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SMART WATER METERING SYSTEM

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Abstract: In urban areas the water supply to residence and commercial establishments are provided at a fixed flow rate. There are incidents of excess water needed by certain customers/users. In this project it is proposed to develop an embedded based remote water monitoring by recording the flow rates at the consumer/user end. In order to implement the proposed water supply system, each consumer end should be provided with an embedded based water flow monitoring system consisting of a microcontroller to record the flow rate using a flow sensor and it is also provided with an electrically operated solenoid valve to supply water to the consumers. It is proposed to employ a NodeMCU MODEM so that if the water reaches the Threshold value message will be delivered saying that water bill has been generated.

Keywords: Water meter, flow rate, water supply, embedded microcontrollers

I. INTRODUCTION

Nearly the third quarterly portion of the earth which estimates up to 71% portion of it is covered with water. But out of which only 0.08% fresh water is available for human purposes and for living beings. The main sources of fresh water available for living purposes and for human use is the surface water available as a result of rainfall which also recharges the lakes, different water resources like aquifers. Water scarcity is the problem faced by the living creatures throughout the history and whose intensity has increased during the last centenary. It's estimated by next decade approximately 25% of the population of earth will live in perpetual scarcity of water. As per Swedish expert Falken Mark, "When water availability is less than 1,000 cubic meter per person per day water stress occurs. Culmination of huge and increasing population and evenly increasing demands for water and uneven accessing to it is the main cause of water scarcity."

Apart from agricultural purposes, the major share in utilizing available fresh water is industries. Industrialization and urbanization brought more use for water especially at nuclear plants for cooling and also at big factories. At this stage it is imperative, for proper management and distribution of water, to conserve the water resource, which will subsequently lead to not only to substantial improvement in human life and condition but also will benefit the different management organs of the biomes and ecosystems.

New strategies need to be implemented in order to avoid setbacks and to fill up the lacuna which generally occurs during the distribution of water for various purposes in the allocation of water resources. With this thought, the project focuses, explicitly, on monitoring the usage of water.

As monitoring will help further for controlling and distributing the water resource evenly according to the region and availability of resource as per area. When water will have charged according to usage and after certain limit the usage exceed, people will start using water carefully.

II. METHODOLOGY

The various components used in this project are describes in this chapter. All these components work together to function as a smart device. There is one main component and all other components provide input to this main component. This main component is the microcontroller. A microcontroller is the brain of the system and controls the functions of all the other components used in the system.

List of components used for implementation:

- Arduino UNO
- Solenoid valve
- Flow Sensor
- 7805 voltage regulators for power supply
- NODEMCU
- LCD
- Relays

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Software:

- Embedded C
- Arduino IDE

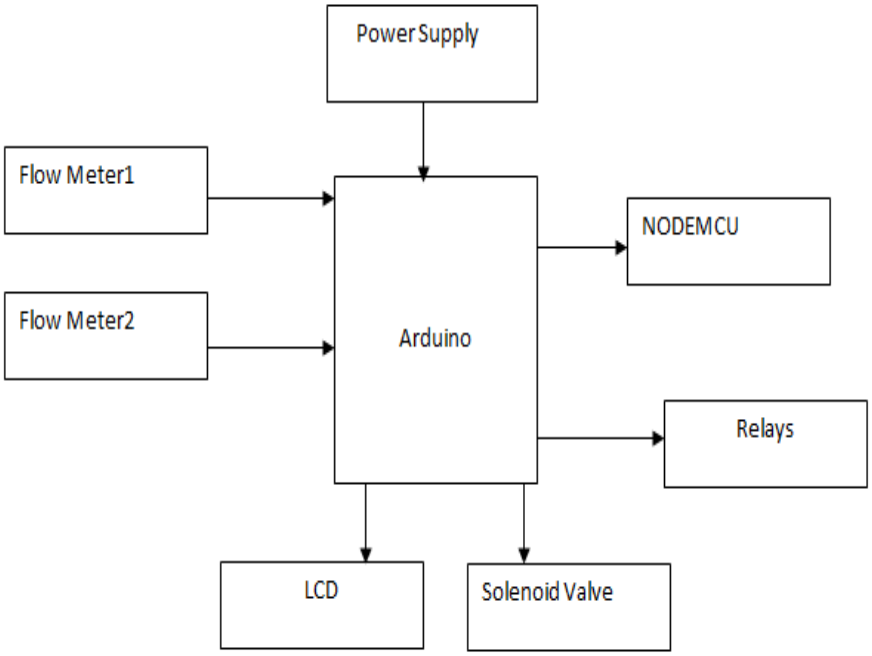

Fig. 1 Block Diagram

- The block diagram of the system is shown in the above figure. Hall effect-based flow meter is to measure the flow rate of the water.
- Arduino uno will act as a microcontroller-based device. The flow meter measures the flow rate of the water and generates a pulse signal accordingly. The flow meter is wired with Arduino so as to sense the pulses from flow meter.
- The flow rate is sensed by the signal conditioning unit when the water is passed. The sensor operates under certain predefined value.
- When the meter reaches the threshold value a bill will be generated and it is sent as an message via

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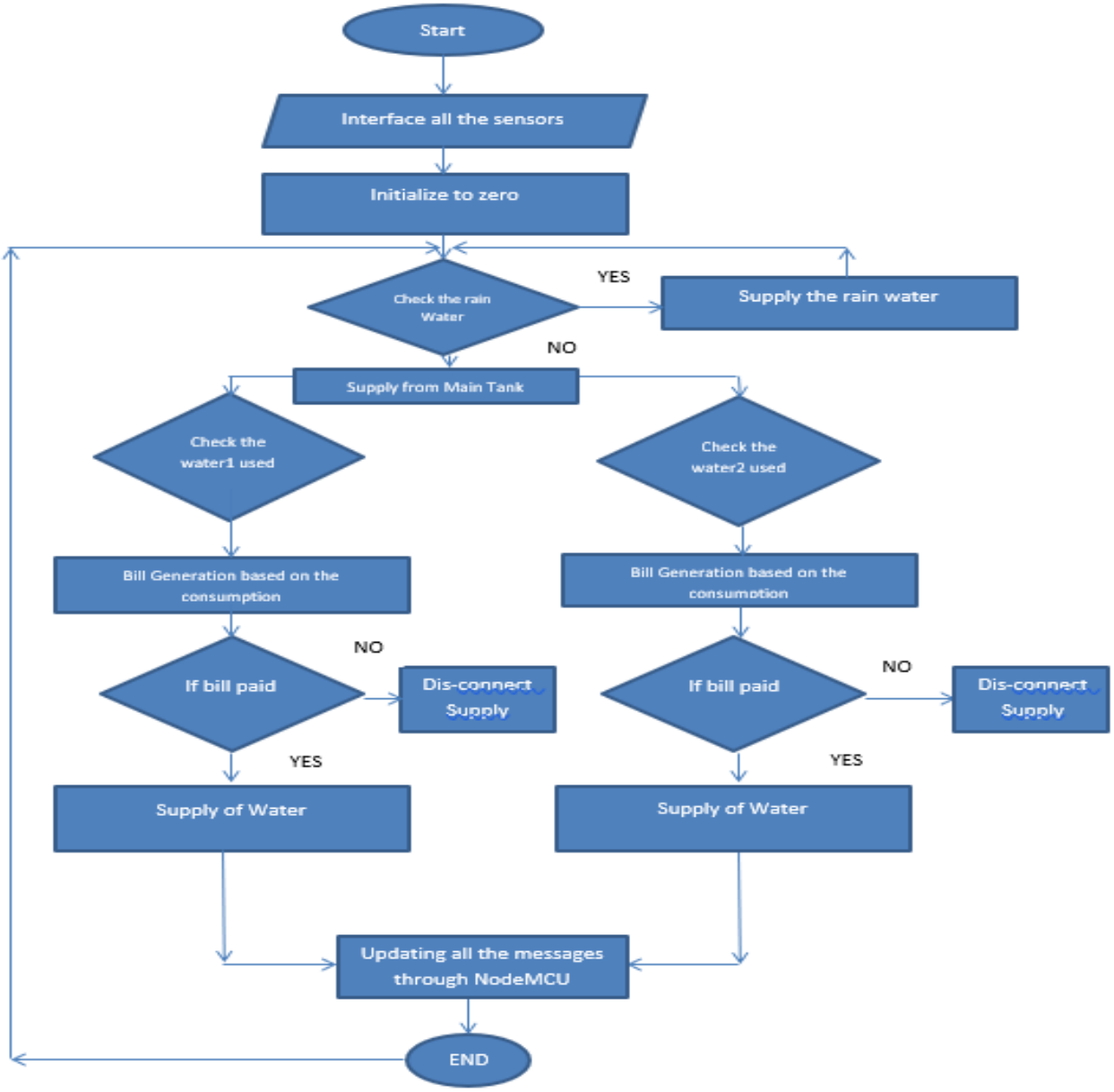
Fig. 2 Flow Chart



- NodeMCU.
- When the water is ON by automatically Switching ON/OFF the solenoid valve we can control the flow of water whenever necessary
- The Rain Water harvesting has been used in this project. So that Rain water is stored in the small tank and when it is supplying from the rain tank then it will be not added to the bill.
- When the Water bill is generated for each tenant/user then only the water from the main tank is considered and not the rain water which is sent to the tank.
- The message is sent to the Telegram App via NodeMCU.
-

III. RESULTS AND DISCUSSION

On the basis of analysis and design, the system provides a smart water meter with ecofriendly and energy efficient system. As the smart water meters are digitized and automated, high accuracy is maintained by decreasing human efforts. Water theft can be avoided since there are no mechanical parts that can be subjected to tamper. A hall effect

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sensor based water metering system was used for automated billing, eliminating the drawbacks of traditional water metering systems. The flow meter is giving the reading under tolerable error. All the power equipments are working properly. The NodeMCU module is working satisfactory by sending the bill amount and amount of water used to the fed mobile number.

HARDWARE OUTPUT

Fig 3 Representation of water before water flow

Fig 4 Representation of Bill

Fig 5 Representation of no rain water

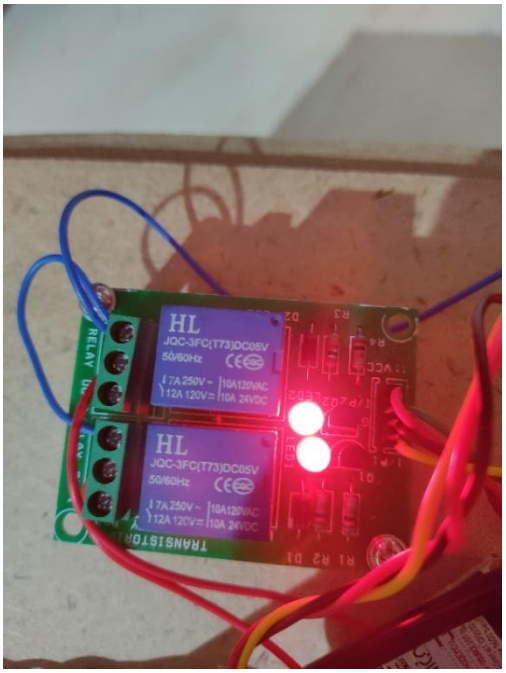

Fig 6 Relays turned on When Tank Water is used

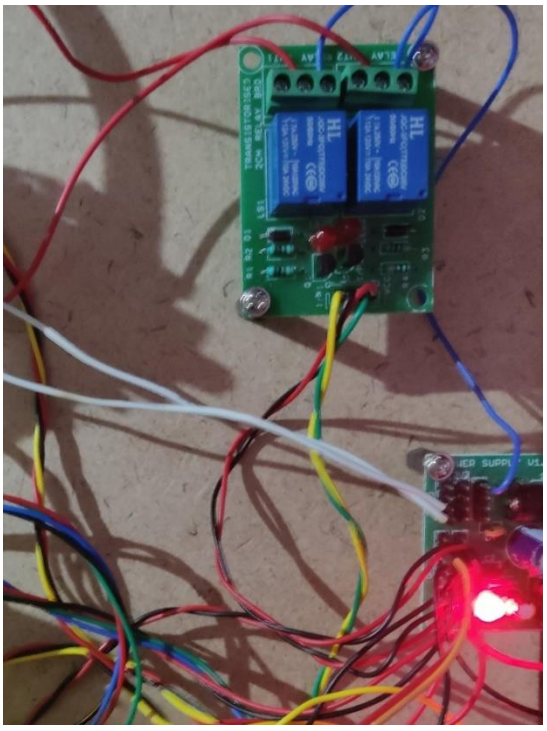

Fig 7 Relays turned off when Rainwater is used

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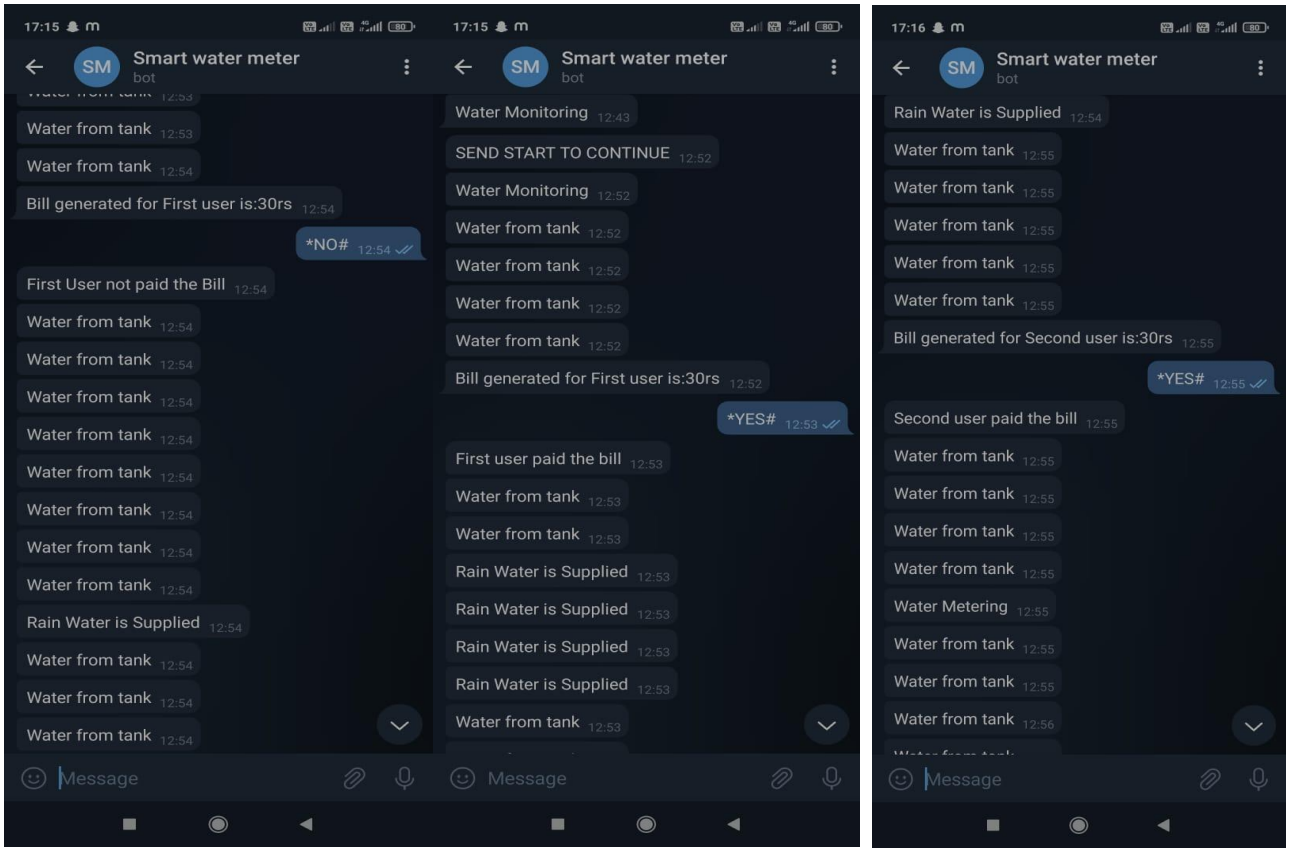

Fig 8 Telegram Messages

CONCLUSION AND FUTURE ENHANCEMENT

The flow of water through the domestic purpose can be monitored, In the proposed system a prototype for water Billing has been implemented. Each consumer will get a separate bill based on the usage and all these data is sent to the users mobile through NodeMCU.

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