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# Automatic Saline Bottle Refilling System

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**Abstract:**
In the process of medication, it is a common practice to treat patients with saline for dehydration and other medical ailments to improve the health condition of the patients. When fed with saline continuous observation of nurses is mandatory in monitoring the level of the saline. There are many cases where patients are being harmed due to the staff inattentiveness, as their absence does not notice the completion of saline level in the container. This arises the problem of back flow of blood immediately after the completion of saline in container. Hence to protect the patient from getting harmed a saline level monitoring system has been developed. The proposed model incorporates a level sensor which continuously detects the saline drops using LM358 comparator IC and Relay unit. Whenever the sensor detects low level of saline, it automatically off the trips bottle for safety of the patients and the saline bottle will be refill by secondary compartment (having saline) present in our system the addition future of this system having the small battery backup in power supply unit to keep the system alive when power cut is occurred. Through this system, doctors and caregivers are not necessary to monitor their patient anytime, anywhere.

**Keywords:** Glucose Monitoring system, hardware, software, level sensor

## INTRODUCTION

This project is to enhance the current technology which eases the medical practitioner to monitor and get the update of the patient's glucose level without physically present at the patient place. The objectives are to detect and monitor the patient's glucose level, also to raise the patient's awareness of their sugar level. And when the glucose level beyond the acceptance range, the system notifies the user. This project uses blood glucose sensor to detect the glucose level, the information from the sensor will retrieve and process by the Arduino Uno which acts as a brain that will transmit the data to the LCD module. The data than analyzing and send the information to the patient's and medical practitioner LCD display. If the glucose beyond the acceptance range, they will receive a warning notification and amount of insulin need to be taken by the patient. The project uses Iterative Waterfall Model as its supports redesign if the changes are needed in the project. By using this methodology, the phase can be looped back to the previous iteration if the process encounters any bugs or lacks any criteria when running the program. The proposed system has the potential to make the diabetic aware of their glucose level and could help them to control their glucose intake. This project is a success and capable of detecting the glucose level, and thus, the data gained used to not the patient when the glucose level reaches the abnormal range. The scope of this project is mainly focusing on diabetic patients, family and medical practitioner for clinic

and hospital in Malaysia. The function of this based Glucose Monitoring System for Diabetic Patients is to make sure the medical practitioner and patients' family knows what the current glucose level of their patient or family is. The system will maintain the current device used to check glucose level which is built-in Arduino glucose sensor shield but with an upgrade of a solution that will notify the medical practitioners when the glucose level is beyond the normal reading through the smartphone. However, the limitations of this project are the system cannot continuously monitor the glucose reading as the patient need to manually check their glucose level first before the data of the sugar can be transferred and then notified to the medical practitioners. however, the number of advanced glucose monitoring systems is small and the existing systems have several limitations. In this paper we study feasibility of invasive and continuous glucose monitoring (CGM) system utilizing level sensor and solenoid valve-based approach. In addition, communication protocol is customized for suiting to the glucose monitoring system and achieving a high level of energy efficiency. Furthermore, we investigate energy consumption of the sensor device and design energy harvesting units for the device. Finally, the work provides many advanced services at a gateway level such as a push notification service for notifying patient and doctors in case of abnormal situations (i.e. too low or too high glucose level). The results show that our system is able to achieve continuous glucose monitoring remotely in real-time. Furthermore, we investigate energy consumption of the sensor device and design energy harvesting units for the device. Finally, the work provides many advanced services at a gateway level such as a push notification service for notifying patient and doctors in case of abnormal situations (i.e. too low or too high glucose level). The results show that our system is able to achieve continuous glucose monitoring remotely in real-time. In addition, the results reveal that a high level of energy efficiency can be achieved by Level sensor.

## SOFTWARE REQUIREMENTS

### A. Arduino IDE

If you haven't written "code" in any computer language yet, you'll have to get used to writing very specific commands to get things done. But Arduino gives you many easy-to-use commands. Arduino is a tool for making computers that can sense and control more of the physical world than your desktop computer. Arduino is a small circuit board with an Atmel Micro controller chip and other parts. See examples HERE. Arduino is intended for use by both non-technical people with no previous programming experience and seasoned pros who love to tinker. Arduino was developed in Italy by Massimo Banzi and a group of people who believed Hardware and Software should be "Open Source" and available to everyone. Physical Computing is quite different than writing software for personal computers where the only physical inputs are the Mouse and Keyboard. With Arduino you can connect and control literally hundreds of different devices, and write software that creates new Intelligent Devices.

**B. SENSOR INPUTS:** On the left are examples of some of the Input Devices you can connect.

**C. ACTION OUTPUTS:** On the right are examples of Output Devices you can control.

**D. SOFTWARE BEHAVIOR:** Here is where you write software (called SKETCHES in Arduino) that makes decisions about what things are sensed with Input Devices, and what actions will be taken with the Output Devices. This may be as simple as sounding a buzzer when a switch is closed. The Arduino IDE (Integrated Development Environment). This is the free software you will use to create the Behavior of your project. Here's what it includes:

- An EDITOR to create and edit the text of your software Sketch. It actively highlights Keywords in

the language so typing errors are more obvious.

- A VERIFY system that runs through your Sketch, verifies that there are no errors, and then compiles it into the machine language program that can be Uploaded to your Arduino board over the USB cable. (This is often called MAKE in other systems, and actually is quite complex, running system preprocessor, compiler, linker etc. "Under the covers").
- An UPLOAD system that communicates with your Arduino Board over USB, loads your program into Arduino memory, and starts your program running.
- A SERIAL MONITOR window that allows you to receive and send messages from programs running on your Arduino board. This is often used for testing and "debugging" programs.
- Many EXAMPLE software Sketches that show how to use many different devices and techniques.
- A LIBRARY system containing many prewritten sections of software.
- A FILE system to save and retrieve Sketches.
- A HELP system that includes the entire Arduino Reference document.

## HARDWARE DESCRIPTION

### A. Power Supply

A power supply unit (or PSU) converts mains AC to low-voltage regulated DC power for the internal components of a computer. Modern personal computers universally use switched-mode power supplies. Some power supplies have a manual switch for selecting input voltage, while others automatically adapt to the mains voltage. The power supply unit is often abbreviated as PSU and is also known as a power pack or power converter. The power supply unit is the piece of hardware that's used to convert the power provided from the outlet into usable power for the many parts inside the computer case. Unlike some hardware components used with a computer that aren't necessarily needed, like a printer, the power supply is a crucial piece because without it, the rest of the internal hardware can't function.

### B. Transformer

A transformer is an electrical device that transfers electrical energy between two or more circuits through electromagnetic induction. Electromagnetic induction produces an electromotive force within a conductor which is exposed to time varying magnetic fields. Transformers are used to increase or decrease the alternating voltages in electric power applications. Arduino is an open-source computer hardware and software company, project and user community that designs and manufactures microcontroller-based kits for building digital devices and interactive objects that can sense and control objects in the physical world.

The project is based on microcontroller board designs, manufactured by several vendors, using various microcontrollers. These systems provide sets of digital and analog I/O pins that can be interfaced to various expansion boards ("shields") and other circuits. The boards feature serial communications interfaces, including USB on some models, for loading programs from personal computers. For programming the microcontrollers, the Arduino project provides an integrated development environment (IDE) based on the Processing project, which includes support for the Cand C++ programming languages.

The first Arduino was introduced in 2005, aiming to provide an inexpensive and easy way for novices and professionals to create devices that interact with their environment using sensors and actuators. Common examples of such devices intended for beginner hobbyists include simple robots, thermostats, and motion detectors.

Arduino boards are available commercially in preassembled form, or as do-it-yourself kits. The hardware design specifications are openly available, allowing the Arduino boards to be manufactured by anyone. Adafruit Industries estimated in mid-2011 that over 300,000 official Arduinos had been commercially produced, and in 2013 that 700,000 official boards were in users' hands.

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started.

Level sensor is a device, module, or subsystem whose purpose is to detect events or changes in its environment and send the information to other electronics, frequently a computer processor. A sensor is always used with other electronics.

Sensors are used in everyday objects such as touch-sensitive elevator buttons (tactile sensor) and lamps which dim or brighten by touching the base, besides innumerable applications of which most people are never aware. With advances in micromachinery and easy-to-use microcontroller platforms, the uses of sensors have expanded beyond the traditional fields of temperature, pressure or flow measurement, for example into MARG sensors. Moreover, analog sensors such as potentiometers and force-sensing resistors are still widely used. Applications include manufacturing and machinery, airplanes and aerospace, cars, medicine, robotics and many other aspects of our day-to-day life.

A sensor's sensitivity indicates how much the sensor's output changes when the input quantity being measured changes. For instance, if the mercury in a thermometer moves 1 cm when the temperature changes by 1 °C, the sensitivity is 1 cm/°C (it is basically the slope Dy/Dx assuming a linear characteristic). Some sensors can also affect what they measure; for instance, a room temperature thermometer inserted into a hot cup of liquid cools the liquid while the liquid heats the thermometer. Sensors are usually designed to have a small effect on what is measured; making the sensor smaller often improves this and may introduce other advantages. Technological progress allows more and more sensors to be manufactured on a microscopic scale as microsensors using MEMS technology. In most cases, a microsensor reaches a significantly higher speed and sensitivity compared with macroscopic approaches.

A comparator is an electronic circuit, which compares the two inputs that are applied to it and produces an output. The output value of the comparator indicates which of the inputs is greater or lesser. The LM358 IC is a great, low power and easy to use dual channel op-amp IC. It is designed and introduced by national semiconductor. It consists of two internally frequency compensated, high gain, independent op-amps. This IC is designed for specially to operate from a single power supply over a wide range of voltages. The LM358 IC is available in a chip sized package and applications of this op amp include conventional op-amp circuits, DC gain blocks and transducer amplifiers. LM358 IC is a good, standard operational amplifier and it is suitable for your needs. It can handle 3-32V DC supply & source up to 20mA per channel. This op-amp is apt, if you want to operate two separate op-amps for a single power supply. It’s available in an 8-pin DIP package

**WORKING**

In this proposes system Automatic saline Bottel refilling system by using Level sensor and Relay unit. It can end the data to i2c LCD display as their absence does not notice the completion of saline level in the

container. This arises the problem of back flow of blood immediately after the completion of saline in container. Hence to protect the patient from getting harmed a saline level monitoring system has been developed using level sensor and relay unit. The proposed model incorporates a level sensor which continuously detects the saline level using comparator IC LM358. Whenever the level sensor and led indicates low level of saline it automatically refills the saline bottle trip for the safety of the patients and also it works during power cut, because the small battery backup is present in the power supply unit.

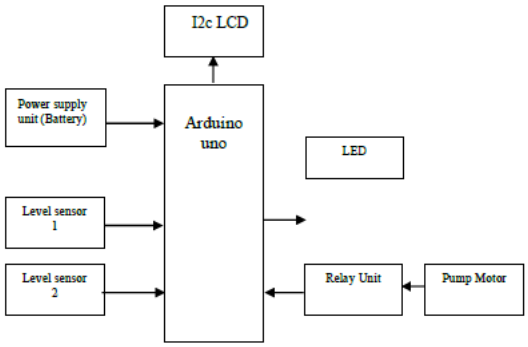


**Fig 4.1**

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A great deal of arduous work and effort has been spent in implementing this project work. Several special people have guided us and have contributed significantly to this work and so this becomes obligatory to record our thanks to them.

## RESULT

We presented a real-time Automatic saline bottle refilling system. Through the system, doctors and caregivers not necessary to monitor their patient anytime, anywhere. Level Sensor measures the level of the glucose, and transmit the data to the Arduino uno efficiently in term of energy consumption relay board switch the pump motor to refill the glucose bottle. The result showed that it is automatically control the glucose bottle so it can be made energy efficient and the cost is too low with power bang is also available in this system.

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