Water Management System

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***Abstract*: Air, Water and Land are the three main resources that every living thing depends on it. It was estimated that around 40 per cent of piped water in India is lost to leakage. In order to control that leakage issues, this article, author offered a design and expansion of a real time water management system using Internet of Things(IoT) at a low cost. To compute the physical parameter of the water such as water flow and other sensor were used. The E system continuously monitors the water flow by using various sensors over a period of time. If it detects the prolonging in the flow of water, it will alerts the concern author that leakage of water is happening, through the Wi-Fi system.**

Keywords*: *Arduino MEGA, Wi-Fi Module, Water Flow Sensor.

I. INTRODUCTION

Nowadays, water has become an enormous problem due to less rain fall the water resources don't seem to be able to supply sufficient water therefore, saving water is everyone's responsibility. To save the water we've to focus on the problems like proper installation, over consumption, analysis of obtainable water, water flow and amount of water flows through pipeline and also to search out over consumption of water.

To overcome these problems we want a stronger technology for monitoring the availability system. By specializing in problems in traditional methods our system designs and develops an occasional cost embedded system device for real time monitoring of water consumption.

Water is a necessary resource and also the most vital element needed by human. because of global environment situation, water management and conservation is important for human survival. additionally, water is additionally employed in various places like industries, domestic and power plants[1],[2].Burst pipe, overflow of water from tank and a water leakage is another major reason for wastage of water[2].In recent time, there have been huge needs of detecting and monitoring water level and leakage that might be swiftly established using Internet of Things(IoT) technology[3].

We have remote controls for our television sets and other electronic systems, which have made our lives real easy. have you ever ever wondered about home automation which might give the ability of controlling tube lights, fans and other electrical appliances reception employing a remote control? Off-course ,Yes! But, are the available options cost-effective? If the solution is not any, we've got found an answer to that. we've got come up with a brand new system called Arduino based home automation using Wi-Fi. this method is super-cost effective and may give the user, the flexibility to manage any device without even spending for a distant control. This project helps the user to manage all the electronic devices using his/her smartphone. Time is extremely valuable things. Everybody wants to save lots of time the maximum amount as they will. New technologies are being introduced to avoid wasting our time. to avoid wasting people's time we are introducing Home Automation using Wi-Fi. With the assistance of this method you'll be able to control your home appliances from your mobile.

II LITERATURE INVESTIGATION

Water contamination and scarcity may be a global issue, which involves a nonstop reform of the concept of directing water

supplies to individual wells globally. Water contamination has been listed because the global leader in diseases. over 10,000 people are killed on a daily basis round the world, consistent with reports. Every day, quite 500 people in India die from water contamination problems. Studies have shown that the number of usable water declines to a minimum level after a few years. Dirty or dirty water is employed to soak up many developing countries without sufficient use. One explanation is that the public and institutional unknowldege and also the lack of a monitoring network of water quality, which causes significant global problems. The consistency and ecological status of water often alter environmental impacts like volcanoes, algae tints and earthquakes.

We analyzed numerous existing systems built by researchers so as to construct a model of fine quality[4].During the study of parameters like temperature, pH and electrical conductivity; pressure different authors proposed different model to check water quality and water leakage. we've developed a wise water control device which will perform of these monitoring functions by observing of these details[5]The [6] author indicated that the Web of Things applications has been rising tremendously in smart homes recently. The large choice of assorted IoT systems typically contributes to interoperability needs.

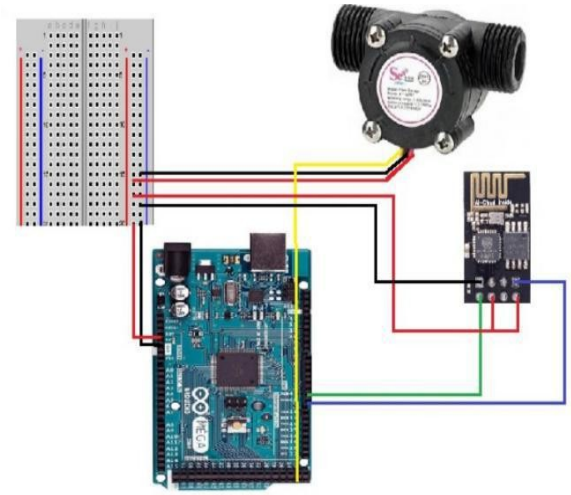
This problem affects various processes in water management, such as water consumption, distribution, system identification and equipment maintenance. OPC UA (Object Linking and Embedding for Process Control Unified Architecture) is a platform independent service-oriented architecture for the control of processes in the logistic and manufacturing sectors[7]. Based on this standard we propose a smart water management model combining Internet of Things technologies with business processes coordination and decision support systems. We provide an architecture for sub-system interaction and a detailed description of the physical scenario in which we will test our implementation, allowing specific vendor equipment to be manageable and interoperable in the specific context of processes water management[8].

In [9] the author shown how to monitor the water level of water systems such as water tanks, rivers, ground water table, and bore wells remotely. They also have shown that how to control the working of pump automatically and remotely. It can be used to remotely monitor the flood affected areas wirelessly and information can be sent to mobile wirelessly[10]. This system is designed to monitor the level of water with the help of water level sensors. This article includes an IoT tool for monitoring and preparing water use. This system is simple and long-lasting to install and maintain. The laser sensor is located on the tank that controls water level continuously in real time. This data is stored in the cloud and users can analyze water quantity[11],[12],[13], [14]. The motor function is operated automatically, depending on the water level in the tank. The motor will automatically be turned on when the water level goes below the threshold level.

In[12] paper, we present an IoT architecture for water monitoring and control that supports is real-time online data collection. The program addresses new problems in calculating the water flow rate and the need to research the water supply to minimize and encourage water pollution. By using pH and conductivity sensors, we also calculate the consistency of water distributed throughout every maintenance intervention to make it uncomfortable and therefore less effective. In the absence of modern models, wired systems are used for smart monitoring and wireless communication of data.

The paper[13], [15], [16] explored various technologies and platforms required for an intelligent world. An architectural framework concept is proposed for intelligent water management and an implementation description is discussed of the intelligent water monitoring system.

III.IMPLEMENTATION System Design



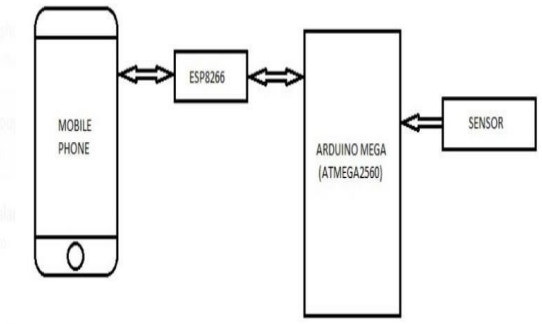


Fig. 1 Design of Water Management System

The diagram of the water management system is shown in fig.1 and different sensors which sense the flow of water and so send to the microcontroller. After processing the varied parameters of water, the microcontroller will start transmitting the information to the corresponding authority via Wi-Fi module ESP8266.

Fig. 2 Circuit of the proposed project

The circuit for the system showed in Fig.2. It consists of the water flow sensor, Arduino MEGA, and ESP8266, The sensor data"s are processed within the Arduino module and shifted by means of the ESP8266 Wi-Fi data transfer unit to the most server. The authorized users can access this data by sorting their account employing a User ID and password[17]. The collected data is, undergoing various stages like process, analysis, transmit, and eventually display the info in real time users. The ESP8266 may be a self-contained SOC Wi-Fi Module with an integrated TCP/IP protocol stack. It permits the microcontroller unit to the right of entry to the WiFi network. This low-cost Wi-Fi microchip is manufactured by M/S Espruino [14],[18],[19]. The Arduino microcontroller unit is predicated on embedded trace support and real-time emulation. This ESP8266 uses a serial transmitter/ receiver (Tx/Rx) for sending and receiving the info in Ethernet buffers, and serial commands to uncertainty and modify the configurations of the Wi-Fi module

This module is directly connecting the microcontroller, so we can start approaching the data up to the main server.

Components Description

Sensor

A sensor may be a device which is employed to detect and response to some form of input from the physical surroundings. the precise inputs are pressure, motion, heat, light, moisture or the other environmental phenomenon. Generally a sign is also produced as outcome which is modified to readable display within the sensor locality or transmitted by machine over a set-up for analyzing the signal for supplementary processing. the following sensors are employed in this research work[20].

Water Flow Sensor

The sensor YF-S201 sits in line with our water line and uses a pinwheel sensor to live what quantity of liquid has moved through it. There's an integrated hall effect sensor that outputs an electrical pulse with every revolution. The hall effect sensor output an electrical pulse with every revolution. The hall effect sensor is sealed at the water pipe and allows the sensor to remain safe and dry[21].

The sensor comes with three wires:

-Red(5-24VDCPower)
-Black(ground)
-Yellow(Hall effect pulse output).

By continuing the pulses from the output of the sensor, you'll easily calculate water flow. Each pulse is

Approximately 2.25 milliliters. This isn't a precision sensor, and therefore the pulse does very a small amount counting on the flow rate, fluid pressure, and sensor orientation. It'll need careful calibration if better the ten percent precision is required. However, it's great for basic measurement tasks.

Arduino Microcontroller

The Arduino Mega is a microcontroller board based on the ATmega1280 datasheet. It has 54 digital input/output pins (of which 14 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an external power supply. The power source is selected automatically. External (non-USB) power can come with either from an AC to DC adapter (wall-watt) or battery. The adapter can be connected by plugging a 2.1 mm centre-positive plug into the board's power jack. Leads from a battery can be inserted in the Gnd and VIN pin headers of the POWER connector.

The board can operate on an external supply of 6 to 20 Volts. If supplied with less than 7V, however, the 5V pin may supply less than 5 Volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 Volts.[22]

VIN : The input voltage to the Arduino board when it is using an external source (as opposed to 5 Volts from the USB connection or other regulated power source). You can supply voltage through this pin or if supplying voltage via the power jack, access it through this pin.

5V: The regulated power supply used to power the microcontroller and other components on the board. This can come either from VIN via an on-board regulator, or be supplied by USB or another regulated 5V supply.

3V: A 3.3 Volt supply generated by the on-board FTDI chip. Maximum current draw is 50mA.

GND: Ground pins.

The Atmega280 has 128 KB of flash memory for storing code (of which 4 KB is used for the boot loader),8KB of SRAM and 4 KB of EEPROM (which can be read and written with the EEPROM

library).Each of the 54 digital pins on the Mega can be used as an input or output , using pinMode(), digitalWrite() and digitalRead() funtions.

They operate at 5 Volts. Each pin can provide or receive a maximum of 40 mA and has an internal pull-up resistor (disconnected by default) of 20-50K Ohms. The Arduino Mega has a number of facilities for communicating with a computer, another Arduino, or other microcontrollers. The ATmega1280 provides four hardware UARTs for TTL (5V) serial communication. An FTDI FT232RLon the board channels one of these over USB and the FTDI drivers (included with the Arduino software) provide a virtual com port to software on the computer. The Ardruino software includes a serial monitor which allows simple textual data to be sent to and from the Arduino board. The RX and TX LEDs on the board will flash when data is being transmitted via the FTDI chip and USB connection to the computer (but not for serial communication on pins 0 and 1).

The ATmega1280 also supports I2C (TWI) and SPI communication. The Arduino software includes a Wire libray to simplify use of the I2C bus; see the documentation on the Wiring website for details. To use the SPI communication, please see the ATmega1280 datasheet.

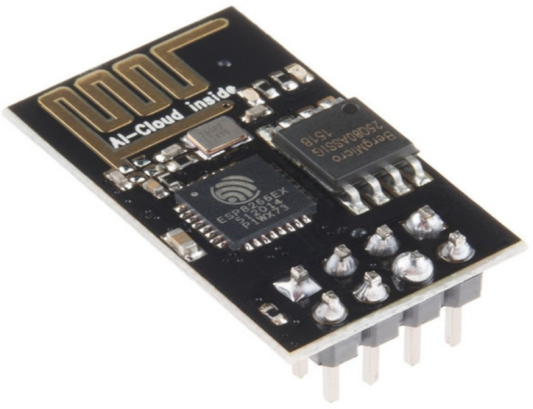
Wi-Fi Module

The ESP8266 module is a low-cost Wi-FI microchip, with a full TCP/IP stack and microcontroller capability. It has type of 32-bit microcontroller, CPU of 80MHz (default) or 160 MHz, Memory 32KiB instruction, 80 KiB user data, input 16 GPIO pins, power 3.3 V DC upto 3.6 DC. It contains everything needed to support the microcontroller; simply connect it to a Arduino MEGA.

Integrated low power 32-bit MCU

Integrated 10-bit ADC

Supports antenna diversity



Support smart link function for both Android and iOS devices.

SOFTWARE IMPLEMENTATION

Arduino IDE

The Arduino integrated development environment (IDE) is a cross-platform application (for windows, macOS, Linux) that is written in the programming language C and C++. It is used to write and upload programs to Arduino compatible boards, but also, with the help of third-party cores, other vendor development boards. The source code for the IDE is released under the GNU Public License; version. The Arduino IDE supports the languages C and C++ using special rules of code structuring[15]. The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures.

User-written code only requires two basic functions, for starting the sketch and the main program loop, that are compiled and linked with a program stub main() into an executable cyclic executive program with the GNU tool chain, also included with the IDE distribution. The Arduino IDE employs the program argued to convert the executable code into a text file in hexadecimal encoding that is loaded into the Arduino board by a loader program in the board's firmware.

IV.OPERATION OF DEVELOPED MODEL

The analog data's captured by above sensors are sent to the microcontroller through, Analog to Digital converter. After processing the digital information within the microcontroller unit where analysis is finished and therefore the water flow is identified and that parameters were sent to the one who is working with the instrument via Wi-Fi. The identical things are going to be displayed within the LCD display unit of the microcontroller. Through the Wi-Fi module, the online page is linked with the microcontroller. The central monitoring system receives the measured value supported the received data, the corresponding authorities will take necessary action for his or her further decision. The simulation code is developed in Embedded - C software.

V. INTERNET OF THINGS (IOT)

Internet of Things is an ecology system of linked physical substance which is accessible through the web. The things‟ in IoT may be a person's being with a monitor or a vehicle with built-in-sensors, i.e. substances that are allotted with a web Protocol address and it's the skill to collect and move the info over a system without physical help or involvement. The embedded technology utilized in the substance makes them work along with internal or external surroundings, which influences the results taken.

EasyIoT Cloud

EasyIoT Cloud is an IoT analytics podium service that permits us to cumulative, imagine, and analyze the live data streams within the cloud. As a result, it's easy to transfer the information to Thing Speak from our device. Thing Speak can post the measured data to store within the cloud .So the instantaneous visualizations of real-time live data and alerts are given to the authorities using web services.

VI. RESULTS

EasyIoT Cloud software permits Authorized users to access the measured data by logging on. By providing the registered user ID and password, the parameters are going to be displayed. In order to avoid wasting water for the longer- term world, the IoT Based Water Saving and Leakage Detection and Manager for apartments and houses are built. The findings of this analysis study are presented and discussed in various parts on the premise of the framework for research methodology. Important results of every study, including the foremost promising wearable devices and sensors for building safety applications and trends are presented. Last, we explain the scenario we identify for validation, and therefore the list of features that we are going to test at this station established an experimental station.

VII.CONCLUSION

The water detection parameters such as the Water Flow sensor are observed and tested in real-time. Based on the measured data, that concerned person will get an alert. It will help them to prevent leakage of piped water within the threshold limit. Rapid actions can be taken to control tremendous levels of leakage like in the case of the 100 storey buildings and Luxury Star Hotels. The major advantage of the proposed work is, simple for installation and it can be placed very close to the target area. This device can be operated with less trained persons also. We may conclude that IoT adoption and water management companies can promote exposure to a wider global market and can bring new benefits to support systems decisions, monitoring, water storage, and water energy ties. Future research will define the test meted out and can specialize in solving coordination issues in multiple recipes using identical physical resources, taking into consideration priority and conditional output and also optimization of processes.

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