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# TAM METİN KİTABI

# (FULL TEXT BOOK)

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KORİNT YAYINCILIK

# IOT SYRINGE INFUSION PUMP

***NURUL SYUHADA BINTI ANUAR***
*Politeknik Sultan Salahuddin Abdul Aziz Shah, Department of Electrical Engineering,*
*Nurulsyuhadaanuar1211@gmail.com*

***MRS IDA MARIA BINTI MOHD YUSOFF***
*Politeknik Sultan Salahuddin Abdul Aziz Shah, Department of Electrical Engineering Iemaria80@gmail.com*

**ABSTRACT**

Syringe infusion pump is the special delivers medicine flow from the machine into the vein blood main stream. This machine is a sophisticated machine because we only need to put the medicine into the syringe then we set on the infusion pump machine the amount that will be flowed into the patient's body. the medication included is according to the doctor's instructions. This syringe infusion pump has only one problem, that is, the volume of the lack of medicine is extreme. Therefore, this project was developed to improve the medicine administration record system in ICU. Secondly, I want to facilitate the movement of doctors and nurses to find the beds of patients who have run out of medicine. Lastly, for doctors and nurses to be more sensitive about patients so that the patient does not overdose. The current process is studied with IoT-based health systems. This study on the application of equipment utilization monitoring systems for ICU types of equipment using the Internet of Things (IoT) was conducted in a private multi-specialty hospital. This paper aims to design a syringe pump that is equipped with a NodeMCU8266 Wi-Fi module to provide notifications via a smartphone so that nurses or doctors can know the alarm even though they are outside the patient monitoring room. In conclusion, if we add IoT in this project, we can save the patient's information to be reviewed by the doctor and at the same time the doctor and nurse will go to the patient. The medicine volume can be recorded through the Wi-Fi module app of Arduino.
**Keyword;** iot( internet of things), ICU (intensive care unit)

**INTRODUCTION**

A syringe pump is a precision-based pumping device that can be mounted with one or more syringes for high precision delivery of fluids. Syringe pumps are widely used in medical sector to provide a small but accurate number of medications. This is done using precision motorized systems to drive syringe pistons and achieve desired dosages. Syringe pump settings are used to set the dosage in ml for the required fluids to be delivered to patient as per doctor instructions. Syringe pumps are usually mounted on side tables or IV poles for usage. The settings on a syringe pump may include direction of flow, flow rate of fluid, time period for which the delivery is to be done. This ensures delivery of the fluid in desired amounts so as to achieve desired dosages.

Well, we here propose to build an IOT based syringe infusion pump that can be monitored as well as controlled via doctors remotely over the internet. This syringe pump allows the doctor to set, modify the flow, stop the infusion of pump over the internet as per patient response. Also, the system sets record of all the commands provided by doctor in a safety log for data inspection if needed. This IOT syringe pump provides the following advantages:

- Precision delivery of medication
- Ability to remotely start stop infusion
- Ability to remotely modify parameters as per patient response
- Doctors can remotely handle patient infusions at multiple hospitals
- Automatic record keeping of all logs
- Easy to Use Device

The system makes use of an Arduino to handle the entire processing system. We here use an LCD display to display settings and other parameters. The machine consists of a syringe mounting to hold the syringe in place as well as press the plunder gradually as per set requirements. The device allows for setting device parameters through device keypad as well as through the internet. When the device internet control option is active the respective doctors can see the device activated on their online portal. The device settings include adjustment the direction flow, the flow rate, the syringe brand and size, total dosage to be delivered and so on. Once settings are fed by user offline or over IOT the machine calculates the push rate of plunger. Based on this the motor operates with accuracy to ensure the delivery of fluid gradually at set flow rate till it delivers the desired amount of fluid and stops automatically with led alert and online alert to signal the successful delivery of set dosage.

**HISTORY**

Infusion pumps are a more contemporary invention, while intravenous therapy has been practised since the Middle Ages. Using a pen and a pig's bladder, Sir Christopher Wren, an Oxford scientist, created the first infusion device in 1656. While useful, Wren found that the device had a short lifespan and required a lot of security. Wren was given the title "Father of Intravenous Therapy" as a result. In 1662, Johann Major was the first person to

successfully inject a person. Major's employment responsibilities included giving medication injections and blood transfusions. Sadly, a lot of deaths from infections at the infusion site resulted from Major's research.

Infusion therapy made significant strides in 1914. Blood coagulation was discovered to be prevented by sodium citrate. In 1925, dextrose was employed as an infusion. Infusions were moved from open containers to glass bottles that were vacuum-sealed in 1930. Nurses were given the go-ahead to administer infusions ten years later. Infusions could only be carried out by doctors prior to 1940.Infusion pumps were made a standard in all hospitals in 1960. You can see from the history of infusions how much the field has advanced. We offer the most advanced infusion therapies and top-notch patient care at Specialty Infusion Centers. For all of your infusion requirements, drop by one of our conveniently located centres

**3.LITERATURE REVIEW**

To evaluate the effect of syringe size and infusion rate on drug delivery after vertical displacement of syringe pumps. Four syringes (10 ml, 20 ml, 30 ml, 50 ml) were studied at three infusion speeds (2 $ml \cdot hr^{-1}$, 1 $ml \cdot hr^{-1}$ and 0.5 $ml \cdot hr^{-1}$). Fluid delivery was measured gravimetrically using an electronic balance. Aspiration volume (amount of fluid retracted into the syringe-infusion line assembly) and zero-drug delivery time (time between the lowering of the syringe pump and reattainment of the initial weight) were determined after lowering the syringe pump 130 cm or 50 cm. Then, infusion bolus was measured after elevating the pump to its initial position. Syringe compliance was calculated from the occlusion release bolus at an occlusion pressure of 300 mmHg.[1]

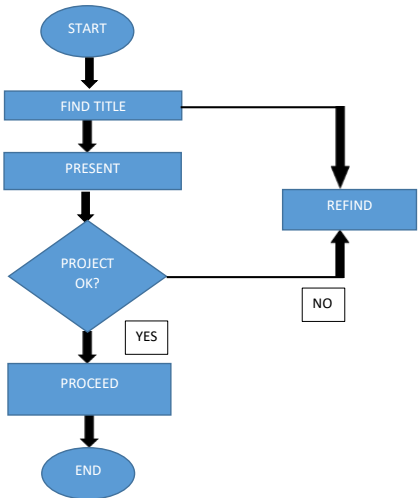
Syringe infusion pumps are used for the precise continuous administration of intravenous drugs. Their compliance and mechanical deficiencies have been found to cause considerable start-up delays, flow irregularities during vertical displacement, as well extensive delays of occlusion alarms at low infusion rates. The aim of this study was to evaluate the performance of several modern syringe infusion pumps at low infusion rates and the impact on drug concentration.[2]

Infusion pumps are the preferred method for intravenous delivery of drugs and fluids, and an essential tool in health facilities. Their high cost, complexity and reliance on electricity pose serious challenges to wide-spread use, availability and access in low- and middle-income countries. PATH developed the RELI Delivery System (RELI), a low cost, non-electric infusion pump to address these challenges. Input collected from fifty-nine newborn and maternal care providers and from seven national level decision makers in Uganda was used to guide product development, further informing product design requirements, and optimal design features to best serve their needs.[4]

Medication errors occur frequently and may potentially harm patients. Administering medication with infusion pumps carries specific risks, which lead to incidents that affect patient safety.[6] In some hospitals the infusion is still done manually, medical staff observes fluid drip directly and then controls its rate using a mechanical resistor (clamp), this method is certainly far from the level of accuracy. Infusion pump is a medical aid that has functions to control and ensure the correct dose of infusion fluid that is given to patients under treatment. The purpose of this study is to analyze the accuracy of the TCRT5000 as a drop sensor, based on readings of the

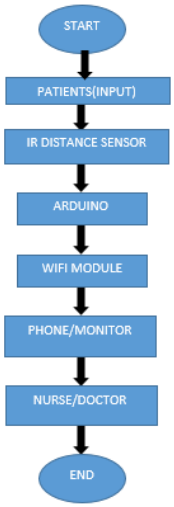
infusion pump monitoring system. This module consists of a TCRT5000 drop sensor module, comparator circuit, monostable circuit, stepper motor, L298N motor driver, and ATmega328 microcontroller. The droplets are detected by the TCRT 5000 sensor, then amplified by a comparator and monostable circuit, then the flow rate and remaining volume readings are generated by the ATmega328 microcontroller. Furthermore, this data is sent to the Personal Computer (PC) via wireless HC-11.[7]

**4.METHODOLOGY**



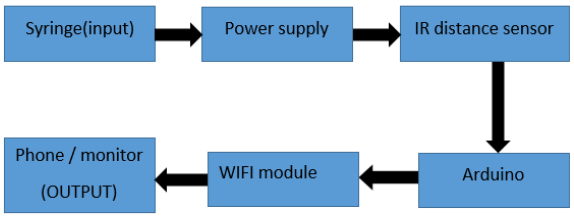

4.1 Flowchart of Operation Project Title

The research started with finding several titles related to medical devices. Then all the titles presented to the Supervisor. Then the title was picked by Supervisor. Investigation report and Gantt Chart was written and submitted. Furthermore, PCB power supply and project circuit were simulated. Next, component was bought and showed to Supervisor.




4.2 Flowchart of Operation IOT Syringe Infusion Pump

The IR distance sensor on the syringe is where the flowchart for this IOT syringe infusion pump begins to function. The fluid on the syringe can then be detected. The data will be sent to the WIFI module after the fluid has been identified. The Blynk Application will then be used to display the outcome on the screen phone or monitor.




4.3 Block Diagram of IOT Syringe Infusion Pump

The rechargeable battery is used to start the circuit and allow current to flow into the circuit during operation of this IOT syringe infusion pump. When the fluid in the syringe has been detected, it flows to the IR distance sensor. Additionally, it is sending the data by Arduino and connecting to the WIFI module. The monitoring programme (Blynk Application) will automatically transmit the data, and the programme will show the fluid level on the syringe. Finally, the animation of the Blynk app will present a complete blue display box when the syringe is filled. In conclusion, the software will show the outcome on the phone or monitor when the IOT syringe infusion pump is working.

**5.CONCLUSION**

The project successfully transmits extremely precise data of the syringe infusion pump over distances. When several IOT syringe infusion pump monitoring devices are used concurrently, the data is simultaneously delivered to the receiver and shown on the screen. The host and remote device, two separate components, have been successfully developed, built, and tested. The WIFI module, a wireless protocol, has been built and enables reliable connection between the host and distant device. A graphical user interface that is easy to use has also been successfully built and put into use.

This procedure had attained artificial intelligence, which can increase the data's correctness. greatly prevent patient overdosing or calculation error. Additionally, the device assembles a highly intelligent system that reduces data inaccuracy using less expensive components. The tool can significantly increase the effectiveness of hospital care while saving time for both medical personnel and patient families. The product has a promising future on the market and many useful applications. To advance the medical industry in the future, it will be necessary to create equipment of comparatively higher quality. As a result, the system must be taken into account throughout the entire design process in order to launch system.

**6.REFERENCES**

Schulze KF, Graff M, Schimmel MS, Schenkman A, Rohan P. Physiologic oscillations produced by an infusion pump. J Pediatr 1983; 103: 796–8.

G.A. Rooke, T.A. Bowdle

Syringe pumps for infusion of vasoactive drugs: mechanical idiosyncrasies and recommended operating procedures

Anesth Analg, 78 (1994), pp. 150-156

Boutsioukis C., Gogos C., Verhaagen B., Versluis M., Kastrinakis E., Van der Sluis L.W.M. The effect of apical preparation size on irrigant flow in root canals evaluated using an unsteady Computational Fluid Dynamics model. *Int Endod J.* 2010;43:874–881.

Lönnqvist PA. How continuous are continuous drug infusions? *Intensive Care Med*. 2000;26(6):660–661. doi: 10.1007/s001340051229

Institute of Medicine Committee on Quality of Health Care in A . In: Kohn, LT, Corrigan, JM, Donaldson, MS (eds) To err is human: building a safer health system. Washington, DC: National Academy of Sciences, National Academies Press.

E. T. Pierce, V. Kumar, H. Zheng, and R. A. Peterfreund, "Medication and Volume Delivery by Gravity-Driven Micro-Drip Intravenous Infusion: Potential Variations During 'Wide-Open' Flow," Annesthesia Patient Saf. Found., vol. D, no. 3, pp. 614–618, 2013

Kohn, LT, Corrigan, JM, Donaldson, MS: To Err is Human. Building a Safer Health System. Institute of Medicine, Washington, DC, National Academy Press, 1999

Taxis K, Barber N. Ethnographic study of incidence and severity of intravenous drug errors. BMJ 2003;326:684–7

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