School of Electronics Engineering – SENSE

Microcontroller and its Applications – ECE3003

Automatic Switching on and off of Water Pump

Submitted to

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Abstract:

The ones who have access to this precious resource always take it for granted. They're very irresponsible towards it. Our project, Automatic switching on and off of water pumps is a tool designed to help save this precious element. By cutting off the water supply when the storage is full and turning on the pump automatically when its empty, we can save a huge amount of water from being wasted and can be utilized for other useful purposes.

If installed in tanks and other places where water is stored, this device has a huge potential to save water. The device is capable of cutting off the water supply as soon as the tank is full.

Aim/Introduction:

This project is done using 8051 Microcontroller and will help in automatically controlling the water pump by sensing the water level in a tank. This circuit works on the principle that water conducts electricity. A wire connected to VCC and four other wires are immersed in a tank at different levels namely, Quarter, Half, three-Fourth and Full. These inputs are taken on pins, P2.7, P2.6, P2.5, P2.4 respectively.

Port P0 is connected to LEDS. Initially, when the tank is empty, LED at P0.4 will glow and the water pump is turned on. As the tank starts to fill, wires at different levels get some positive voltage. This positive voltage is then fed to their corresponding pins of the 8051microcontroller to display the water level.

When the tank is completely filled, LED at P0.0 will be turned on and the water pump is automatically turned off. The Water pump is connected to P0.5 and VCC of the microcontroller.

In this project we use an IR sensor to detect if the object is black or white. The IR sensor is connected to digital pin on an Arduino. When the object is white or close to white the IR sensor gives low pulse or binary zero to the digital pin of the Arduino. When the object is black or close to black the IR sensor give a High pulse or binary one to the digital pin of the Arduino. A servo motor is also connected to digital pin of the Arduino. The Arduino moves the servo motor corresponding to the Input value from the IR sensor.

Block Diagram:
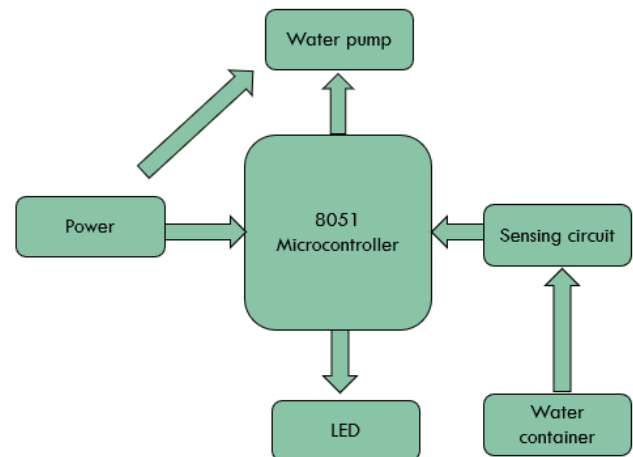
Components required:

Microcontroller (AT89C51):

A microcontroller is a compact integrated circuit designed to govern a specific operation in an embedded system. A typical microcontroller includes a processor, memory and input/output (I/O) peripherals on a single chip. Sometimes referred to as an embedded controller or microcontroller unit (MCU), microcontrollers are found in vehicles, robots, office machines, medical devices, mobile radio transceivers, vending machines and home appliances among other devices.

Transistors:

A transistor is a device that regulates current or voltage flow and acts as a switch or gate for electronic signals. Transistors consist of three layers of a semiconductor material, each capable of carrying a current. A transistor regulates current or voltage flow and acts as a switch or gate for electronic signals

Basic Circuit elements:

Resistors, Capacitors, Bread Board, Connecting Wires

Water Pump:

Pumps water into the tank.

Keil Software:

Keil development tools for the 8051 Microcontroller Architecture support every level of software developer from the professional applications engineer to the student just learning about embedded software development.

Proteus Simulation:

The Proteus is an electronic circuit design software which includes aschematic capture, simulation and PCB (Printed Circuit Board) Layout modules. But generally now a days Eagle CAD is highly preferred over Proteus for PCB designing because of its flexibility.

Algorithm:

- Define P2 as Input
- Define P0 as Output
- First the microcontroller checks if water is available. And turns the motor off if not available.
- When the tank is empty the corresponding byte is sent by port 2 and the microcontroller checks the byte using if condition and it sends a byte to port 0 such that the leds connected shows the status as empty and turn on the motor.
- Similarly for 1-4th, half, 3-4th, Full are given in different if conditions.
- When the tank is full corresponding led is shown and also the pump is turned off.

Circuit Diagram:
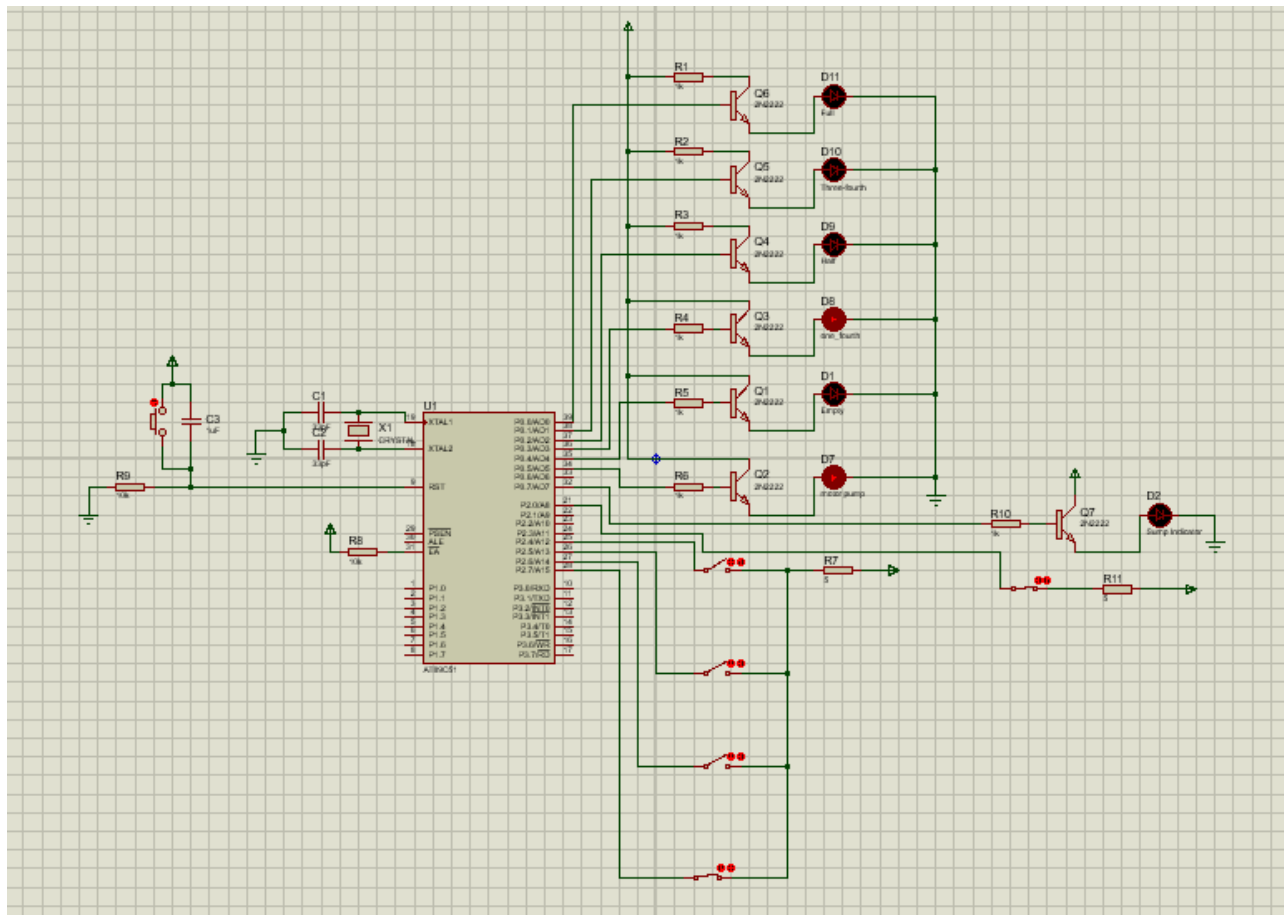
Code:

```
MOV P2,#00H
MOV P0,#0FFH
MOV A,#00H

//Full
L1:ACALL WTRCK
MOV A,P2
CJNE A,#0F1H,L2      //11110001
SETB P0.0
CLR P0.1
CLR P0.2
CLR P0.3
CLR P0.4
CLR P0.5

//Three-fourth
L2:MOV A,P2
CJNE A,#0E1H,L3      //11100001
CLR P0.0
SETB P0.1
CLR P0.2
CLR P0.3
CLR P0.4
SETB P0.5

//Half
L3:MOV A,P2
CJNE A,#0C1H,L4      //11000001
CLR P0.0

CLR P0.1
SETB P0.2
CLR P0.3
CLR P0.4
SETB P0.5

//Quarter
L4:MOV A,P2
CJNE A,#81H,L5       //10000001
CLR P0.0
CLR P0.1
CLR P0.2
SETB P0.3
CLR P0.4
SETB P0.5

//Empty
L5:MOV A,P2
CJNE A,#01H,L1       //00000001
CLR P0.0
CLR P0.1
CLR P0.2
CLR P0.3
SETB P0.4
SETB P0.5
SJMP L1

WTRCK:JNB P2.0,L6
CLR P0.7
SJMP L7
```

L6:CLR P0.5

SETB P0.7

L7:RET

END

Observation:

All the connections were made and the circuit was tested. The circuit performed as expected and displayed the correct information on the LCD display and the water pump is controlled perfectly. The 8051 is a very powerful tool which can be used for many such innovative and useful projects.

Application:

•Automatic Water level Controller can be used in hotels, factories, homes apartments, commercial complexes, drainages, etc.

•It will automatically start the pump as soon as the water level falls below the predetermined level and shall switch off the pump set as soon as tank is full.

Conclusion:

Automatic water pump control system employs the use of different technologies in its design, development, and implementation. The system used microcontroller to automate the process of water pumping in an over-head tank storage system and has the ability to detect the level of water in a tank, switch on/off the pump accordingly and display the status on an LCD screen. This research has successfully provided an improvement on existing water level controllers by its use of calibrated circuit to indicate the water level.

References:
https://www.electronicshub.org/water-level-controller-using-8051-microcontroller/

https://www.academia.edu/11989580/Water_level_detector_using_8051_microcontroller