Groundwater Monitoring System Using Internet of Things

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Abstract: The major problem among the people is that they are lacking in the awareness of the underground water usage. Thus, they are in the process of designing the “Application” which gives the data about the underground water consumption of the consumers and monitor the ground water usage of the consumers. Also, alarming when the maximum usage of water or wastage of water. This system sends the information of the water usage of that area and automatically recorded in the government water board of that area with quantity of the water usage, If exceeds the limit will have the locking system of the water supply of the usage area with fine. Thus the paper gives the total guidance to the people according the usage of the underground water resources digitally with the application itself

Keywords - Arduino, IoT, Groundwater

1. Introduction

Groundwater is water underneath the outside of the Earth. Groundwater begins as precipitation and the part of the downpour water that penetrates underneath the ground's surface, either normally or falsely, becomes groundwater. The rest of the bit of the precipitation is utilized by plants, dissipates, or becomes surface water spillover which can either add to groundwater levels in different territories or be expanded by groundwater outpourings relying upon the geography the surface water voyages through. The measure of precipitation that gets assimilated and becomes groundwater relies upon the dirt type [1-2]. Highly permeable soils, for example, sandy soils, retain water a lot quicker than soil, for example, mud which has little pores. The immersed soil acts like a wipe and the region where groundwater is available, or soaked, in the dirt are called a spring, which for the most part has a limit characterized as its basin [3-4]. Groundwater bowls are framed normally over a period running from quite a while to over a thousand years in certain topographies. Groundwater is basic to the networks that are based on or approach the spring, or the underground layer of water that fills splits in the stone or sand that makes up the soil. This groundwater layer which makes up around 30 percent of the worlds freshwater gracefully used for certain, reasons including water framework, private drinking water, and metropolitan water supplies. Groundwater is a key bit of the United States ability to flood its farmland. Water system structures speak to the usage of about 53.3 billion [5] gallons of groundwater consistently for agriculture watering. This utilization can be appeared differently in relation to the 1900s when the US simply used 2.2 billion [6] gallons for water system. Furthermore the creatures and aquaculture ventures eat up generally 3.2 billion [7] gallons of groundwater consistently. Information as for groundwater use for drinking water generally speaking is limited, in any case it is surveyed that 33% [8-9] of the all out
people depend upon groundwater as the essential wellspring of their drinking water. More than 13 million US nuclear families typically depend upon private ground water wells. Groundwater sources are used by around 33 percent [10] of the vast water structures in the United States. Among open and private water wells around 44 percent of the US people depends upon groundwater for their drinking water. Counting drinking water and developing nearby various jobs of groundwater, for instance, collecting, mining, and thermo electric ability to give a few models, 79.6 billion gallons each day of new groundwater are used.

2. Motivation

Knowing the groundwater level is noteworthy for a couple of reasons, including understanding spring levels under static conditions and siphoning conditions, choosing how the levels partner with close by surface water sources, and perceiving how surface headway has influenced the spring. Groundwater extraction from siphoning groundwater for surface use has the best effect on the proportion of groundwater [11-12] set aside in a spring and the rate at which it finishes off or energizes. The most serious outcome of over the top groundwater siphoning is that the water table can be lowered. It is critical to screen and comprehend the groundwater levels proceeding boring any wells which will have noteworthy draw down of the spring on the grounds that the water table levels will give a smart thought of the effect of the new well. For water to be pulled back beginning from the most punctual stage, must be directed from a well that compasses underneath the water table [13-14]. The data assembled by checking groundwater can be used to choose the proportion of groundwater that can safely be pulled back before no more water can be siphoned. Close by water managers can shield wells from going dry and hinder the improvement of progressively disastrous quality groundwater into the spring. In the event that groundwater levels decline exorbitantly [15] far, by then the well owner may need to broaden the well, drill another well, or, at any rate, try to cut down the siphon which could end up being expensive for the proprietor. Despite the cost of extending the significance of the well, entering another well, or moving the direct down as the significance to water constructs; the water should now be lifted higher to rise to the top. Sometimes there may be a chance that siphons are used to lift the water (rather than artesian wells), greater essentialness is required to drive the siphon which realizes continuously exorbitant water. In the end a significant well could end up being prohibitively expensive to siphon water from.

Certain regions decreasing the water table level can greatly affect the groundwater's quality. In waterfront freshwater spring’s salt water interruption can happen when the various densities of both the saltwater and new water permit the sea water to barge in into the new water aquifer [16-17]. Often beach front groundwater springs bolster huge populaces where the interest for groundwater withdrawals surpasses the new water revive rate permitting salt water to advance into the spring sullying the water.

Worldwide Positioning System (GPS) and nearby situating calculations can be utilized to acquire area and situating data of water. By which the location of the water body with the flow rate is shown in mobile simply. The sensor is used to detect the Moisture content and Temperature of the certain area in the underground water and when the limit exceeds the Notification is sent to the Customer and Government water board automatically.

3 Proposed System

3.1 Water Level Sensor

Water stream sensor comprises of a plastic valve from which water can pass. Water pivots alongside a Hall Effect sensor that sense and measures the water stream [18-19]. The fundamental working guideline behind the working of this sensor is the Hall Effect. As per this standard, in this sensor, a voltage distinction is instigated in the conductor because of the revolution of the rotor. This initiated voltage distinction is transverse to the electric flow.
3.2. Arduino

3.3 Arduino UNO Pinout
GPS (Global Positioning System) which is used to locate the area of the underground fresh water availability by storing the entire data by this project in the Cloud Computing Technology. The Application provides the Guidance with the Data of water in that area visually to the people in “Google Map” and it helps energy conserved and utilized efficiently [20]. The limit of the water is set according to the water availability and quality of water to alarm over usage information to the people and Water Board by measuring the water flow using “Arduino & Sensors”. Peoples are always For instance deforestation, depleted wetlands, and urban improvement cause water to overflow a lot quicker than it would normally. This prompts diminished charging of the fundamental aquifer. The surface water collaboration referenced before extra concerns incorporate the expanded expense of water and land subsidence. The expense of water increments as the profundity of the water table increments because of expenses related with the vitality required to lift the water further. Land subsidence, or soaking in, is brought about by the loss of help underground. Groundwater extraction can cause subsidence by leaving a void where the water was and drying the dirt permitting it to shrivel and settle. As groundwater is ceaselessly removed from the dirt the probability builds that the ground will settle to occupy the unfilled spaces left behind. This settling can be the wellspring of significant harm to the nearby networks remembering breaks for establishments, dividers, streets or possibly even sinkholes. It is necessary to determine the Powerful groundwater watching is the best way to deal with secures the local system, ensure a dependable and sensible groundwater gracefully, and guarantee the sum available for at some point later [21]. Help line provision with Water Board Advice also available. The GPS (Global Positioning System) is utilized to recognize the area of the water body with the subtleties is associated with the Google Map secretly. This configuration makes it possible for the Raspberry pi sensor sent the data to the Government when the water is over utilized or squandered [22].
5. Results

The consumer can view their water consumption through the application shown below and they can communicate to water board through it. It will useful for consumer and immediately they get consumption of water. The flow rate also can able to monitor with help of internet of things. The proposed method is simulated and hardware is implemented [23].
6. Conclusion

In this paper, a model brilliant groundwater level observing framework utilizing Arduino is introduced. For this a few sensors are utilized. The gathered information from all the sensors are utilized for investigation reason for better arrangement of water level just as stream rate checking can be executed. So this application will be the best challenger continuously checking and control framework and use to comprehend all the groundwater level observing related issues.

7. References

[1] Alessio B, Walter D, Valerio P, Antonio P, "Integration of Cloud computing and Internet of Things: A survey", Futur Gener Comput Syst 56: pp. 684–700, 2016.
[2] K. Xu, Y. Qu, K. Yang, "A tutorial on the Internet of Things: From a heterogeneous network integration perspective", IEEE Netw., Vol. 30, No. 2, pp. 102-108, 2016.
[3] Prachet Verma, Akshay Kumar, Nihesh Rathod, Pratik Jain, Mallik Arjun, Renu Subramanian, "Towards an IoT based water management system for a campus", IEEE 2015.
[4] Al-Fuqaha A et al, "Internet of Things: A Survey on Enabling Technologies, Protocols, and Applications", IEEE Commun Surv Tutorials 17(4), pp. 2347–2376, 2015.
[5] Thinagaran Perumal, Md Nasir Sulaiman, Leong.C.Y, "Internet Of Things (IoT) enabled water monitoring system", 2015 IEEE 4th Global Conference on Consumer Electronics (GCCE).
[6] Prachet Varma, Akshay Kumar, Nihesh Rathod, Pratik Jain, Mallikarjun S, Renu Subramaniyam, Bhardhwaj Amrutur, M.S.Mohan Kumar, Rajesh Sundresan, "IoT based water management System for a Campus IEEE", IEEE First International Smart Cities Conference (ISC2), 2015.
[7] Perumal, T.; Sulaiman, M.N.; Mustapha, N.; Shahi, A.; Thinaharan, R., "Proactive architecture for Internet of Things (IoTs) management in smart homes," Consumer Electronics International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056 Volume: 05 Issue: 10 | Oct 2018 www.irjet.net p-ISSN: 2395-0072 © 2018, IRJET | Impact Factor value: 7.211 | ISO
[8] V. Jayakumar, DC. Kumaresan, R. Karthikeyan “Wind Energy Conversion System and Solar PV Integration” International Journal of Innovative Technology and Exploring Engineering (IJITEE) ISSN: 2278-3075, Volume-8 Issue-7, 1595-1600, May, 2019.

[9] V. Jayakumar, PL. Somasuandaram “Implementation of single phase improved inverter for PV source”, International journal of pure and applied mathematics JARIIE-ISSN(O)-2395-4396 Volume 4 No. 3 2018, 118 – 126

[10] S K Saranya & Dr R Karthikeyan “Security for Smart Distribution Grid by Using Wireless Communication”, International Journal of Innovative Research in Computer and Communication Engineering (IJIRCE), Volume 02 Special Issue 01 March 2014, pp: 01 – 09, ISSN: 2320-9801.

[11] Saima Maqbool, Nidhi Chandra,“Real Time Wireless Monitoring and Control of Water Systems using Zigbee 802.15.4”, 5th International Conference on Computational Intelligence and Communication Networks, 2013.

[12] Asaad Ahmed Mohammed Ahmed Eltaieb, Zhang Jian Min,“Automatic Water Level Control System”, International Journal of Science and Research (IJSR) 2013.

[13] A. T. Sankara Subramanian, P. Sabarish, M. D.Udayakumar and T. V. Shikumar, “Performance Analysis of Various Photovoltaic Configurations under Uniform Shading and Partial Shading Formations”, Biosc.Biotech.Res. Comm. Special Issue Vol 13 No (3) 2020 Pp-185-192.

[14] P. Sabarish et al 2019 IOP Conf. Ser.: Mater. Sci. Eng. 623 012011.

[15] M D Udayakumar et al 2019 IOP Conf. Ser.: Mater. Sci. Eng. 623 012018.

[16] P. Sabarish, A. T. Sankara Subramanian, S. Murugesan and V. Sureshkumar, ”A New Methodology of Arterial Blood Clot Removal Using Bio Molecular Devices for ATPase Nuclear Motors.” Biosc.Biotech.Res.Com. Special Issue Vol 13 No (3) 2020 Pp-197-201.

[17] Karthick, R and Sundararajan, M. (2017), “Design and Implementation of Low Power Testing Using Advanced Razor Based Processor;” International Journal of Applied Engineering Research, 12.

[18] Karthick, R and Sundararajan, M. (2018), “A novel 3-D-IC test architecture-a review,” International Journal of Engineering and Technology (UAE).

[19] A Nazar Ali, D Sivamani, R Jaiganesh M Pradeep (2019), Solar powered air conditioner using BLDC motor, IOP Conference Series: Materials Science and Engineering, vol. 23.

[20] V Venkatesh, A Nazar Ali, R Jaiganesh. V Indiragandhi (2019), Extraction and conversion of exhaust heat from automobile engine to electrical energy, IOP Conference Series: Materials Science and Engineering, vol. 23.

[21] A Ali Nazar, R Jayabharath, MD Udayakumar (2014) An ANFIS Based Advanced MPPT Control of a Wind-Solar Hybrid Power Generation System,International review of modelling and Simulations. vol.7, no. 4, pp. 638–643.

[22] A.Nazar Ali and R. Jayabharath (2014), "Performance Enhancement of Hybrid Wind/Photo Voltaic System Using Z Source Inverter with Cuk-sepic Fused Converter." Research Journal of Applied Sciences, Engineering and Technology7,19 pp. 3964-3970.

[23] C.Kalavalli, S.R.Paveethra, S.Murugesan, Dr.A.Nazar Ali, (2020), Design And Implementation Of High Efficiency H6 PV Inverter with Dual Axis Tracking, International Journal of Scientific & Technology Research, Vol 9, issue 02, pp. 4728-31