion bag. The intravenous infusion water bag to be detected is hung on an infusion pole that has a load cell sensor installed, so that the weight of the infusion water will be detected by the load cell sensor. Then the LCD (liquid crystal display) displays the weight value of the infused water and a buzzer as an indicator that will give a warning when the weight of the infused water has reached == 250 ml for the first warning, == 200 ml for the second warning and <= 150 ml for the warning final.

The buzzer becomes an indicator indicating that the infusion bag is suitable for replacement and also through the Stuffing Machine the Internet of Things will inform the nurse via the Telegram application to inform the infusion bag that it is appropriate to replace it. So nurses can monitor the process of detecting the volume of infusion water remotely.

Load cell sensor testing is carried out by connecting the VCC voltage source, ground and the sensor pin section which is connected to the MCU8266 node so that values are obtained for each sensor. Here's the test table:

Table 1. Load Cell Sensor Test Results

Sensor Value	Lcd
== 250	water weight == 250 ml
== 200	water weight == 200 ml
<= 150	water weight <= 150 ml

Based on Table 1, the sensor test results, when the sensor is given a value of == 250, the weight of the infused water has reached == 250 ml, the sensor is given a value of == 200, the weight of the infused water has reached == 200 ml, and the sensor is given a value of <= 150 weight of water infusion has reached <= 150 ml d. We can see the entire circuit that has been tested in the picture Image 1.

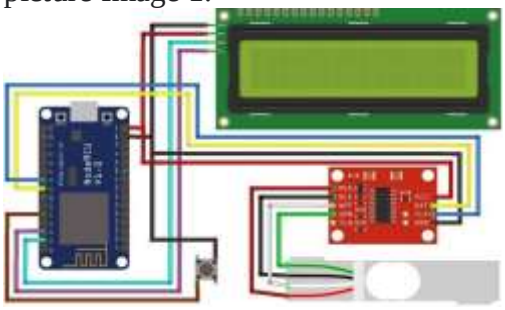

Image 1. Overall Series

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Image 1 shows the overall electronic circuit that has been designed

Table 2. Overall Prototype Test Results

Load Cell Sensor	LCD	Alarm
== 250	the weight of the infused water has reached == 250 ml	Off
== 200	the weight of the infused water has reached == 200 ml	Off
<= 150	The weight of the infusion water has reached <= 150 ml and the infusion must be replaced	Onn

Table 2 of the overall test results, when the sensor is given a value of == 250, the d LCD display shows that the weight of the infusion water has reached == 250 ml and the alarm is still off. If the sensor is given a value of == 200, the LCD display shows that the weight of the infusion water has reached == 200 ml and the alarm is still off. If the sensor is given a value of <= 150, the d LCD display displays the weight of the infusion water that has reached <= 150 ml and the infusion water 1 is worth replacing and the alarm will turn on.

To see whether the alarm is functioning normally or is damaged, we have to test the entire series of sensors that have been made in the system. If the entire sensor circuit is connected properly then the alarm will sound.

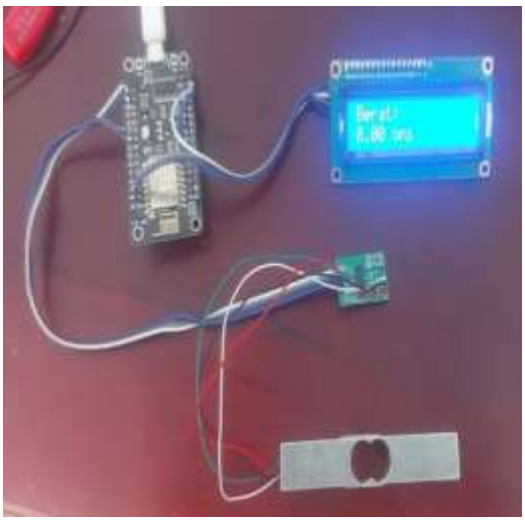

Image 2. Physical circuit of the device circuit

In Image 2, there is a physical circuit of the device connecting all existing electronic components

Image 3. Physical Form of the Infusion Water Volume Detector Device

In Image 3 is the design of a prototype infusion volume detection device using IoT.

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Arduino IDE Program Test Results

This test aims to determine whether the Arduino IDE (Integrated Development Environment) program application that will be uploaded to NodeMcu 6288 is correct. This test is carried out by verifying/compiling the program that has been created as in the example steps above.

Image 4. Program Uploaded Successfully to Node MCU 8266

After carrying out several tests on the series and program of the infusion water volume detection system, the authors conclude that the infusion water volume detection system designed to use the Internet Of Things stuffing machine is fully running according to what the authors expect in this study.

CONCLUSION

The performance system for the blind aids is built using an Arduino IDE system. The media used in making the detector with NodeMCu 6288 hardware, uses a loadcell sensor that can read distances at a distance that has been programmed on the Arduino Nano and an output in the form of a 5 V buzzer.

From the results of testing the tool with respondents when the sensor was given a value of == 250, the display on the LCD showed that the weight of the infused water had reached == 250 ml and the alarm was still off. If the sensor is given a value of == 200, the display on the LCD shows that the weight of the infused water has reached == 200 ml and the alarm is still off. If the sensor is given a value <= 150, the LCD display shows that the weight of the infusion water has reached <= 150 ml and the infusion water 1 is suitable for replacement and the alarm will turn on. To see whether the alarm is functioning normally or is damaged, we have to test the entire series of sensors that have been made in the system. If the cell and battery life test results show that the battery life with a maximum power of 3.6 Wh can be used for a maximum of 9 hours, the battery is used continuously or with the buzzer on for 9 hours.

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