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Smart City Underground Water Leak and Theft Detection System with IOT

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ABSTRACT

This paper depicts regarding those plan and usage of an advanced smart city water leakage following furthermore identification framework will screen furthermore recognize spill for those help for remote networked sensors. The goal for this improved framework will be identify workable underground water spillage to private water pipes that would monitor starting with a workstation. Therefore, a hearty also dependable remote sensor organize which create arduino uno micro controller board, information from remote sensor (water flow) will be gathered those information what's more monitored looking into a workstation with identify those correct spillage position. When a spill is detected, those water utility must take restorative activity will minimize water misfortunes in the water appropriation framework. Subsequently the recommended framework will be used to spare water furthermore lessens those trading cosset.

Keywords : Wireless Sensor Network, Water leakage,theft Arduino, water flow sensor, MQTT.

I. INTRODUCTION

Framework following need has been magnetic subject for analysts in later quite some time. Developments to Hardware Furthermore declines in the expense about sensors What's more electrical parts bring aggravated keen Infrastructures and actuality. Moreover, the burgeoning of the web need opened up new provisions to. Those "internet of things" will serve concerning illustration a spine for base screening [1–3]. A standout amongst that principle Issues On framework screening may be force utilization and force accessibility. Energy utilization about sensor hubs ought to be advanced same time keeping their purpose will a suitableness level. Another issue in the field from claiming foundation monitoring, particularly extensive scale base for example, such that water channel. Networks will be information taking care of. Those sensor hub clinched alongside these frameworks if a chance to be skilled of taking care of the Generated all the information generally et cetera send the transformed information of the control core in place with minimize those. Needed post preparing and transmission bundle measure. Pipeline frameworks would answerable for transporting indispensable materials for example, such that water, oil and gas. Any Spillage in the channel might foundation significant money related misfortunes What's more workable natural harms. Currently, Covered pipelines are best monitored at way points, which could make divided a few kilometres separated. A. Framework with a higher spatial determination might give acceptable operators with a superior Comprehension from claiming their System.

Clinched alongside covered pipeline monitoring, sensor hubs need aid deployed previously, dirt the underground surroundings. Imposes significant impediments with respect to sensor nodes, for example, such that poor RF transmission and absence of maintainability. Burrowing trenches so as on repair shed or trade hubs may be greatly costly; hence sensor hubs ought further bolstering. Have an in length operational existence without whatever support. This implies that sensor hubs would needed should be. Hearty Also devour a little sum about vitality so as will most recent their wanted lifetime. In spite of those limitations, underground remote sensor Networks (UWSN) brings an extensive variety about Requisitions [4–6]. Pipeline checking may be a standout amongst those principle territories in which UWSN cam wood make utilized. A. Suitableness UWSN to pipeline observing ought to be not difficult should convey with respect to existing What's more new pipes.

Estimations of the pipes condition if additionally make non-invasive of the channel in place should keep up that Structural integument of the pipeline. This makes a requirement on outline furthermore create new strategies for. Measuring pipeline aspects so as to screen their structural integument Different routines need aid utilized within request with identify Furthermore spot breaks over pipes [7]. The fundamental strategies for Channel screening are acoustic measurements, weight measurements, dream built systems, ground. Infiltrating radar (GPR) based systems, fibber optic observing also multimodal frameworks. Dream based frameworks utilize A PIG (pipeline review gauge) for a structure of image transforming alternately. Laser examining in place will Figure cracks What's more faults to pipelines [8]. These frameworks oblige entry of the. Inner part of the channel should work what's best make estimations toward long time intervals similarly as it is unreasonable on embed. Those PIGS under the channel Also they oblige helter skilled preparing force or a gifted driver will investigate those outcomes [9].

SMART CITIES

Brilliant Cities fluctuates from city to city and nation to nation as indicated by level of advancement to change, assets, innovation, condition, way of life, culture, financial level of people groups and so forth. In India, a Smart City would have an alternate idea. It's not possible for anyone to characterize how a shrewd city can be?

Shrewd Cities principally centre their needs and the offices to enhance client's life. Savvy City has been produced for expanding computerized and data advancements, to enhance urban arranging and people in general private connections and approaches for client comfort life. In India, 31% of individuals live's in city. These rates are quickly expanding with populace projection. Keen urban communities predominantly cantered around requirements of clients to enhance the personal satisfaction for occupants' kin in their future. Shrewd urban areas might be the frameworks with streams of vitality, materials, administrations, individuals, condition, activity, security and financing and so on. Urban arranging must build up the innovation with monetary and social digestion of groups, for example, vitality proficient and green spaces, ID, and mix, and transportation, versatility in city arranging, administration and advancement in more quick witted way. Subsequently, it is requirements to build up the urban individuals' life astutely with imaginative innovations as opposed to existing structures.

A. Smart City Mission of India

In India, mission of Smart city is to improve the economic growth with high quality of urban life by creation of infrastructure with assured service level and efficient governance. Several programs are shaped to urban development on India's growth, challenges and opportunities. Smart City aims to promote growth of economics, strength of governance and give a comfort life of users to improve urban residents. To set the Smart city in India, good ideas are welcomed in many shapes and sizes, designs that includes technology, nstitutional or managerial reforms, citizen involvement.

B. Smart City Vision of India

The vision of the Ministry of Urban Development (MoUD) says "creation of economically vibrant, inclusive, efficient and sustainable urban habitats".

The vision of smart cities is to develop the urban people life with safe, secure and efficient. Because the structure of smart cities with power, water, transportation and the other basic needs is designed, constructed and maintained with integrated materials, sensors, electronics and integrated networks through computerized system

C. Prime Minister Modi's Smart City

Our Prime Minister Narendra Modi had announced his vision to set up 100 smart cities in India. Smart cities have been developed to improve adoption of solutions with efficient resources, infrastructures, technologies. He has announced the list of first 20 cities in which will be developed into smart cities in 2016. The list of smart cities in TABLE 1

UNDER GROUND WATER PIPE LEAKAGE

- Unusual wet areas in sports that are landscaped and/or pools of water on the surface of the ground.
- An area that's moldy, soft, green, or mossy that's surrounded by a dryer condition.
- A very noticeable drop in flow volume/water pressure.
- A new problem with dirt or air in your water or rusty water, although this can be due to another problem.
- A section of an area that's irrigated suddenly brown/dying/dead and it used to be lush and green. This is due to the water pressure being too low for far sprinkler heads to
- Properly pop up.
- Cracking or heaving of areas that are paved.
- Potholes or sink holes.
- Even grades of floor or a structure leaning.
- A sudden increase in use of water that is unexplained, water use that is consistently high, or even water use that's been steadily climbing for a few billing cycles. The underground pipe water leakage examples (Figure. 1 & Figure. 2).

II. EXISTING METHOD

Existing underground water Leak Detection Methods Various strategies are utilized as a part of request to recognize and find spills in funnels [1-4]. The fundamental strategies for pipe observing are acoustic estimations, weight estimations, vision based frameworks, and ground entering radar (GPR) based frameworks, fiber optic checking and multi modular frameworks. Vision based frameworks utilize a PIG (pipeline review measure) with a type of picture handling or laser filtering so as to discover splits and blames in pipelines [5]. These frameworks expect access to the inside of the pipe to work and just take estimations at long time interims as it is exorbitant to embed the PIGS into the pipe. In addition they require high preparing power or a gifted administrator to break down the outcomes [6]. A tremendous measure of writing and research exists with respect to the utilization of acoustic or vibration estimations for pipeline observing [2, 7]. The greater part of these strategies depends on the location of the acoustic outflows from the pipe. The recurrence and size of these signs relies upon pipe weight, spill width and sort of liquid inside the pipe [2]. These signs are then recognized by hydrophones or accelerometers [7]. The area of the release at that point can be computed by various cross relationship strategies. Despite the fact that these frameworks look encouraging they have a few weaknesses, which make them as of now not reasonable to be conveyed as a covered remote sensor arrange framework. Estimating the acoustic flag requires a high testing rate which influences the hubs to devour more power and last a shorter measure of time on the constrained power supply accessible. These techniques likewise deliver substantial informational indexes and require complex handling calculations which additionally increment the power utilization of the sensor hubs.

III. PROPOSED MODEL FOR SMART CITY UNDERGROUND WATER LEAK AND THEFT DETECTION SYSTEM

A. Arduino

Arduino is an open-source platform used for building electronics projects. Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board.

The Arduino platform has become quite popular with people just starting out with electronics, and for good reason. Unlike most previous programmable circuit boards, the Arduino does not need a separate piece of hardware (called a programmer) in order to load new code onto the board – you can simply use a USB cable. Additionally, the Arduino IDE uses a simplified version of C++, making it easier to learn to program. Finally, Arduino provides a standard form factor that breaks out the functions of the micro-controller into a more accessible package

B. Water flow sensor

Water flow sensor consists of a plastic valve body, a water rotor, and a hall-effect sensor. When water flows through the rotor, rotor rolls. Its speed changes with different rate of flow. The hall-effect sensor outputs the corresponding pulse signal. This one is suitable to detect flow in water dispenser or coffee machine.

C. GSM module

GSM is an international standard for mobile telephones. It is an acronym that stands for Global System for Mobile Communications. It is also sometimes referred to as 3G, as it is a second-generation cellular network. To use GPRS for internet access, and for the Arduino to request or serve WebPages, you need to obtain the Access Point Name (APN) and a username/password from the network operator. See the information in Connecting to the Internet for more information about using the data capabilities of the shield. Among other things, GSM supports outgoing and incoming voice calls, Simple Message System (SMS or text messaging), and data communication (via GPRS).The Arduino GSM shield is a GSM modem. From the mobile operator perspective, the Arduino GSM shield looks just like a mobile phone. From the Arduino perspective, the Arduino GSM shield looks just like a modem.

IV. ARCHITECTURE OF PROPOSSED MODEL

The figure .6 shows that micro controller (Arduino) connected to the water flow sensor. It is connected at the two edges of the pipe. When the water flows through sensor it calculates some values by using water flow sensor. Ardunio will send the calculated values to GSM module. Then the value data will be stored in desktop. This can also be viewed by the government or organization by using smart city water monitoring application. If the first input sensor value is 100% then the end output sensor value will be 98% there is no leakage or theft of water .If the end output sensor values are below 98% then we can identify the there is a leakage of water or theft of water.

V. IMPLEMENTATION & RESULT

The figure 7&8 show the connectivity of micro controller (arduino), water flow sensor and GSM module. The micro controller (arduino) is connected to water flow sensor and GSM module. Figure 9 represents if there is no flow of water, the values indicated as null values .we used empty transparent water bottle and fixed water flow sensor at top of the bottle which is connected to micro controller and GSM module. Figure 10 indicate when there is a flow of water, the water flow sensor will calculate the value and send to the micro controller.the calculated value can be viewed in the desktop by using arduino IDE(serial monitor).the figure11 shows output of water flow

.

VI. MESSAGE QUEUING TELEMETRY TRANSPORT (MQTT)

MQTT stands for MQ Telemetry Transport. It is publish/subscribe, extremely simple and lightweight messaging protocol, designed for constrained devices and low-bandwidth, high-latency or unreliable networks. The design principles are to minimize network bandwidth and device resource requirements whilst also attempting to ensure reliability and some degree of assurance of delivery. These principles also turn out to make the protocol ideal of the emerging “machine-to-machine” (M2M) or “Internet of Things” world of connected devices, and for mobile applications where bandwidth and battery power are at a premium. Figure 12 is depicted in MQTT (Message Queuing Telemetry Transport) connectivity and process. We have four water flow monitoring device (1, 2, 3, 4) and each device is connected with micro controller, GSM module and water flow sensor. These four devices will continuously send the water flow value to micro controller and data will be sending to GSM module by micro controller. Then the GSM module will send the data to Message Queuing Telemetry Transport (MQTT). By using postman tool the data can be viewed through monitor.

VII. FUTURE WORK

- ✓ For this work we have to create a particular application for water leakage and water theft.
- ✓ This application can be viewed by each area.
- ✓ Whenever there is an identification of theft or leakage of water, it will automatically start to alarm.
- ✓ The same method can be used for agriculture and private organization using android application.

VIII. CONCLUSION

Subsequently those recommended framework engineering organization What's more gear assumes a major part previously, decreasing a utility's water misfortunes. Extensive volumes from claiming misfortunes need aid from transmission Mains and are customarily troublesome on identify. A few of the innovations for finding such misfortunes need been around to huge numbers years, and some are moderately new, tackling those fast improvement over technology, instrumentation, translation and interchanges. This need enabled the utility specialist should receive An 'multi-sensor' approach, using the entire range for engineering and selecting an fitting blend for supplies to particular system characteristics, site areas Also kind for spill. New frameworks Furthermore instruments are ceaselessly continuously created. The next few a considerable length of time will see a fast expansion in the improvement from claiming. What's more utilization of new engineering organization identifying breaks done transmission mains. A percentage of the advances examined need aid in the test stage, others would at present constantly trailed ,but a number of them are generally constantly utilized or nearing production, including a new extend of devices of the multi-sensor particular idea. The framework recommended spill identification techniques didn't permit useful execution. A channel spillage identification framework (PLDS) test station to trying system to future provisions might have been built at PVC channel Furthermore is intended on suit distinctive sorts about channel also spill configurations. Spill identification trials with help neighborhood utilities on execute those innovation organizations vital to pinpoint breaks in the water appropriation framework Also decrease water misfortune.

IX. TABLE AND FIGURES

Figure 1. Metal pipe water leakage

Figure. 2 Plastic pipe water leakages

Figure 3. Arduino

Figure 4. Water flow Sensor

Figure 5. GSM Module

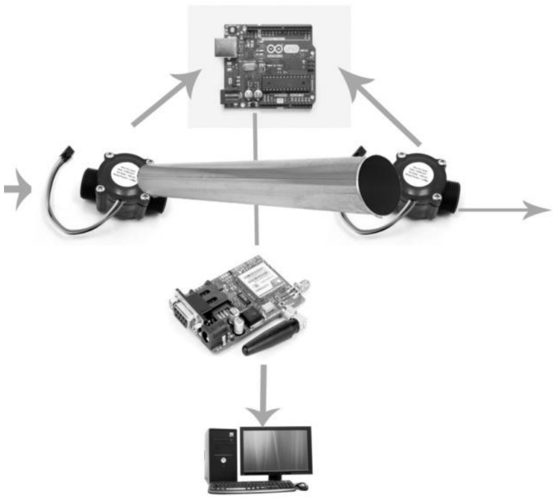

Figure 6. Proposed Model

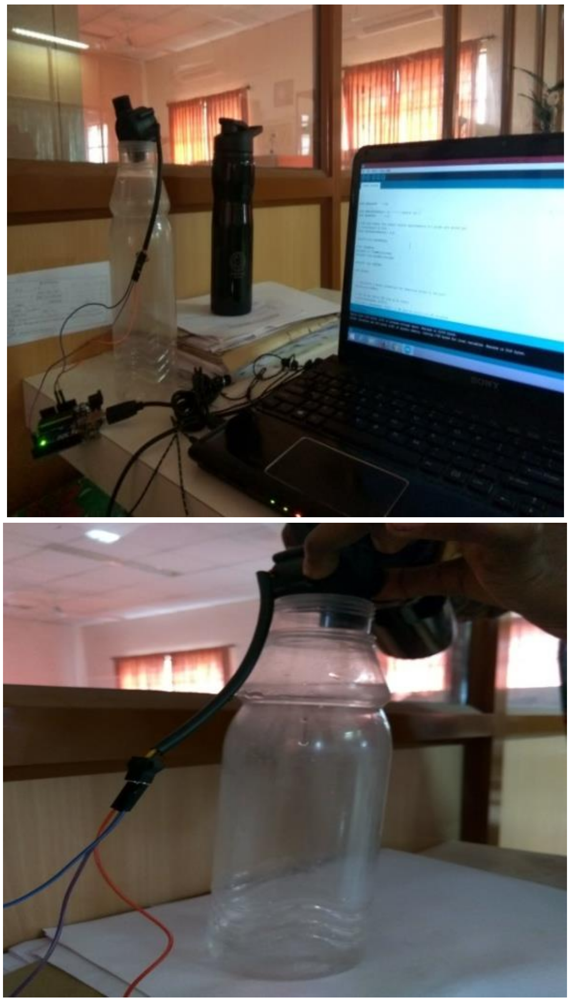

Figure 7&8. connectivity of micro controller and sensor

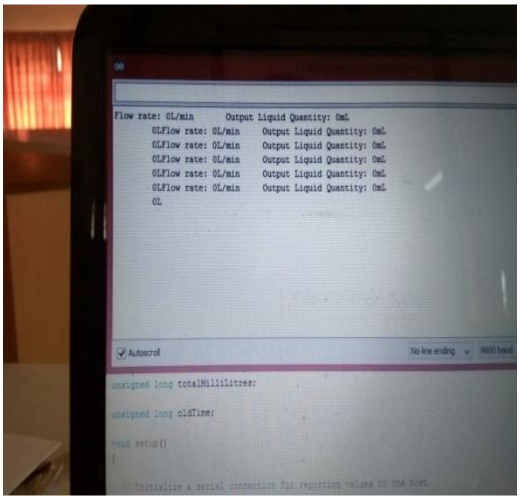

Figure 9. Output of without water flow

Figure 10. water flow

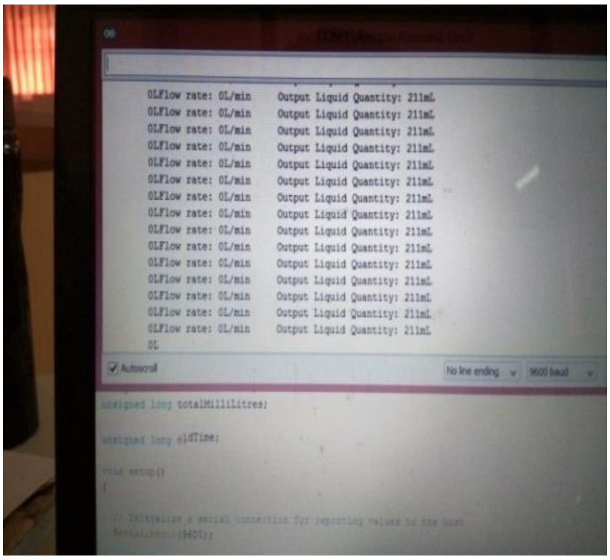

Figure 11. output of water flow

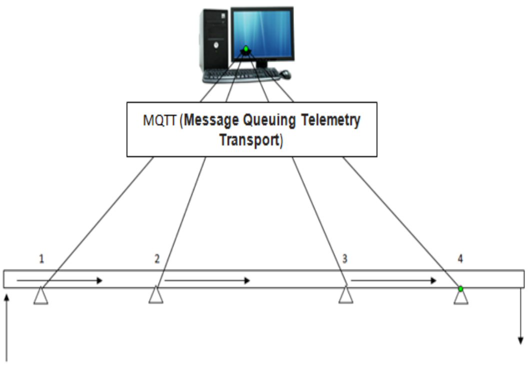

Figure 12. MQTT connectivity and process

Table 1. The list of smart cities in india

Sl.No.	Name of State/UT	No. of cities
1.	Andaman & Nicobar Islands	1
2.	Andhra Pradesh	3
3.	Arunachal Pradesh	1
4.	Assam	1
5.	Bihar	3
6.	Chandigarh	1
7.	Chhattisgarh	2
8.	Daman & Diu	1
9.	Dadra & Nagar Haveli	1
10.	Delhi	1
11.	Gao	1
12.	Gujarat	6
13.	Haryana	2
14.	Himachal Pradesh	1
15.	Jharkhand	1
16.	Karnataka	6
17.	Kerala	1
18.	Lakshadweep	1
19.	Madhya Pradesh	7
20.	Maharashtra	10
21.	Manipur	1
22.	Meghalaya	1
23.	Mizoram	1
24.	Nagaland	1
25.	Odisha	2
26.	Puducherry	1
27.	Punjab	3
28.	Rajasthan	4
29.	Sikkim	1
30.	Tamil Nadu	12
31.	Telangana	2
32.	Tripura	1
33.	Uttar Pradesh	12
34.	Uttarakhand	1
35.	West Bengal	4
Total		98

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