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RTC BASED PUMP SWITCHER SYSTEAM

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ABSTRACT

This paper presents a low cost and flexible pump automation using arduino system. It employs embedded micro web server in Arduino at Mega 328p microcontroller, with connectivity for accessing and controlling devices and appliances automatically. To demonstrate the feasibility and effectiveness of this system, devices such as pump, arduino, float sensor, solenoid valve, tank, wires, motor, have been integrated with the proposed pump control system. In states including Maharashtra, Gujarat, Delhi, Karnataka, a city water authority supplies the clean water and pumps it into large ground-level storage tanks. A resident's water pump then pumps the water to a water tank on top of his/her house. When the water level in the ground-level storage tank becomes too low, the pump siphons air and shuts down, requiring a resident to manually prime the water pump to get it running again. Residents struggle to monitor the water level of the tanks effectively and keep the pump running properly.

1. INTRODUCTION

We usually come across areas where we need to switch devices on/off at particular time intervals. We simulate this system using a water pump that is controlled through RTC input. The RTC (Real time clock) is used to switch the motor on and off at desired time intervals. An RTC outputs real time signals which need to be converted into digital signals for further processing. The RTC provides these inputs to the microcontroller. The microcontroller then checks for time. It then switches on off motor when the RTC time matches predefined time.

2. LITERATURE SURVEY

The literature review contains the brief discussion of some recent works of water automation for water pump controller system through android application. A model is presented in [1] which can collect water expense from a customer and detect the leakage in the water distribution system. The advantage of this model is that it can reduce the periodic tours of providers to each physical location to read each meter. Another advantage is that the bill of water usage can give based on the near real-time expense from the previous expense. Detecting leak supports to save water resources and energy and also reduce the cost. The paper [2] proposes a water monitoring system by using an automatic overflow control circuit unit. The proposal is designed from the perspective of monitoring the flow of water into the tanks automatically and from the perspective of setting as per the user demands using a Mobile Application.

3. WORKING

In this proposed system, RTC is used to predefine the time for ON/OFF the pump. This project is built with RTC as input and relay attached with pump is output part, which are connected to arduino. A Arduino in this project is used to control the entire system by detecting the RTC optput. When the RTC reaches to set value in program, then the comparator directs the command to the Arduino, and Arduino sends command to relay and then pump. Here **t**he **"Relay functions"** as an interface between the **"arduino microcontroller"** and pump arrangement.

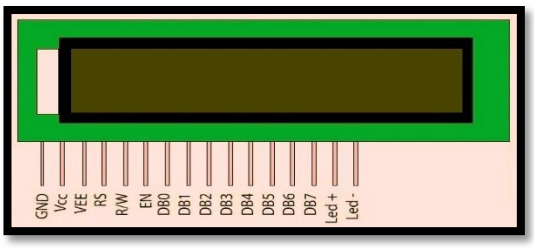
A microcontroller in this project is used to control the entire system by detecting the RTC input. The RTC & the water pump status are shown on the LCD which is **interfaced to the microcontroller**. Similarly, when RTC reaches defined value then the microcontroller sends the instructions to the relay to switch off the motor.

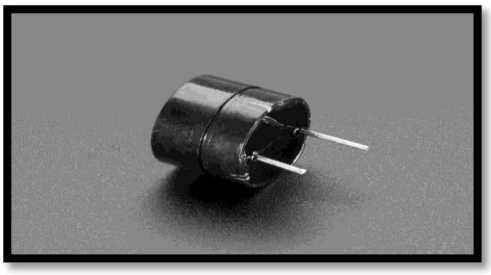
4. HARDWARE REQUIREMENTS

A. ARDUINO UNO: The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 Digital pins, 6 Analog pins, and programmable with the Arduino IDE (Integrated Development Environment) via a type B USB cable. It can be powered by the USB cable or by an external 9-volt battery,

though it accepts voltages between 7 and 20 volts. It is also similar to the Arduino Nano and Leonardo. The hardware reference design is distributed under a Creative Commons Attribution Share-Alike 2.5 license and is available on the Arduino website. Layout and production files for some versions of the hardware are also available.

B. LIQUID CRYSTAL DISPLAY (LCD): LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on. A **16x2 LCD** means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data.

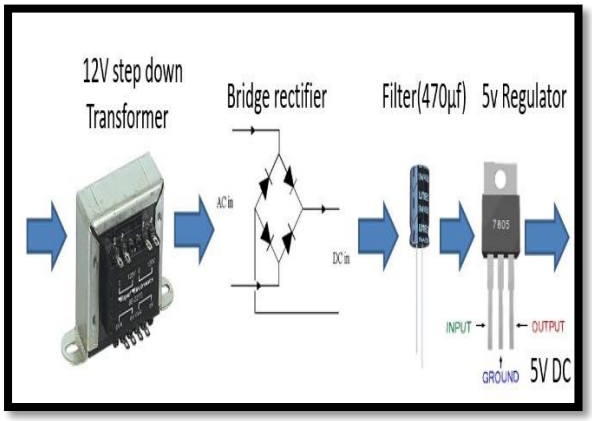


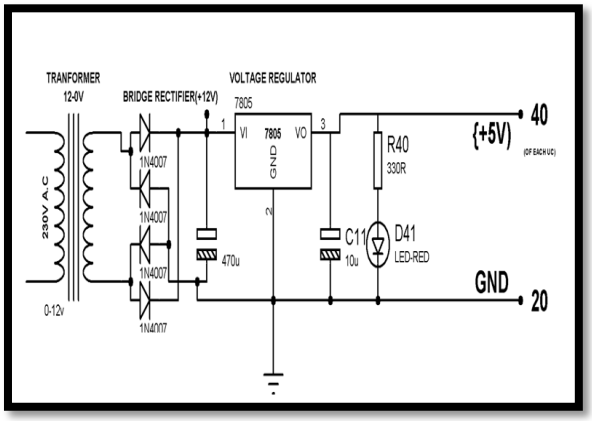


The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD. Click to learn more about internal structure of a LCD.

C. BUZZER: A buzzer takes some sort of input and emits a sound in response to it. They may use various means to produce the sound; everything from metal clappers to electromechanical devices. A buzzer needs to have some way of taking in energy and converting it to acoustic energy. Many buzzers are part of a larger circuit and take their power directly from the device's power source. In other cases, however, the buzzer may be battery powered so that it will go off in the event of a mains outage. Some devices that provide emergency power have buzzers on them so that the user knows that they are running on backup power and not on mains power.

D. POWER SUPPLY





E. DESCRIPTION OF POWER SUPPLY

- The circuit uses standard power supply comprising of a step-down transformer from 230v to 12v and 4 diodes forming a Bridge Rectifier that delivers pulsating dc which is then filtered by an electrolytic capacitor of about 470microf to 100microF.
- The filtered dc being un regulated IC LM7805 is used to get 5v constant at its pin no 3 irrespective of input dc varying from 9v to 14v.
- The regulated 5volts dc is further filtered by a small electrolytic capacitor of 10 micro f for any noise so generated by the circuit.
- One LED is connected of this 5v point in series with a resistor of 330ohms to the ground i.e. negative voltage to indicate 5v power supply availability.

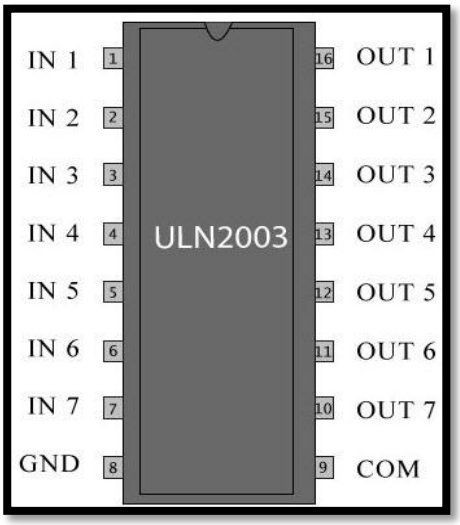
5. VOLTAGE TRANSFORMER

One of the main reasons that we use alternating AC voltages and currents in our homes and workplace's is that AC supplies can be easily generated at a convenient voltage, transformed (hence the name transformer) into much higher voltages and then distributed .

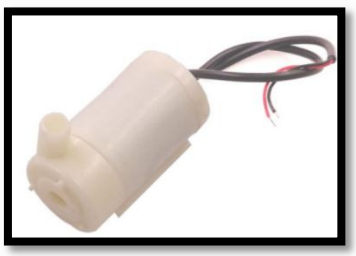
The reason for transforming the voltage to a much higher level is that higher distribution voltages implies lower currents for the same power and therefore lower I^2R losses along the networked grid of cables. These higher AC transmission voltages and currents can then be reduced to a much lower, safer and usable voltage level where it can be used to supply electrical equipment in our homes and workplaces, and all this is possible thanks to the basic

A. VOLTAGE TRANSFORMER

B. RELAY DRIVER IC 2003: The relay driver uln2003 ic is a high voltage and current Darlington array ic, it comprises of 7-open collector Darlington pairs with common emitters. A pair of Darlington is an arrangement of two bipolar transistors. This IC belongs to the family of ULN200x ICs and various types of this family interface to various logic families. This ULN2003 IC is for 5V TTL and CMOS logic devices. These ICs are used as relay drivers as well as to drive a wide range of loads, line drivers, display drivers etc. This IC is also normally used while driving Stepper Motors.

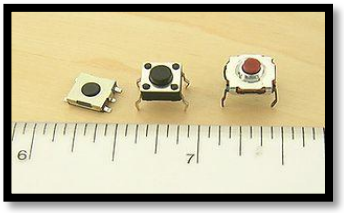


C. PUMP: For this example, the model represents a typical setup for a polder pumping station in lowland areas. The inflow from precipitation and seepage is modelled as a discharge (left side), with the total surface area / volume of storage in the polder modelled as a linear storage. The downstream water level is assumed to not be (directly) influenced by the pumping station, and therefore modelled as a boundary condition.

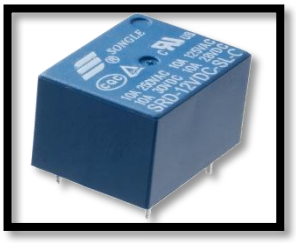


D. DC MOTOR: A DC motor in simple words is a device that converts direct current(electrical energy) into mechanical energy. It's of vital importance for the industry today, and is equally important for engineers to look into the **working principle of DC motor** in details that has been discussed in this article. In order to understand the **operating principle of dc motor** we need to first look into its constructional feature.

E. SWITCH: A push-button (also spelled pushbutton) or simply button is a simple switch mechanism for controlling some aspect of a machine or a process. Buttons are typically made out of hard material, usually plastic or metal.



F. RELAY: A simple electromagnetic relay consists of a coil of wire wrapped around a soft iron core, an iron yoke which provides a low reluctance path for magnetic flux, a movable iron armature, and one or more sets of contacts (there are two in the relay pictured). The armature is hinged to the yoke and mechanically linked to one or more sets of moving contacts. It is held in place by a spring so that when the relay is de-energized there is an air gap in the magnetic circuit.



6. RESULT

An RTC outputs real time signals which need to be converted into digital signals for further processing. The RTC provides these inputs to the arduino. The arduino then checks for time. It then switches on off motor when the RTC time **matches pre-defined time**.

7. ADVANTAGES

1. Sturdy and durable, need not maintain.
2. No current / voltage is passed through water, therefore no electrolysis.
3. Long life.
4. Can be used in hard water -fuel-such as diesel, kerosene, oil etc.
5. Save of electricity due to perfect timing of water pump operation.
6. Elimination of concern about the water pump switching ON/OFF.
7. Elimination of embracing situation due to water scarcity.
8. The cost is amazingly low compared to other existing market product.
9. Compact size.
10. Ease of use.

8. APPLICATIONS

1. Agriculture livestock watering / crop irrigation, home gardens and drip irrigation system.
2. Domestic water portable for remote homes, campgrounds, Bungalows.
3. Pond water management and water transfer.
4. Water supply for villages in developing world.
5. This system is also used in Hospitals , Factories, Hotels and restaurants , Commercial centers , All places with water tanks

9. CONCLUSION

The RTC Based Pump switching system proves to be a real time feedback control system which monitors and controls all the activities of system efficiently. Arduino based Public Garden Automation system is simple and easy. In this system various applications like gate, water pump, light etc are turned ON and OFF for the predefined time. The present proposal is a model to modernize and automated the day today life gadgets with optimum expenditure. Using this system, one can save manpower, water to improve production and ultimately high profit.

10. FUTURE SCOPE

The RTC pump level controller designed in this project can be used to control water flow. however, whether the source of water, which in this case is the UGT actually has water or not if no water source is present then the submersible pump would start running unnecessarily and over heat it set this

could be taken care by implementing another sensor also the rate of water input must always be equal or greater than the rate of water output. To make this happen we could use a speed regulator If these issues are taken care of then a more efficient and reliable can be performance

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