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Automatic water level controller using NOR Gates

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Abstract: *Automatic water level controller circuit is a simple electronics project. It can automatically switch ON and OFF the domestic water pump set depending on the tank water level. You can implement this motor driver circuit at your home or college using less costly components. The approximated cost of the project is very less. The main advantage of this water level controller circuit is that it automatically controls the water pump without any user interaction.*

Keywords: *BC 547 transistor, NOR gate, Relay switch, SR Gates,5V DC Supply.*

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I. INTRODUCTION

In this project I use SR latch to control water level, namely NOR SR latch. I use two NOR gate for latching process in which input S & R give from up and low level of water and output Q is use to control water pump The idea of this project is come from water wastage. As we know that water the most important thing for human, animal and every living thing so it is necessary to conserve or save water. By this thought we made a project which can control or save water at domestic level, agricultureas well as other areas.

II. PRINCIPLE

The principle is based on NOR SR latch. In electronics, a flip-flop or latch is a circuit that has two stable states and can be used to store state information. A flip-flop is a bi stable multi vibrator. The circuit can be made to change state by signals applied to one or more control inputs and will have one or two outputs. It is the basic storage element in sequential logic. Flip-flops and latches are fundamental building blocks of digital electronics systems used in computers, communications, and many other types of systems.

Flip-flops and latches are used as data storage elements. A flip-flop stores a single bit (binary digit) of data; one of its two states represents a "one" and the other represents a "zero". Such data storage can be used for storage of state, and such a circuit is described as sequential logic. When used in a finite-state machine, the output and next state depend not only on its current input, but also on its current state (and hence, previous inputs). It can also be used for counting of pulses, and for synchronizing variably-timed input signals to some reference timing signal.[1]

III. COMPONENT REQUIRED

*3.1 NOR Gate IC 7402**:-The NOR:-***Gate is a digital logic gate that implements logical NOR - it behaves according to the truth table to the right. A HIGH (1) output results if both the inputs to the gate are LOW (0); if one or both input is HIGH (1), a LOW(0) output results.[2]

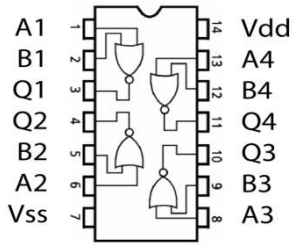

Fig.1 NOR Gate IC 7402

*3.2 BC 547 transistor:-*BC547 is an NPN bi-polar junction transistor. A transistor, stands for transfer of resistance, is commonly used to amplify current. A small current at its base controls a larger current at collector & emitter terminals.[3]

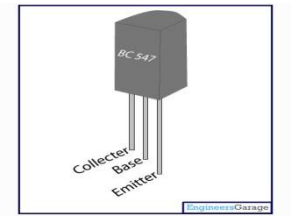

Fig.2 BC 547 transistor

*3.3 Resistor 100 ohm:-*A resistor is a passive two-terminal electrical component that implements electrical resistance as a circuit element. In electronic circuits, resistors are used to reduce current flow, adjust signal levels, to divide voltages, bias active elements, and terminate transmission lines, among other uses.

Fig.3 Resistor 100 ohm

*3.4 6V SPDT Relay switch:-*Relays are that open and close circuit electromagnetically or electronically. Relay control one electrical circuit by opening and closing contact in another circuit. When a relay contact is normally closed (NC), There is a closed contact when the relay is not energized.[4]

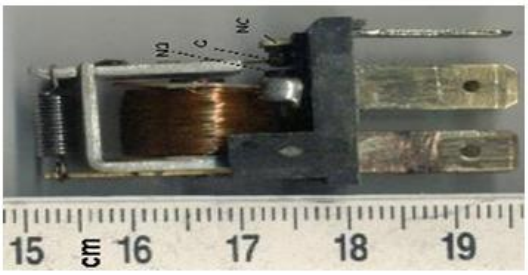

Fig.4SPDT Relay switch

3.5 *2V 5mm LED's:-*A light-emitting diode (LED) is a two-lead semiconductor light source. It is a p–n junction diode that emits light when activated.When a suitable voltage is applied to the leads, electrons are able to recombine with electron holes within the device, releasing energy in the form of photons.

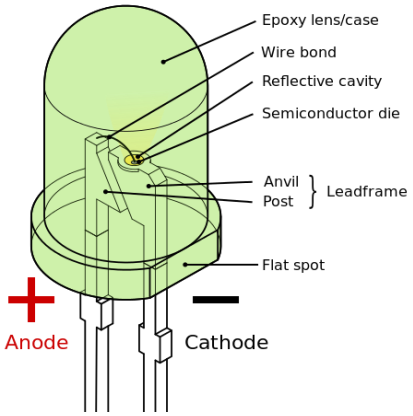

Fig.5 5 mm LED's

3.6 *Water pump:-*Here we us an electric motor to operate water pump. An electric motor is an electrical machine that converts electrical energy into mechanical energy. The reverse of this is the conversion of mechanical energy into electrical energy and is done by an electric generator.

3.7 *5V DC Supply:-*A power supply is an electronic device that supplies electric energy to an electrical load.The primary function of a power supply is to convert one form of electrical energy to another.

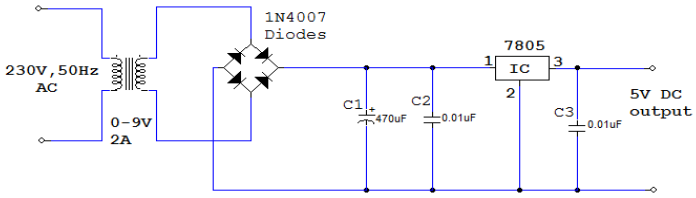

Fig.6 5V DC Supply

IV. CIRCUIT ARRANGEMENT

Circuit arrangement for device is shown in below figure. In this circuit I will make three water sensors. I use BC547 transistor to make water sensor. In BC547 transistor as soon as we give small current in the base of transistor then we get high current at the emitter. There are three LED use to indicate water level. Emitter of the transistor 2, 3 and 4 connected with the negative terminal of the battery. Collector off the transistor 2, 3 and 4 connected with the positive terminal of the with 100ohm resistance in series.

There are two 6v relay switch are also connected at the low and top level of the water sensor. Relay switch (1) which is connected with the low level or red led by using another BC547 transistor 1, 5. In this relay switch (1) we give 5v VCC at the normal closed (NC) and 0V with normally open (NO). Another relay switch (2) which is connected with the high level or green led. In this relay we give 5V VCC at normally open (NO) and ground at normally closed (NC).

Common of relay switch (1) connected with pin number 2 (RESET) of the IC7402 and common of relay switch (2) connected with the pin 5 (SET) of the IC7402. Pin 1 of the IC7402 connected to the base of NPN transistor. Collector and emitter of transistor are connected through the supply on/off switch terminals of the relay switch (3). This relay switch named as water pump controller. Water pump supply on/off switch terminals connected with the normally closed (NC) and common of the relay switch (3).

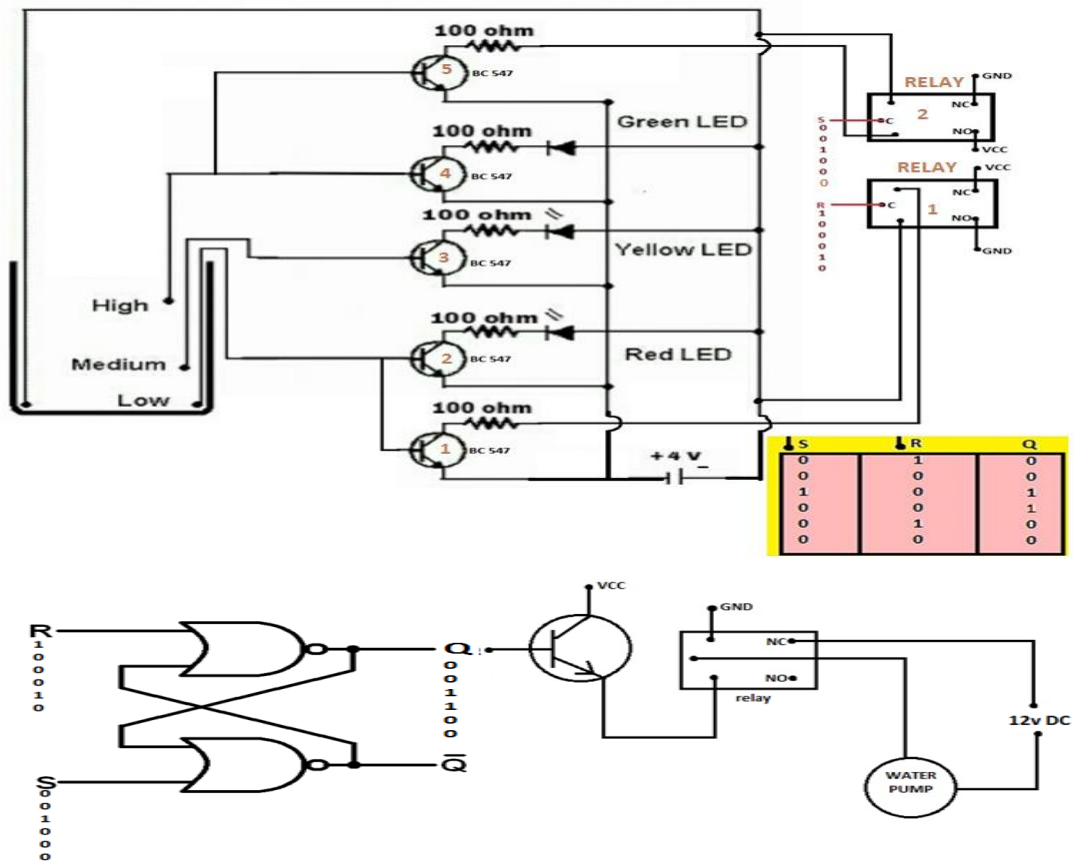

Fig.7 Circuit aarangement

V. WORKING

From above figure it is clear that in the initial condition when water tank is empty then there are no supply in relay switch (1) & (2). Therefore in this condition common (C) of relay switch (1) (RESET) will remains connected with the HIGH and common of relay switch (2) with the LOW. Therefore value of output Q will becomes LOW, according the principle of NOR S-R latch. When the value of Q is LOW then there is no supply to relay switch (3). So water pump will be on.

When the water level increases, low sensor will touch the water so the supply of red LED and relay switch (1) become start. Therefore value of RESET becomes LOW. In this condition S-R latch work as memory therefore value of output Q remains same. Hence water pump remains on. When the water level reach at the middle point of the water tank then sensor (2) will touch the water and yellow LED becomes on which indicate half water level. In this condition there is no change in the supply of both the relay so value of SET & RESET will be same.

As soon as water level reach at top then it will be touch the third sensor. In this condition supply of the green LED and relay switch (3) becomes start. Therefore value of SET becomes HIGH and according the principle value of output Q,of theNOR S-R latch will becomes HIGH. In this condition supply of relay switch (3) will be on. So water pump supply switch becomes off and water pump also off.

When the water level of water tank will decreases then supply of relay switch (2) become off. Then value of SET becomes low and green LED off. In this condition S-R latch work as memory so value of output Q remains same. So water pump remains off. When the water level further decreases then at low to middle point first yellow LED becomes off. Now when level reach at low point then red LED becomes off and supply of relay (1) also off. In this condition device come in its initial condition therefore water pump get start again.

VI. CONCLUSION

Water monitoring system is a project that can be applied in agriculture sector. This project is the solution to help the user to pump water from well reservoir or river into the water tank using the automatic pumping system and monitor the water level on the dump monitoring system. As agriculture is been focused nowadays, it is important to apply this project in a wide farm. Knowledge about selecting the transducer as a detector to detect the water level is very important. The detector is a great addition to the suite of detectors available to detect distance of the object. They are quite inexpensive, use very little power, fit in small spaces, and have a unique range that is ideally suited to small robots in human spaces such as hallways, rooms, and the occasional maze. A pump system in this project is using an AC pump. Transistor driven relay circuit is integrate together to make it can operate in dc condition because it is able to control an output circuit. If the coil is energized with DC voltage, a diode is frequently installed across the coil, to dissipate the energy from the collapsing magnetic field at deactivation, which would otherwise generate a spike of voltage and might cause damage to circuit components. If the coil is designed to be energized with AC voltage, a small copper ring can be crimped 37 to the end of the solenoid. This "shading ring" creates a small out-of-phase current, which increases the minimum pull on the armature during the AC cycle Upon completion of this project, understandable in the basic and fundamentals of data acquisition theories is very important.

6.1 Recommendation for Future Project:-Water monitoring system has a good potential to implement in future especially for agriculture sector. This system is connected in serial connection between microcontroller and PC interfacing. This project will be more effective if it can be replaced with wireless connection which is accomplished without the use of a "hard wired" connection. With wireless communication, the information or data can be transfer more efficiently between monitor system and pump system for any distances involved. 38 This project can be expanded by using 2 pumps instead of using 1 pump. The first pump will be used to allow the amount of water from sources that will be flow into the tank and the other pump will be used to flow the water out from tank which controlled by using the other type of sensor. More sensors will be suggested to be more application for future project such as temperature sensor or humidity sensor. The temperature sensor will be suggested to control the water flow from tank to farm by detecting the temperature's environment changes. The other recommendation to improve this project is by adding new features at interfacing system. The interfacing system can add 'print' and 'save data' features so that users can print or save the present data for documentation and references.

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REFERENCES

[1]. Anil K. Maini, Digital Electronics Principles Devices and Applications(Ltd. ISBN: 978-0-470-03214-5,2007).
[2]. ShefaliMamataj, DibyaSaha, NahidaBanu, A Review of Reversible Gates and its Application in Logic Design, American Journal of Engineering Research (AJER) e-ISSN: 2320-0847 p-ISSN: 2320-0936 Volume-03, Issue-04, pp-151-161.
[3]. A. StegouSagia, Adel Al Jumaily, YogitaBajpai, Solar Power Charge Controller, Global Journal of Researches in Engineering: F Electrical and Electronics Engineering Volume 16 Issue 8 Version 1.0 Year 2016.
[4]. NidhiVerma, Kartik Gupta, Sheila Mahapatra, Implementation, Of Solid State Relays for Power System Protection, International Journal of scientific & technology research volume 4, Issue 06, June 2015 ISSN 2277-86162.
[5]. Pragati Sharma, A.S.Sindekar, Suitability and Comparison of Electrical Motors for Water Pump Application, International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering (An ISO 3297: 2007 Certified Organization) Vol. 5, Issue 3, March 2016 Copyright to IJAREEIE DOI:10.15662/IJAREEIE.2016.0503026 1356.

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