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IOT based Manhole Detection and Monitoring System

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Abstract: ***With the increasing Urban population, the need for Internet of Things (IoT) based smart city applications, such as monitoring manhole covers (MC), becomes crucial. However, current MC monitoring systems lack full automation, have a short lifespan, and face design challenges from an IoT device perspective. In this study, we explore the use of compressive sensing (CS) to reduce power consumption in the analog-to-digital converter (ADC) of an IoT-based MC monitoring system, aiming to extend its lifetime. We propose two low-power analog chaotic oscillators as an alternative to the digital pseudo-random number generator (PRNG) commonly used in CS-based ADC's. The proposed systems are validated through temperature measurements, showing promising results. This research addresses circuit design challenges and improves system performance for long-term and efficient operation of IoT-based MC monitoring systems.***

I. INTRODUCTION

People are moving into urban areas because these are more desirable places to reside. But this development also places strain on urban resources and services, leading to utility outages and increasing resource use. Modern governments are implementing "Smart City" practises to manage urban services and resources in order to overcome these difficulties.

A "smart city" is described as a community that uses intelligent monitoring and control systems to assure sustainability and efficiency while integrating all of its infrastructure and services into a seamless whole. Smart infrastructures, which include subterranean utilities like electrical, water/sewer systems, and natural gas systems, are one of the main focuses of smart cities. Manhole covers (MC) are structures that are used to monitor and provide access to these facilities. However, the economy, safety, and security of cities may all be significantly impacted by the collapse of MCs.

Both automatic and manual monitoring tools are available for urban resources and services. While manual monitoring relies on human effort to physically visit the installation site for monitoring, automatic monitoring systems do not require human effort and often communicate data through wireless or wired systems. Automated monitoring systems are quicker and more cost-effective, but they still have limitations, especially when it comes to IoT devices—the monitoring systems that are utilised for Smart City applications and are IoT-based. Sensors, a data acquisition system (DAQ), a control unit (CU), a communication unit, and a power supply unit are commonly included in an IoT-based MC automated monitoring system.

Designing IoT-based automated MC monitoring systems is difficult due to energy consumption, with the ADC in the DAQ unit being the circuit with the largest power consumption. As a result, the study in this field focuses on developing an analogue circuit design technique-based low-power secure ADC. Analogue circuit design offers potential advantages in terms of power consumption and security, even though the majority of Internet of Things devices are based on digital circuit design.

The use of a high sample rate is one of the primary causes of the ADC circuit's excessive power consumption. However, if the signal is poorly recorded in one of the well-known domains, such as the frequency domain, compressive sensing (CS) theory, which was introduced in 2002, contends that the ADC sampling rate can be decreased to less than the Nyquist Shannon rate. Because of this, CS is a desirable strategy for IoT device power and data optimisation

II. LITERATURE SURVEY

A. Design space of wireless detector networks, Wireless Communication Author Romer,K. Mattern

Description : In the recent history, they had wireless detector networks have set up their way into a wide variety of operations and systems with veritably different conditions and characteristics. International Journal of Engineering Research & Technology(IJERT) ISSN 2278- 0181 Published bywww.ijert.org NCCDS- Proceedings of the 2021 Conference Volume 9, Issue 12 Special Edition – 2021 14 As a result, it becomes further and more delicate bandy typical requests regarding tackle issues and software support.

This is particularly problematic in a multidisciplinary exploration area similar as wireless detector networks where close cooperation between druggies, operation sphere experts, tackle and software contrivers inventors are demanded to apply effective systems. In this donation we bandy the consequences of this fact with regard to design space of wireless detector networks by considering its different confines. We justify our opinion with a demonstration that specific being operations enthrall different locales design space.

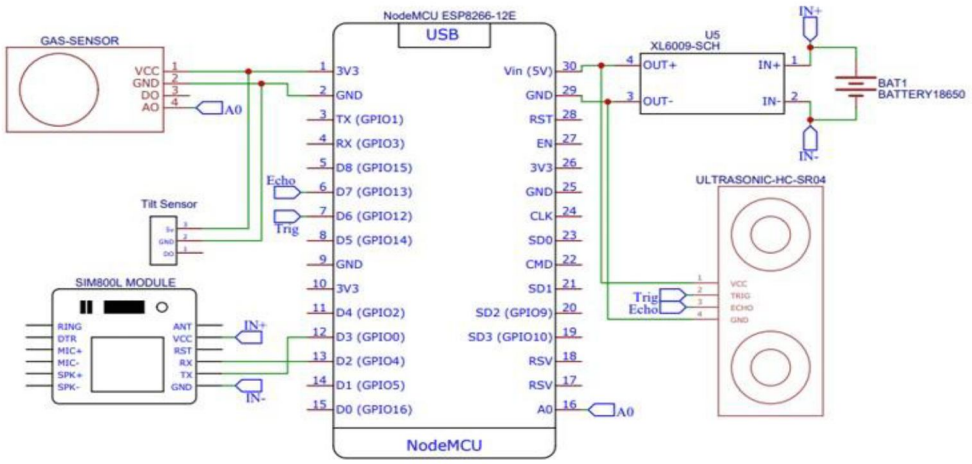
B. Towards enforcing IoT for the terrain Condition monitoring in homes By KellyS.D.T, Suryadevara,N.K., MukhopadhyayS.C
Description : In this document we've presented an effective an perpetration for the Internet of effects used for covering common domestic conditions through ubiquitous low costs seeing system. Description of the integrated network armature and connection mechanisms for dependable dimension of parameters by smart detectors and data transfer via the Internet is presented. The the longitudinal literacy system was suitable to give tone- covering a medium for better device operation during monitoring phase. The frame of the monitoring system is grounded on a combination of pervasive distributed seeing units, information system for data aggregation, logic and mindfulness of environment. The results are encouraging as is the trustability seeing the transmission of information through the proposed integrated network armature is 97. The prototype was tested to induce graphical information in real time rather than a test bed script.

C. Monitoring Smart City operations using Raspberry PI Based on IOT AuthorsProf. SA.Shaikh 1, SuvarnaA. Sonawane.
Description : The thing of the development is a Smart megacity cover the quality of coffers in the megacity to ameliorate the good operation and faster development of the megacity needed the imperative is to contemporize the healthy and safe metropolises that give real- time services and the rearmost outfit to apply the conception smart metropolises use the IoT conception, which enables easy wireless connectivity communication is possible. The system consists of detectors, collect colorful types of data from detectors and transmit it to Raspberry Pi3 motorist. The affair attained from the regulator is transferred to the control room viae-mail and also view on a particular computer.

III. COMPONENT

1) Tilt Sensor
2) Smoke Sensor
3) Buzzer
4) LCD (16x2)
5) Node MCU ESP8266
6) Temperature Sensor
7) GSM Module
8) Adapter 5V
9) Float Sensor

IV. CIRCUIT DIAGRAM



V. METHODOLOGY

In our design, we crushed these disadvantages in both cases being systems. rather, we produce an edge network Internet. We've constructed a loophole discovery system by connecting a number of detectors similar as cock detector, throttle detector, Float detector etc and also connect esp8266 s this system. We programmed this esp8266 as access a point that provides its own network without the Internet. still, shaft discovery system automatically sends detector data to the stoner via the web or alert dispatches mobile operation without internet below are some of the crucial benefits of the proposed result system There's no need to spend in this suggested system internet costs, If stoner present in this area. The whole system works as a original networks using edge computing. stoner can use any device to get updates from the system. It isn't limited to use only registered device. The stoner doesn't need to have internet access on their device get an update from this shaft discovery system

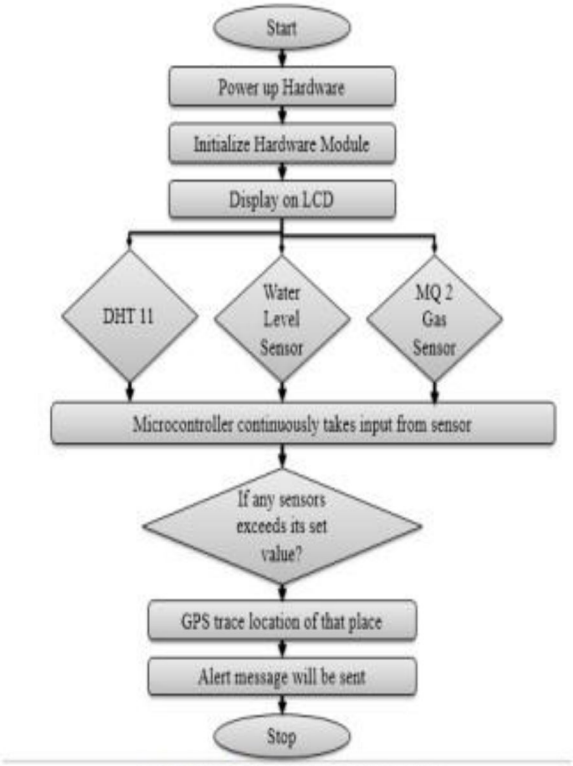


Figure 5: Flow chart of proposed model

VI. WORKING

An underground drainage monitoring system won't only help in maintaining the proper health and safety of the megacity but also in reducing the work of government labor force. colorful types of detectors(inflow, position, temperature and gas detectors) are connived with microcontroller Arduino Uno in order to make the system smart. When the separate detectors reach the threshold position, the suggestion of that separate value and detector is being transferred to the microcontroller. likewise, Arduino Uno also sends the signal and position of the manhole to the external pot through GSM and GPS and the officers could fluently detect which manhole is having the problem and could take applicable way. Also, Arduino Uno updates the live values of all the detectors in the manholes falling under the separate area using IoT. A communication will also be displayed on the TV.

VII. CONCLUSION

Underground monitoring is a grueling problem. This design suggests colorful styles of monitoring and operation resistance drainage system. It explains the colorful operations similar as underground drainage and shaft identification in reality time. colorful parameters similar as temperature, poisonous feasts, inflow and the water position is covered and streamlined internet using internet of effects. This allows a person responsible to take necessary action in this matter. In this way gratuitous passages through the shafts are saved can only be done if necessary. Also in real time streamlining on the internet helps to maintain chronicity in check drainage to avoid peril

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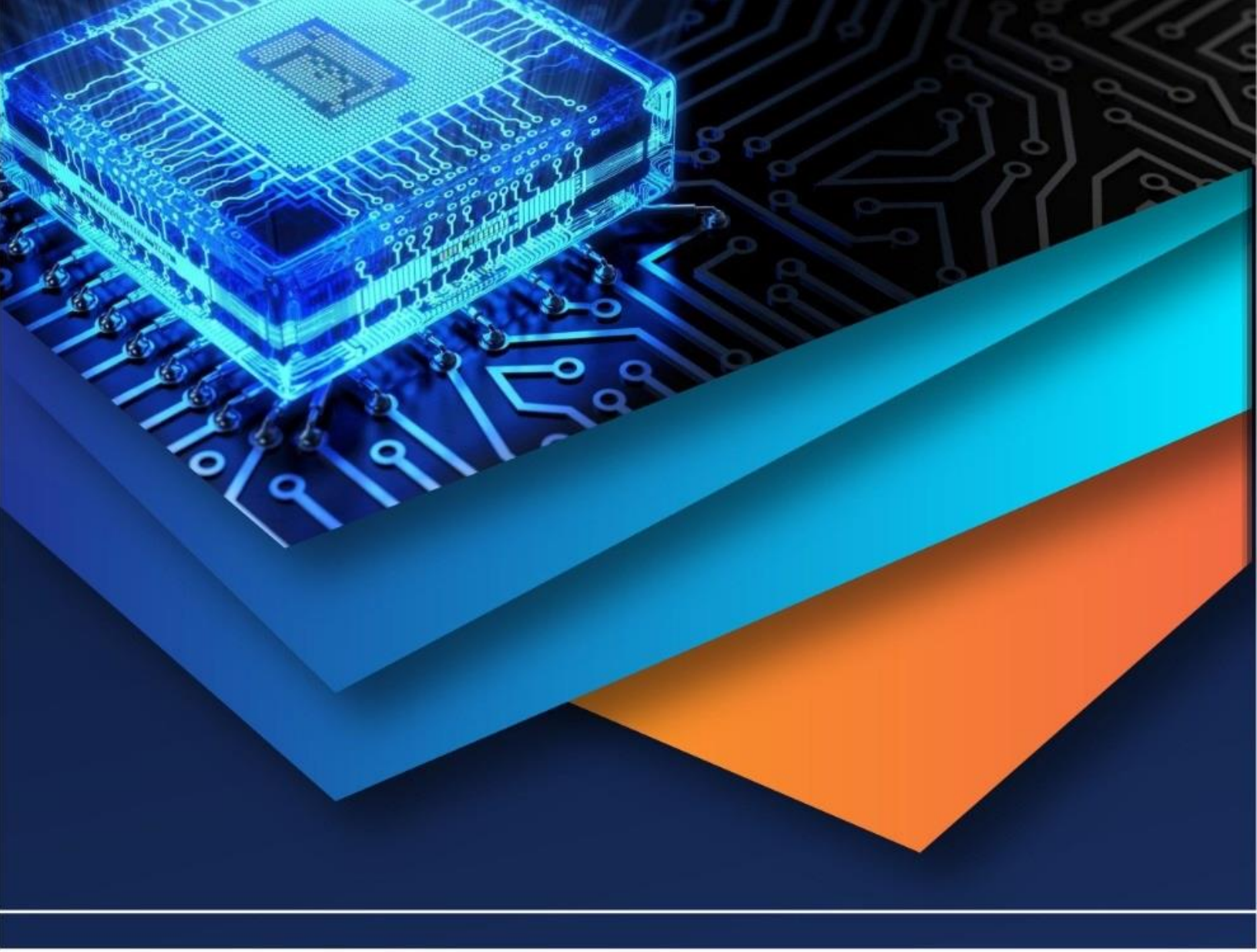

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