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WATER PUMP CONTROLLER

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ABSTRACT

The Water ATM system is a practical solution to provide water to individuals in a controlled and automated manner. Using an Arduino-based platform, this system incorporates an RFID reader (EM18) for user identification and an LCD display (20x4) to show essential details such as remaining balance, the status of the transaction, and time remaining. The system uses a MOSFET IRF540 to control a water pump for water dispensing and allows the user to recharge their balance via a keypad interface. The project aims to create an efficient, low-cost, and easy-to- maintain system for water distribution.

INTRODUCTION

Water scarcity is an issue faced in many regions, and the need for a controlled and accessible water distribution system is crucial. This project focuses on designing a smart water ATM system using an Arduino-based microcontroller. The system uses an RFID reader to authenticate users, providing a seamless experience for obtaining water. The project is designed to be reliable, with automated water dispensing controlled via a MOSFET IRF540 transistor. The balance is managed using a keypad and LCD display, while the power supply is handled by a step-down transformer and associated components. This system can ensure efficient use of water by controlling the quantity dispensed and tracking users' balances.

METHODOLOGY

Problem Identification - Manual water level control leads to water wastage and energy inefficiency.Existing single-tank controllers lack the capability to manage multiple tanks efficiently.

Requirements Defined - The system should automatically detect water levels using sensors. The motor and valves should operate only when necessary. The LCD should display the water level and system status.

System Design & Architecture

Block Diagram Development

Power Supply Unit: 12V step-down transformer, rectifier, regulator.

Sensors: Two-level water sensors for each tank (low, high).

Microcontroller: Arduino Uno (ATmega328) for control logic.

Motor & Valve Control: MOSFET-based motor driver and solenoid valves.

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Circuit Design

Designed using Proteus software to simulate sensor inputs, motor driver, and LCD interfacing.

Hardware Development

Component Selection & Testing- Selected high-quality water level sensors to ensure accurate readings.Used a 12V motor and solenoid valves for efficient water distribution.

System Assembly- Connected sensors to microcontroller input pins. Integrated the motor driver with MOSFETs for better power efficiency. Connected LCD display for real-time system monitoring.

Software Development: Programming the Arduino Uno

Sensor Data Processing: Reads water level sensor inputs.

Motor & Valve Control Logic: Turns ON motor and respective valve when both sensors in a tank go LOW. Turns OFF motor and valve when both sensors go HIGH.

LCD Display Updates: Shows water level status and system actions.

Code Implementation & Testing: Developed and tested the Arduino program using the Arduino IDE

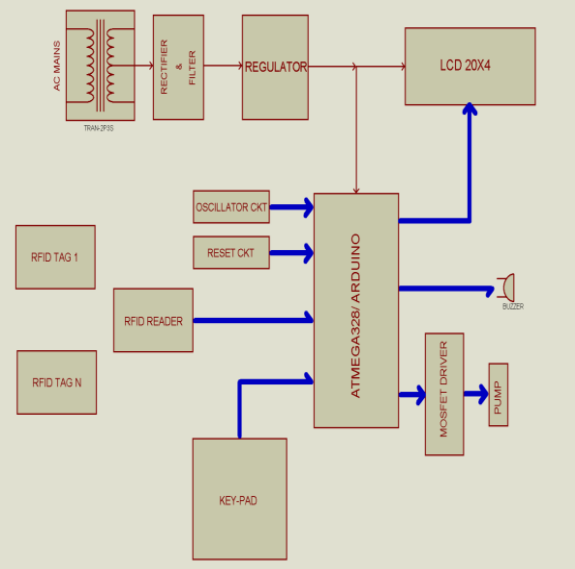
Testing & Performance Evaluation

Simulation Testing: Simulated different water levels to verify if the motor and valves responded correctly.

Optimization & Improvements

Energy Optimization: Implemented power-saving techniques for motor operation.

BLOCK DIAGRAM



Atmega328 microcontroller

The **ATmega328** is a popular 8-bit microcontroller from the AVR family developed by **Atmel**, now part of **Microchip Technology**. It is widely used in various embedded systems and Arduino and versatility.

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Key Specifications:

Operating Voltage: 1.8V to 5.5V

Clock Speed: 16 MHz (Standard Arduino Clock Speed, but can be configured for other frequencies)

Flash Memory (Program Memory):32 KB (of which 0.5 KB is used by the bootloader)
EEPROM (Electrically Erasable Programmable Read-Only Memory):1 KB

6 pins with PWM (Pulse Width Modulation) capability

8 analog input pins (ADC channels)

Pump

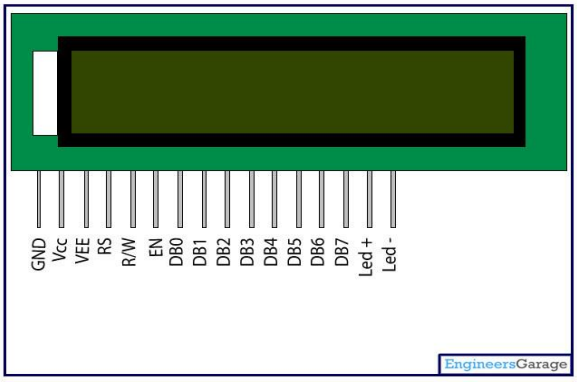
pump rated for 6 to 12V DC. It has a eelf-priming capability which draws water from a depth of 2 meters and can pump water vertically up to 3 meters and can handle a maximum flow rate of 2-3 liters per minute. The pump draws a current of approximately 0.23A under no load, increasing to between 0.5-0.7A when under load. Also, the pump can generate a maximum pressure of 1-2.5 kg/cm², allowing it to effectively push liquids through various systems.

10 4x3 KEYPAD

Keypads are collection of push switches however arranged in the form of a matrix. So there are rows And columns of switches.The two connections of A switch are also connected in the matrix, so that The row has common connection and column has A common connection. Thus when a button is Pressed a row and a column,where the button is Pressed gets connected internally . The keypads Are usually available as telephone type 3X4 keypad . This one has three columns and 4rows,or a 4 x 4 keypad having 4 rows and 4 columns.

LCD Display

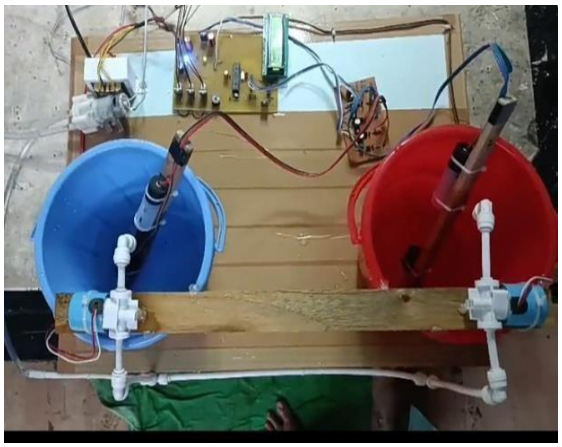
LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2/ 20x4 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons 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.



CONCLUSION

This water ATM system offers a smart solution to manage water distribution efficiently. By automating the process and incorporating a recharge system, it ensures that users only receive water based on their available balance. The system's flexibility and scalability make it suitable for various applications in both urban and rural setting.

RESULT



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