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SMART DOMESTIC PUMPING SYSTEM

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Abstract:

Water pumping system in domestic houses is not transparent or not clear to the house holder with respect to the power consumption, water consumption, motor health, frequency of motor usage, power usage. So in this Smart pumping control system we are going to use the ultrasonic sensor and magnetic float Sensor. This concept is used in our water controller project where the motor pump is automatically turned on when water level in the tank became empty and motor pump is automatically turned off when water level in the tank became full.

1.Introduction:

Smart Domestic Pumping System is a unique solution for knowing better about domestic pumping system. This system uses smart devices connected to motor switch and devices connected to overhead water tank. The devices connected to motor switch and overhead tank sends periodic data to cloud with the configured parameters. The parameters that can be configured are, motor on/off cycles, interval between on/off cycles, power consumed in every on/off cycle, overhead water tank water level.Using these parameters, cloud system will be configured to derive analytics like, monthly forecasted motor running costs, per person energy and water consumption, daily/monthly/yearly usage of water & energy for pumping. Motor health also can be derived based on the power consumed vs water level in overhead tank. Also, motor can be automatically on/off considering the water level in overhead tank. Accuracy can

be increased by using more number of sensors. This system also provides wireless water level monitoring & controlling.This system can be made intelligent by connecting this system with external power operators. The power operators will publish the scheduled power cuts through their servers. This system will connect to those servers to fetch data regarding power cuts and can send notifications to users to make sure the water in overhead tank is available as per house holder convenience.

2.Literature Survey

Water pumping system in many houses is not clear to the house holder with respect to the how much power consumption is consumed, water consumption, motor health, frequency of motor usage and power usage.Smart Domestic pumping system is a unique solution for knowing better about domestic pumping system in houses. This system uses smart devices connected to

motors switch using Micro Controller and Magnetic float switch sensor devices connected to overhead water tank is used to detect the water level of a tank and the switch is used to control the pump. The devices connected to motor switch and overhead tank the magnetic float sensor and ultrasonic sensor send periodic data to cloud with the given configured parameters. The parameter that can be configured are, motor on/off cycles, interval between on/off cycles, power consumed in every on/off cycle, overhead water tank level. Using these parameters cloud system will be configured to derive analytics like monthly forecasted motor running cost, per person energy and water consumption, daily/monthly/yearly usage of water and energy for pumping. Motor health also can be derived based on the power consumed vs water level in overhead tank. Also, motor can be automatically on/off considering the water level in overhead tank. Accuracy can be increased by using more no. of sensors. This system also provides wireless water level monitoring and controlling.

We survived so many real time scenario and identify the house holder problems. Consider the user side problem we are given user friendly features like:

- Automatic Motor on/off
- Push notifications to user
- User can check the motor condition
- User can check the power consumption
- User can check the water levels
- User can check the amount bill generated by the motor power usage.

Existing System:

Real time local water information and suggestions are not available with the users, which helps them to take decisions accordingly in their daily lives and the user doesn't know whether the tank is full or not. The water is wasted, and the power consumption will be more. So, for this disadvantage we build this mobile application.

4. Proposed System:

This system allows user to get water levels in real time by using motor, relay, ultrasonic and magnetic sensors to monitor local water tank levels. It allows users to directly check the water levels and power consumption on mobile application. The recorded data will be transmitted to the microcontroller. Then Microcontroller processes transmitted data and send the processed data to cloud server. The system is connected to the cloud server over a Wi-Fi connection. The data collected in cloud server will be retrieved and shown on the mobile applications. Mobile application will provide dashboard screens to depict the current water information. The system allows user to set alerts for water levels. Also, notifications can be sent to mobile applications for the configured alerts. Users without internet connection can receive the notifications through SMS service. Machine Learning algorithms will be executed on collected data at cloud. These algorithms can provide Smart suggestions. Also, by connecting to pumping services to provide more accurate and customized notifications. Notifications can be customized as per user profile.

Advantages:

- The disadvantage of existing system is the main advantage for this mobile application.
- User operate his hardware i.e. motor with his mobile applications from any where with the help of internet.
- User can operate manually switch on the motor and switch off the motor with his mobile application.
- In this we have automatic mode if we select auto mode it will automatically on the motor when tank is empty and off the motor when tank is full without any manual intervention

4.1. System Architecture:

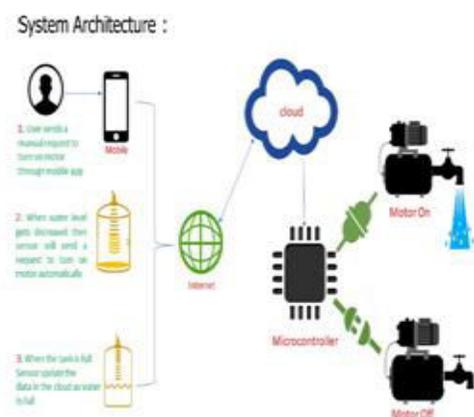
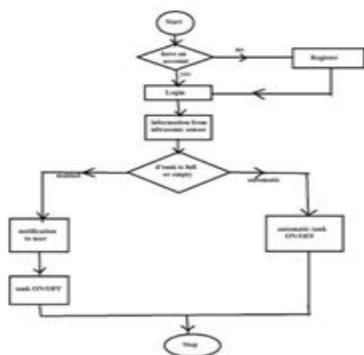


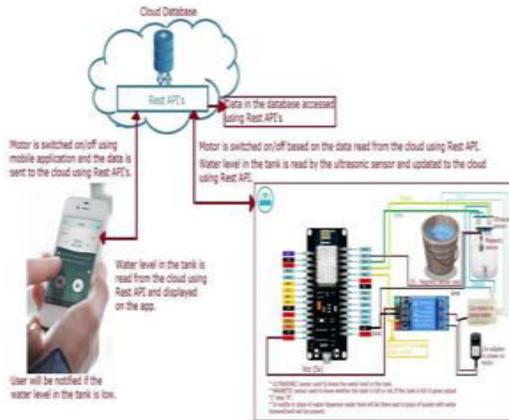
fig: system architecture

Data Flow:



Working Principle:

1. Working principle of this project you can operate your hardware with your mobile application.
2. User will be notified if the water level in the tank is low.
3. Water level in the tank is read from cloud using Rest API and displayed on the app
4. Motor is switched on/off using mobile application and the data is sent to cloud using Rest API's. Motor is switched on/off based on the data read from the cloud using Rest API 's.
5. Water level in the tank is read by the hardware i.e. ultrasonic sensor and updated to cloud.
6. Cloud is used to store the data from mobile application and hardware. Cloud acts as a interface between mobile application and hardware.
7. We also calculate power consumption by taking the start time of the motor from the mobile and store in the database.
8. When motor is switch off then it will automatically update the current mobile time in the database.
9. By using start time and end time in the database it automatically calculates the motor running time. With that motor running time we calculate the motor power consumption.



In hardware we are using Node MCU, Relay, Ultrasonic Sensor, Magnetic Float Switch Sensor and 12v motor.

- Node MCU is inbuilt Wi-Fi module our code stored in Node MCU.
- Ultrasonic sensor is used to calculate the water level in the tank.
- Magnetic Float switch sensor act like a switch if tank is full the coil goes up and indicate tank is full.
- Relay also act like switch when tank is full if off the motor and tank is empty it on the motor.
- Motor is used to pump the water.

How Hardware works:

In hardware we have Node MCU it operated with your Wi-Fi connection. Node MCU VCC(5v) pin connected to relay and ground GND pin connected to relay and magnetic float switch sensor and relay read digital input/output from the D4 pin. The D1 pin connects to magnetic float switch sensor and it sent data either 0 or 1 if tank is full it gives output as 1 and if tank is empty it give output as 0. The D2 pin is connected to Echo pin of ultrasonic sensor Echo pin is act like input. The D3 pin connected to trig pin of

ultrasonic sensor. Ultrasonic sensors emits short high- frequency sound pulses at regular intervals. These propagate in the air at the velocity of sound. If they strike any object, then sound waves are reflected back as echo signals to the sensor, which itself computes the distance to the target based on the time-span between emitting the signal and receiving the echo. When echo pin is high it calculate the duration and distance calculate with duration.

$$\text{Distance} = \text{duration} * 0.034 / 2$$

Modules: User Features:

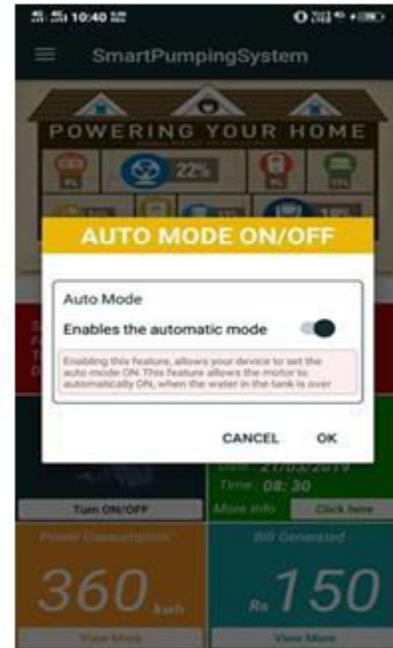
- Login
- Register
- Forgot Password
- Home Page
- Motor Status (manual mode)
- Auto mode
- Tank Information
- Power Consumption
- Water Consumption
- Bill Generated
- Share
- Feedback
- Logout

These are the features given to the user to operate the Smart domestic pumping system without manual interaction

Home Screen:



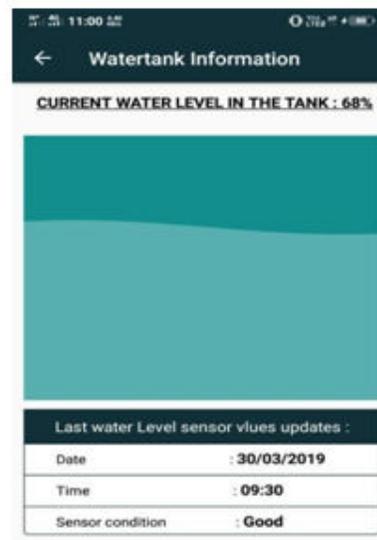
Auto Mode Screen:



Manual mode Screen:



Tank information screen:



Features:

1.Login Page:

This option provides the authorized or verified users to securely login to the application.

2.Registration Page:

If user doesn't have an account user can register with this page. When user register user data stored in the database.

3.Home Page:

Once user login into this application this Home screen appear. This screen provides information about the motor status, Tank Information, Power Consumption and Bill generated.

4.Motor Status(Manual mode):

In this option user can select manual or automatic mode option. If user select manual option user can manually operate the motor and user can also check weather motor is on/off . If user select automatic mode without any manual intervention motor can on/off.

5.Auto Mode:

In this option user can select auto mode then it will automatically on the motor when tank is empty and automatically off the motor when tank is full.

6.Tank Information:

In this option user can check the water level present in the tank. And user check the motor on time and sensor condition also.

7.Power Consumption:

In this option user can check the how much power consumed by the motor power usage.

8.Water Consumption:

In this option user can check the how much water consumed by the user.

9.Bill Generated:

In this option user can see the how much bill generated for the usage of motor power.

10.Feed Back:

In this option user can give the app feedback.

11.Share:

If user like to share this app user can share this app to another users.

12.Logout:

By this option user can logout from the app.

4.4 System Analysis:

In this mobile application we analysis that how much power consumed by the motor and water consumed by user in weekly and monthly.

Power Consumption:



In power consumption analysis it shows how much power consumed in week wise and it also show that in which day the power is consumed high and in which day the power consumed is low.

Water Consumption:

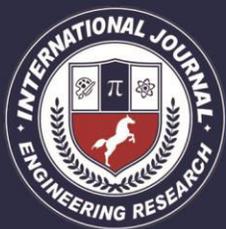


In water consumption analysis it shows how much water consumed in week wise and it also show that in which day the water is

consumed more and in which day the water consumed is less.

5.Conclusion:

Smart domestic pumping systems react and adjust themselves to system changes without manual intervention. These types of systems must have the ability to recognize and safeguard themselves from operating under conditions, which may reduce mean time between failure (MTBF). A smart domestic pumping system should be capable to understanding when the system unusual or transient operating condition has cleared, thereby allowing normal pump operation to resume. The value of these systems to the user is reduced life cycle costs. Smart systems utilizes a variable frequency of controller that can match pump output to system head requirements thereby reducing operating costs significantly over the life of the pump. Energy consuming control valves are no longer required. The smart-control software will permit the pump to operate outside from anywhere we can switch on and switch of the motor. As a result, maintenance costs will decrease and MTBF will increase for these systems. Smart domestic pumping systems can integrate the functionality of several pieces of equipment from a conventional pumping system to reduce both initial and installation cost. If the total initial cost of a smart domestic pumping system is compared to that of a conventional system it can be shown that the smart system can be very competitive in cost. When comparing to total life cycle cost smart domestic pumping systems can have an overwhelming advantage.



6. FUTURE ENHANCEMENT:

By this Smart domestic pumping system application user can automatically on/off the motor from anywhere. By this application we can save the water without any wastage. When tank is full automatically off the pump when tank is empty it automatically on the pump without any human interaction. Based on the power cuts the system can automatically turn on the motor before the power cut time, so that the water tank be filled completely, hence the user can use the water until power comes. This will be very helpful in rural areas especially during summer season the power will be limited, i.e., for example, only 12 hours power will be available and using this options the tank can be filled before the power cut.

7. References:

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