

# Urban Resources for Smart City Application

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**Abstract** with growing urbanization, fair and efficient distribution of water and collection of garbage from dustbin is critical. As the name suggest we are developing two modules an Urban Resources for Smart City Application which is based on microcontroller as well as on GSM module. The first module is Automatic Water Supply Management, in this servo motor will be placed on the valve. We can on or off the water valve. Accordingly area, date and time it will be distribute the water. The second module is an Automatic garbage collection system in urban area. In that, the main concept is sensor will be placed on every garbage collection point along with ultrasonic sensor at top of the garbage can. The sensor will check the level of the garbage with the help of microcontroller. After analysing the garbage we get an idea about level of garbage in the dustbin. Accordingly information is processed that is controller checks if the level exceeded or not. The controller sends a message with the help of GSM module. Accordingly the microcontroller sends garbage can collecting vehicle to collect the garbage, which is done with help of Short Message Service.

**Keywords** — Arduino microcontroller, GSM, Ultrasonic Sensor, USB cable, Servo Motor, SIM shield, Jumper Wires, Bread Board.

## I. INTRODUCTION

Now a day, every one is running towards technological growth. Our nation mainly focused on developing the city assets, changing quality of life. Thus, all things come under internet of things. Internet of things is a paradigm which connects everyday objects like smart control.

The Internet of Things can connect services with new ways, and trying to transform urban centres in the Smart Cities. Smart city is one that uses technology to make cities more efficient and that must be of people satisfactory. The current system proposed to develop two modules of smart city, water distribution supply and garbage collection management.

With the rapid growth of urbanization, in today's city people face new challenges. As the existing system all know, major problem in current city is the lack of water. The current system the people does waste the water due to our laziness. Once

completing water usage everyone switch off the tap to save water. But no one bothers about it. Another reason for wastage of water is operating error. To avoid such wastage, the current system propose to implement water distribution supply method which automatically on valve whenever necessary and off it when the current system done with its usage. In water distribution supply, the set point is fixed for each pipeline. The sensor measures the flow rate of the water and valve is used to open and close automatically. If the flow rate reaches its set point, the sensor will be turned OFF and it will be turned ON after an hour later. The water wastages such as mankind laziness and operating error can be avoided.

The current system proposes to develop another module garbage collection management. As the existing system all see on street side, bins are getting filled and garbage spread out surrounding bins and spread over the street. Government should take care of such things, as garbage results in unhealthy climate.

The current system will implement garbage collection management method to take care of such things. When the dustbin full then that indication will be given to microcontroller. The microcontroller will give an indication through GSM to the garbage collector as which garbage bin is completely filled and needs urgent attention.

The controller will give an indication by sending SMS using GSM technology. If both the garbage bins are full at the same time, then the message will be displayed. Also Short Message Service will be sent to the garbage collectors mobile one by one.

[1]- [2].

## II. LITRATURE REVIEW

In the previous research study different techniques and methods are used for different application based on different user content.

“Survey on Technology Tools for Water and Garbage Management for Smart City Planning” The proposed system implements two modules of the smart city- Water distribution supply and Garbage collection management respectively. The system has done research related to previously implemented papers on the above two modules. And the system has discovered different methodologies used in previous papers for implementing same modules [1]“Automatic Collection of Smart City Resources”, Proposed system implements

two modules. So that it reduces the wastage of water and dustbin overflow. The development of this system can reduce the waste of water and make the management of water more effective and convenient in the city. The proposed system would solve a lot of problems related to solid waste collection, monitoring, minimizing cost and accelerate the management [2] “Industrial Data Communication; Industrial Ethernet”, in this paper the theft of water can be monitored and calculated by flow sensors. System automation is based on an electronic sensor. To improve water distribution they use ZigBee technology. The system includes Remote Terminal Units (RTU) over a large geographical area [3]

“Automated urban drinking water supply control and water theft identification system”, in this paper with the help of flow sensor water theft can identify. They use supervisory control and data acquisition for optimization process and Decision support system (DSS) for data driven [4] “Smart Water Grids for Smart Cities”, in this the system implemented a prototype for a smart water metering system. For water flow supply they use harvesting technology is an open metering technology used for implementing a meter system for water consumption [5] “Smart Water Supply Management” ,in this system they use microcontroller to count and major the flow rate using a sensor and wireless transmitter to transmit the flow rate the valve turns on /off by central PC [6]

“SENSOR NETWORKS FOR MONITORING AND CONTROL OF WATER DISTRIBUTION SYSTEMS” ,in this paper they use Water Wise technology that supports the dynamic prediction of water demand application and hydraulic value or state, online prediction and detection of events and data mining for identification of long-term trends [7] “AUTOMATED WATER DISTRIBUTION SYSTEM USING PLC AND SCADA”, in this system they use two technologies SCADA PLC and. SCADA is used for water monitoring and PLC for water control distribution. Whole system depends on PLC and SCADA [8] “Design and Implementation of a Network Management System for Water Distribution Networks”, in this it would provide a solid waste collection in time and also overcome the disadvantages such as low fuel cost, clean environment, usage of minimum rate available vehicle [9]

### III. IMPLEMENTATION METHODOLOGY

#### A. AUTOMATIC GARBAGE COLLECTION SYSTEM

In Fig .Implementation of Garbage Collection, in that sensor is placed both side of dustbin, So that communication is overhead. If the dustbin is full at that time the compatibility between arduino and GSM module will be taken care by chip at the receiver side. The GSM Module is interfaced with the arduino board through chip. GSM Module has a SIM card; it sends an SMS to garbage user. They are used for sending and receiving SMS alerts.

##### 1) Arduino Microcontroller:

Arduino is an open-source platform. Easy-to-use software and hardware. Arduino microcontroller is able to read inputs and display the required output. Its work depends on integrated development environment (IDE). According to user instruction it works. It is the brain of more than thousands of projects.

##### 2) GSM Shield and GSM Technology:

It is used in Arduino for making and receiving the voice call. For this purpose GPRS is used. GSM short message SIM shield is also used to send/receive short message service. It is connected to Arduino microcontroller. It follows the instruction to send /receive the message or voice calls. Global System for Mobile communication (GSM) is an open technology. Today's mobiles are based on this technology. It is used for digital wireless telephone system (TDMA, GSM, CDMA). It works only 900 MHz or 1800 MHz frequency band.

##### 3) Ultrasonic Sensor:

The Ultrasonic Sensor sends a high-frequency sound pulse and then checks how long time echo takes to reflect back the sound. The sensor contains two openings transmits like a tiny speaker and the second one is receives like a tiny microphone. In the air the speed of sound is 341 meters per second. To determine an object distance along with the time difference between receiving and sending the sound pulse.

Distance can be measured by

$$\text{Distance} = \text{Time} * \text{Sound speed} / 2$$

Where Time = the time between an ultrasonic wave is received and transmitted.

#### B. Automatic Water Supply Management

In water supply management we are using sensors to sense the amount of water level in the storage tank. The valve will be turned off with the help of motor. If the water is not sufficient in the tank the valve will

be turned on. If the water level once contains its maximum the overall is system started.

1) **Water Valve:**

The valve is used to turn on and off condition and supply is given to the main valve. The output from the Arduino is necessary to give switch function using a relay to on and off the valve. If the water level in the storage tank reaches the maximum main valve is automatically turned on. The set point is fixed for other valves. If anyone one of its valve or both the valves attains the set point the main valve is turned off. The valve will be turned on after 24 hours later. The valve is used to control the flow rate.

2) **Servo motor:**

Servo motors are used in many applications for a long time. They are very energy efficient and small in size. They can be used to radio-controlled toy cars, airplanes and robots or to operate remote –controlled applications and also used in robotics, in-line manufacturing, in industrial applications, food services and pharmaceuticals.

Servos are controlled through the control wire by sending a pulse width modulation (PWM) or electrical pulse of variable width. There are a maximum pulse, minimum pulse and repetition rate. A servo motor can usually only turn 90° in either direction for a total of 180° movement. A servo motor can usually turn 90° total of 180° movement.

**A. 1. Garbage Collection System Steps**

**Step 1: Placing Sensors**

Sensors are placed both side of dustbin, So that communication is overhead.



Fig. 1.1 Initial Stage

**Step 2: Compatibility between arduino and GMS module**

If the dustbin is full at that time the compatibility between arduino and GMS module will be taken care by chip at the receiver side.

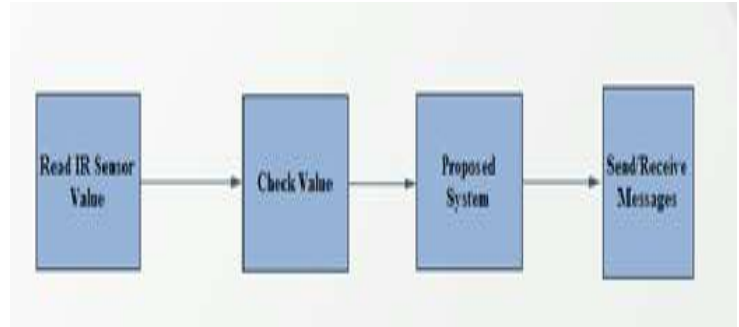


Fig. 1.2 Processing Stage

**Step 3: Interfaced with Microcontroller**

The GSM Module is interfaced with the audio board through chip.GSM Module has a SIM card, its sends an SMS to garbage user. They are used for sending and receiving SMS alerts.

**B. 2. Water Distribution System Steps**

**Step 1: Checking Water level**

Using sensors user will sense the amount of water level in the storage tank.

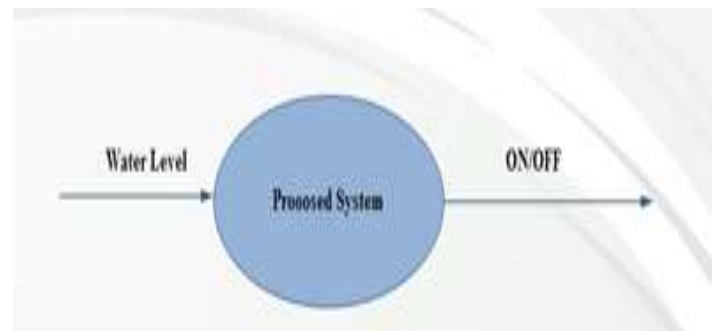


Fig. 2.1 Initial Stage

**Step 2: Valve On/OFF**

The valve will be turned off with the help of motor. If the water is insufficient in the tank the valve will be turned on.

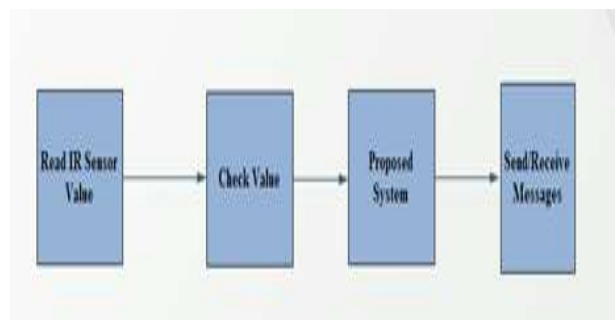


Fig. 2.2 Processing Stage

**Step 3: Start System**

When the water level contains its maximum then overall system will started.

**IV. EXPERIMENT AND RESULT**

Our system goal is to make city smart by removing man power laziness, unhygienic garbage at road side, wastage of water.

**1. Automatic Garbage Collection System**

**Step1: Connecting Microcontroller**

Giving input to Microcontroller through sensor.

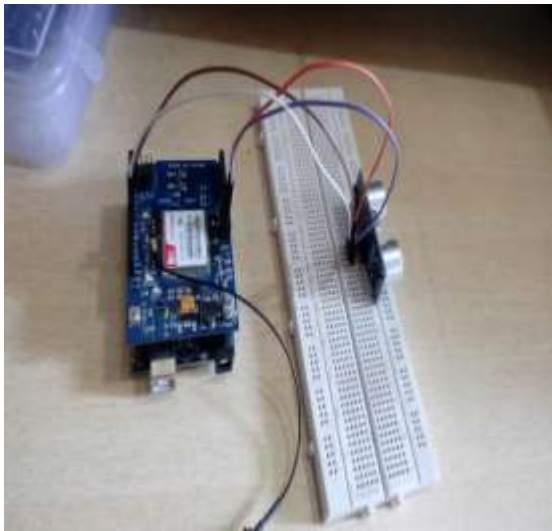


Fig. 1.1.1 Connection to Ultrasonic Sensor

**Step2: Checking garbage level**

Communication over head.

**Step3: Sending SMS**

Send SMS to truck driver.

**2. Automatic water distribution system**

**Step1: Connecting Microcontroller**

Giving input to Microcontroller through servo motor.

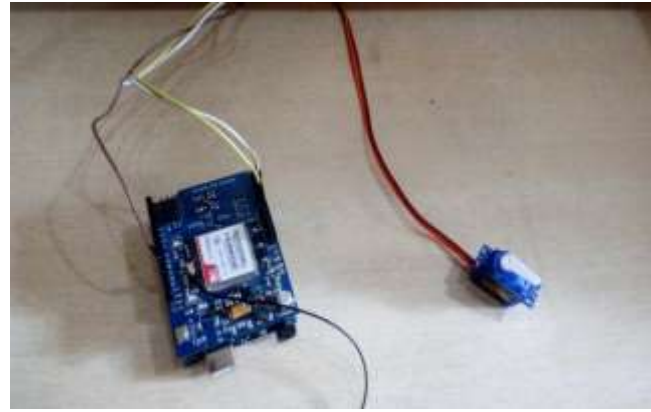


Fig. 2.1.1 Connection to Servo Motor

**Step2: ON/OFF**

Motor Started.

**Step3: Manually ON/OFF**

According to user need user can ON/OFF using android API.

**2.1 Automatic water distribution system performs following steps using App**

**Step1: Login Page**

It contains two features Login and New User. A user already exists then it will put his/her username and password to login successfully. If it does not exist then register as new user along with her/his username and password and make successful login.



Fig. 2.1.2 Auto Water App

**Step2: Choose Option ON/OFF**

One's the user login successfully then he/she can automatically or manually ON/OFF motor based on our need.

## V. CONCLUSIONS

This paper shows the implementation of smart water supply management and smart garbage collection management system using Servo motor, Ultrasonic sensor, microcontroller and GSM module. The first module is water supply management which impacts on several key matters of human lives and several scenarios, such as agriculture, cities and natural areas. In that it equally distributes the water based on day, time and area. This module helps to remove the disadvantages of unequal distribution of water, wastage of water and any time distribution of water. The second module is smart garbage collection system is assures the cleaning of dustbins when garbage level reaches its maximum. If the dustbin is not cleaned in specific time, then till collection of garbage messages will send to truck driver. This system makes the garbage collection more efficient. It reduces the disadvantages less effective and Time consuming process, trucks go and empty containers, whether they are full or not. Cost is high. Environment gets Unhygienic. Smell spread bad everywhere and human beings may cause illness. More noise and traffic.

By implementing this we will avoid overflowing of garbage from container in residential area and wastage of water which is previously done by manually or with the help of loaders. Manual doing takes time and reduce the productivity of the vehicles and manpower deployed.

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