

Iot Based Smart Water Truck Using Raspberry Pi

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Abstract- India's huge population has paved a way for water shortage and scarcity. Water has become the most commercial product of the recent years. Most of the people depend on water supply trucks for their daily water requirements. People face many problems while fetching water from the water trucks. In the proposed system a solution is given to overcome those issues. In this system the Raspberry pi plays a major role. RFID Reader is connected to the raspberry pi and the whole set up is fitted in the water truck. When the RFID Tag owned by the consumers is displayed before the RFID Reader, the water valve turns on. The people can use the RFID tag only twice a day. If the tag is used more than twice, then a message will be sent to their mobile using Global System for Mobile Communications (GSM). In addition to this, to track the location of the truck Global Positioning System (GPS) is used. When the Tag Id is mismatched with the data stored in the Raspberry pi the GPS activates and the amount of water supplied illegally to that area is sensed by the water level sensor. The Value is sent and monitored by the corporation office using Internet of Things.

Keywords- water scarcity, Raspberry pi, RFID Reader, RFID Tag, GPS, GSM, Water level sensor, IoT

I. INTRODUCTION

Water is of major importance to all living things. But due to the increase in the population of the country, the demand for water is also increased. As long as this situation exists, the future of water will be a gamble. In order to supply the water to the urban and peri-urban areas motorized trucks are used. The usage of water trucks also has many issues. The truck owners supply limited amount of water to the government instructed places and sell the remaining water for good price. The water corporation is not aware of any details such as water supplied areas, amount of litres delivered etc. The litres of water present in the water tank are unknown to the people as well as the truck representatives. People fight and deceive while fetching water. In addition to this some people fetch more water and others go home with empty buckets. To overcome the problem and to make the water truck work systematically, we have proposed a system using Raspberry pi. The Raspberry pi is a System on Chip and a programmable processor. It communicates with all the input

and output devices. The major functions like reading input from the RFID reader, comparing the input from the reader with the data stored in its memory, activating the GPS at a particular time are carried out by the Raspberry pi.

In between RFID Reader and RFID tag, the Wireless communication is used. The consumers will own a RFID tag. The RFID Reader fixed in the truck identifies the tag and when the tag id matches the stored id, the water valve opens to supply the water. The tag can be used twice in a day. If the Tag ID is not matched with the data stored in the Raspberry pi, then GPS activates.

The GPS receiver is used to provide the real time location of the vehicle. Raspberry pi is interfaced with it. It gives the latitude and longitude information of the vehicle. In addition to this, the amount of water supplied to that area illegally will be sensed by the water level sensor and further the data is sent to the corporation using Internet of Things.

LITERATURE SURVEY 1

Design and Implementation of Smart Attendance System Based on Raspberry pi by Hayder Fadhil Abdulsada demonstrated a system using Raspberry pi 3B model and Arduino UNO for hardware implementation of attendance system using RFID-RC522. It consists of two units a terminal unit and the base station unit. The terminal unit includes RFID unit, communication unit and control unit. The RFID unit has tags and reader. The reader will direct the problem to the tag present in the reading range of the reader; hence it is accountable for collecting information and sending it to the control unit. The control unit combined of Raspberry pi and screen GUI user interface. This unit is accountable for getting the information (IDs) from the RFID unit and doing all processing required to the attendance system. When the student shows the tag near the reader, the reader will redirect the tag difficulty in order to obtain its ID's. The tag receives the signal and sends its ID's to the Reader that is connected with the Raspberry pi. The received IDs are sent to the control unit i.e Raspberry pi. The Raspberry pi compares the names in the SQL database to fetch students name that are absent. The corresponding IDs of the absent students are push to the central unit (Arduino and GSM shield). The final step is

represented by obtaining the data from all the terminals units to save this data and come to the conclusion about the states of the students.

LITERATURE SURVEY 2

Smart garbage monitoring system using sensors with rfid over internet of things by Somu Dhana Satyamanikanta and M.Narayanan uses the recent technology to dispose the waste. With the help of the sensors authorities can get information about the bin up to date by the particular ID of the bin. So if the bin is over flowing, by the information given by the bin indicator they can find the location of the bin and squash it soon. If the person is coming to throw the waste into the bin, RFID card reader read the information stored in the tag. Photo electric sensor detects the object and sends the outline representation of object to the local authorities if there are any electrical components present inside the bin. The weight of the garbage present in the bin is identified by the Weight sensor and with the help of RFID and IR the up to date information is send to the officers .If the bin fills they can squash that bin and also monitors continuously. It makes the little noise and some indication will show on the screen of the authorities if the bin reaches the maximum level.

PROPOSED SYSTEM

The objective of this project is to provide a proper water supply by the trucks to the rural areas. This project develops a solution using RFID and real time tracking system. The RFID tag has a transmitter and receiver. It contains 1024 bytes of information like identification number, name, card information etc. The tag is displayed to the RFID reader between 0-600m. The reader fitted in the truck transmits a radio signal to communicate with the tag. This radio signal activates the tag. In response to this, the tag converts the radio signals into useful power. The tag id is stored in the memory of the raspberry pi. The pi then compares the tag id with the stored id. When the id matches the motor operates and the water valve opens. In case the id is mismatched, the valve will remain closed. In addition to this the GPS is activated.

The GPS initially build connections with many satellites. The satellite sends the radio signals and the GPS receives this signal and calculate the current time and position of the truck. This information is monitored by the water corporation in a private website using Internet of Things. When the same tag is identified by the reader more than twice, then the GSM 900A is activated by the pi. The GSM-900 has an up link frequency of range of 895-915 MHz and a down link frequency range of 935-960 MHz. The transmitter of the GSM module is used to send the message to the consumer's

mobile. The supply and transport of water is maintained, hence the corruption in issuing water is avoided.

Block Diagram

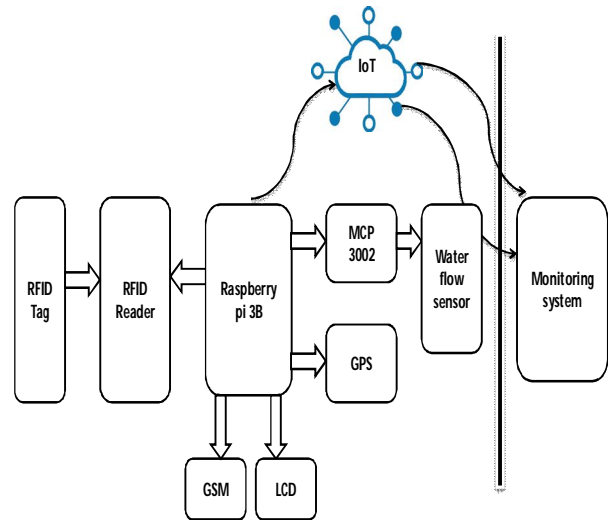


Figure: Block Diagram of Proposed Diagram

HARDWARE USED

I.RASPBERRY PI 3B

Raspberry Pi is a powerful, single board computer. The operating system used is Raspbian. The processor of Raspberry Pi is 32 bit, 700MHz system on a chip which is built on ARM 11 architecture. It has 1 GB RAM. It provides support for USB 2.0 devices over a LAN. It can run in server mode. The Raspberry pi used in this project is model 3B. The Raspberry Pi 3 Model B is the third generation Raspberry Pi. The Pi 3 supports wireless internet, with built-in Wi-Fi and Bluetooth LE. Therefore it is very useful to work with Internet of Things in model 3B. A micro SD card is used for loading your operating systems and storing information. It has 40 GPIO pins and 4 USB ports.

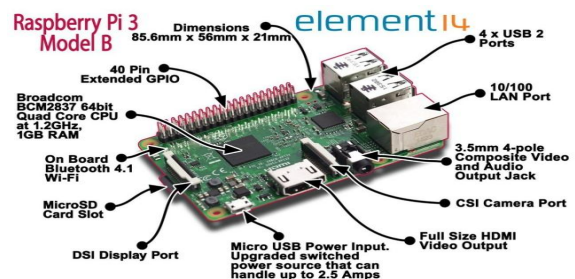


Figure: Raspberry Pi 3B

II. RFID TAG

RFID stands for Radio Frequency Identification. The RFID tag is an electronic tag and exchanges data with the RFID reader with the help of radio waves. The main parts of the RFID tag are the antenna and the Integrated IC. The antenna is used to receive radio frequency (RF) waves. The IC is used for modulating and demodulating the radio waves received/sent by the antenna. It is also used for processing and storing data. There are two types of RFID tag active RFID tag and passive RFID tag. In the proposed system the passive RFID tag is used. It has no internal power source and has a life span of twenty years or more. It is very cheap and small in size. The chip stores data and performs specific tasks. It ranges from 2-1000 bits.



Figure: RFID Tag

III. RFID READER

Radio Frequency Identification (RFID) reader and its antenna works together to read the information on the tags. Digital data encoded in RFID tags are captured by a reader via radio waves. A reader has an RF module, which serve as a transmitter and receiver of radio frequency signals. The antenna of the reader converts electrical signals into electromagnetic waves that are radiated into space and received by tag antenna and are again converted back into electrical signals. The type of RFID used in this project is RC522 module, runs with 3.3V. It consists of 8 pins (SDA, SCK, MOSI, MISO, IRQ, GND, RST, 3.3V). The RFID-RC522 module accepts only High frequency tags at 13.56 MHz.



Figure: RFID Reader

IV. GPS

The Global Positioning System (GPS) is a precise-positioning and navigation device. It helps to provide information about the moving object. It is formed from the constellation of 24 satellites and their ground stations. It is capable of receiving information from GPS satellites and then calculates the device's geographical position. It is a U.S. space-based global direction-finding satellite system. GPS receivers are built for receiving information and not for transmitting. The GPS device establishes a connection to the number of satellites to work properly. GPS consist of three segments: 1) GPS Ground control stations used to send control signals 2) GPS satellites is used to transmit radio signals 3) GPS receivers receive the signals and calculate the position.



Figure: GPS

V. GSM

GSM, Global System for Mobile Communication which is a digital cellular technology used for transmitting mobile voice and data services. A GSM modem accepts a SIM card and operates like a mobile phone. GSM Modem allows the capability to send and receive SMS to and from the system. The GSM modem used in this project is SIM800A. The SIM800A modem has a SIM800A GSM chip and RS232 interface. The communication with the system takes place via RS232 serial port. The Voltage Supply Required for SIM800A GSM ranges from 9VDC to 12VDC with minimum 2A Peak Current Capability. It consists of Speaker, Mic, TTL Rx and TTL Tx Outputs.



Figure: GSM

VI. INPUT DEVICES / OUTPUT DEVICES

The input devices are used to communicate with an embedded system. The main input devices used are keyboard and mouse to interact with the Raspberry pi. It is used to feed the data to the system. Raspberry pi 3b has 4 USB ports. The keyboard and the mouse are connected to two of the USB ports. The monitor and the LCD display act as the output device which is used to display the information. The HDMI cable of the monitor is connected to the HDMI port of the Raspberry pi 3b.

VII. WATER FLOW SENSOR

Water flow sensor comprises of a plastic valve body, a hall-effect sensor and a water rotor. When water flows through the rotor, rotor rolls. Its speed gets modified with different rate of flow. The corresponding pulse signal is given by hall-effect sensor. It draws a maximum of 15-20mA at 5V DC input.

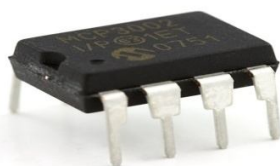


Figure: Flowchart of Proposed System



Figure: Water flow Sensor

VIII. MCP3002

The raspberry pi does not have any inbuilt Analog to Digital Converter (ADC). There along with the water flow sensor, the MCP3002 is used. It has a 10-bit analog to digital converter (ADC) with SPI interface.

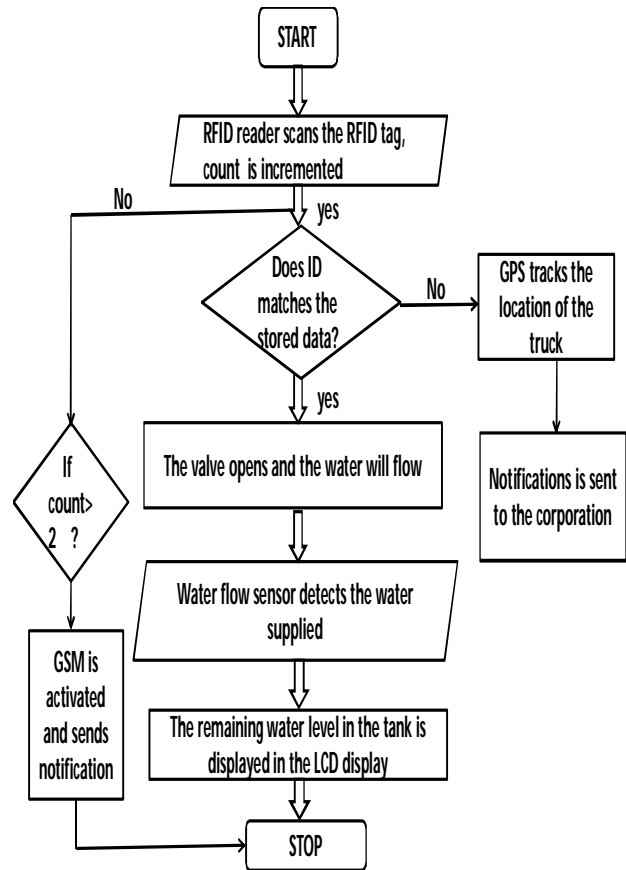


Figure: Flowchart of Proposed System

ADVANTAGES

IoT Based Smart Water Truck can be used to avoid illegal use of water. It plays a vital in eliminating corruption. The truck drivers involving in activities that are against the government instruction will be easily identified. The RFID tag can be used only once or twice in a day. Thus the cheating of the people can be avoided and all the others can get equal amount of water. The amount of water in the tank in displayed in the LCD. By looking at that the people can analyze and fetch the water without any hesitation. The system is very compact and can be easily fitted in any type of trucks.

FUTURE SCOPE

In future most of the people will only depend on the packed water bottles and other means of water supplies. Part of the people depends only on water truck for water. Therefore this system will be very useful and helpful for the people. At present, RFID tag is used to activate the water valve. There are some cases where the tag can be lost. Therefore the future idea is to use aadhar card or smart card instead of RFID tag in the project. Usually all the people will own these cards. Thus they will not face any issues in using the card. By using these cards all the people can fetch water if they display the card to the reader. They will not be forced to use the tag given by the corporation. The users don't want to spend amount to use this system.

CONCLUSION

Water shortage has many negative impacts on the environment. Today 41% of the world's population are under water stress. According to World Water Forum (WWF) about 1.1 billion people around the world are suffering from water shortage daily. There is a huge need for every people to depend of the packed water bottle or water trucks for water. This project is a more efficient way to supply water to the water demand areas. All the people will be supplied equal amount of water and the continuous monitoring is also done to keep a track of the water truck. The people get equal amount of water without any deviation and the wastage of water is also avoided as the valve is made automatic. On the other hand the unofficial supply of water to the other areas is also restricted by continuous tracking of the vehicle by the corporation.

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