



REVIEW ON SMART CITIES BASED ON WIRELESS SENSOR NETWORK

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ABSTRACT: Innovative headways in registering and media transmission have radically changed the world. Specifically, the development of Internet of Things and distributed computing has been utilized to upgrade the quality of services in cities. The ascent in populace is the major contributing variable towards the need of smarter frameworks. Smart Cities improve supportability and productivity of different urban elements, for example, wellbeing, water, land, and vitality. The idea of the Internet of Things (IoT), has gotten integral to the conceptualisation and usage of Smart Cities because of the necessary network between the sensor nodes. In this paper we intend to examine and identify the roles and challenges of network sensors (referred to as smart sensors in this work) in smart cities, using an exploratory approach based on literature review. The investigation likewise intends to propose arrangements and future undertakings to address the challenges.

Keyword: [Internet of Things, quality of services, Smart Cities, sensor node.]

1. INTRODUCTION

A smart city is a urban region that utilizes the data that is gathered by different kinds of sensors and gadgets to screen and deal with its foundations and its assets productively. In view of the sensory information, the screen and control frameworks can persistently learn and adjust the evolving conditions, with the end goal that the frameworks consistently give a fulfilled exhibition. Contrasted with the current refers to, a smart city is required to give a superior association between the services and the residents. All the more explicitly, for the smart observing frameworks, they should utilize the data produced from the enormous measure of individual gadgets, join the residents into the

frameworks to take an interest in detecting, and be progressively open regarding information, strategies, and government. As should be obvious, the observing is a fundamental part of a smart city. Accordingly, in this overview we center around the observing of a smart city as far as sending and the board.

Urban territories around the globe are populating their roads with wireless sensor networks (WSNs) so as to take care of nascent smart city IT frameworks with metropolitan information. Later on smart cities, WSN innovation will have a monstrous nearness in the roads, and the activity of city services will be put together by and large with respect to information accumulated with this innovation.

Sensor nodes related with various Smart City applications produce a lot of information that are right now fundamentally under-utilized. Utilizing existing ICT framework, created heterogeneous data can be united. A portion of the current wireless correspondence technologies that can be misused to accomplish this data total are 3G, LTE and Wi-Fi. With regards to utilization of installed gadgets and existing internet framework the Internet of things (IoT) includes PC's and other encompassing electronic gadgets. The Smart City vision is subject to working billions of IoT gadgets from a typical spot.

One preferred position of smart cities is that contamination checking makes for an eco-accommodating condition. The broad utilization of ICT additionally enables the advancement of fundamental services, for example, wellbeing, security, police and local groups of fire-fighters and so forth. A smart city can make our lives vitality effective. Wireless advancements can bolster general wellbeing, giving specialists access to clinical records effectively and at negligible expense. The fundamental objectives are mechanized determination and social insurance for patients in risky circumstances. This will be executed by sensor gadgets, which can screen temperature, pace of breathing, and so on and give an individual picture to determination. The following figure shows some applications of smart cities based on WSN.

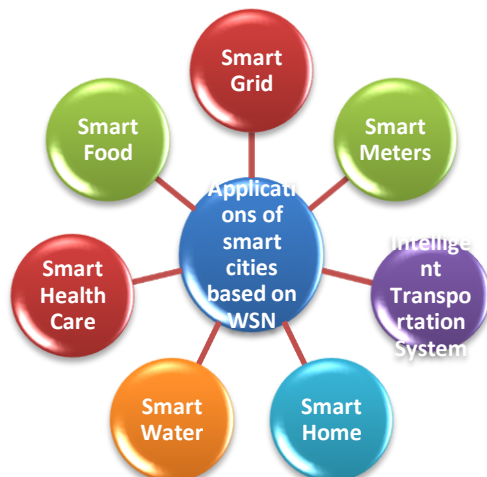


Figure 1: Applications of smart cities based on WSN.

2. LITERATURE SURVEY

1. Smart Grid

There are various meanings of the smart grid: practical or innovative. A typical model is the advanced power grid that gathers and appropriates data. It provides electricity from the supplier through bilateral technical direction. A smart grid is an adaptable framework that connections individuals with innovation and normal frameworks. It comprises of an electric grid, a correspondences network, and equipment or software to monitor and control it. It can give power, limit cost and give instant data.

1. Deepak Kumar Aagri, Altanai Bisht (2018) proposed A hybrid smart grid, opens up new avenues for solar power based micro grids, opens up new roads for sunlight based force based miniaturized scale frameworks, to be controlled and gotten to by Internet of things technologies. Likewise it makes conceivable new plans of action for send out/import of produced and collected Solar PV. Mix with IoT permits smaller scale grid systems to perform information logging over the cloud and give controller of the grid. This paper depicts the way to deal with improve Hybrid power grid system in homes, and to connect them to a main grid connecting many other homes. The node proprietors can buy or sell the produced/put away force at their homes, utilizing a web interface. Information lumberjacks will match up data with disseminated database frameworks on cloud while ongoing diagnostic motors will give warnings and reports to imagine information for prescient and measurable examination.

Merits

1. This strong model even gives business avenues to mortgage holders to collect and market produced solar power.
2. It will likewise assist governments with regulating power generation and utilization for a more beneficial and greener condition.

Demerits

1. Energy capacity choices and abilities are an exceptionally frail connection in the accomplishment of Micro grid activities.

2. Gayathri M. S., Ravishankar A. N., Kumaravel S., and Ashok S (2018) proposed a novel idea to monitor a battery by the maker, showcase seller once it is conveyed for its utilization. The most recent IoT innovation empowers to procure battery boundary esteems with less time and cost. This work would encourages the battery producer to distinguish batteries that are in wasteful working conditions and supports the client for better proficient use through proposals and suggestions. The capacity gets essential for any manageable vitality gracefully framework that utilizes sustainable power source technologies. Likewise, electric vehicles will profoundly infiltrates into basic man's transportation choices. In these two zones, batteries are acceptable choice for capacity arrangements. This makes enormous arrangement of batteries over the world. In this way a battery the board framework that screens continuous patterns of boundaries and offer this information to partners turns out to be profoundly vital.

Merits

1. The proposed framework can be utilized for planning industrial prototypes.
2. Also it is having a bit of leeway over existing ones, that the boundaries can be gets to at whenever, anyplace with the assistance of IoT which improves the proficiency of restorative activities taken.

Demerits

1. More delicate to high temperature than other battery chemistries, bringing about a lot quicker debasement when put away or worked at high temperatures.

3. Kumar Nalinaksh, Lokesh Pathak and Dr. Vinay Rishiwal (2018) proposed propose and reproduce an extraordinary model which

can be utilized as an extra to the current foundation of the force grid. At the point when made on a business scale, it would be very economical contrasted with existing significant expense smart grid equipment and would aid close and exact observing of electrical utilization measurements from end client to control discoms, controlling and gathering insights and in particular genuine – time distinguishing proof of intensity robbery and successive shock because of harm to electric transmission lines or dissemination framework, as and when it happens.

Merits

1. It would make sense to switch to the proposed arrangement, at that point to execute the accessible arrangement for enormous scope. It would spare gigantic measure of income.
2. The proposed arrangement is amazingly modest and simple to convey and keep up in the underdeveloped nations, for example, India and Brazil and so on.

Demerits

It can't work modular, and incorporate self-networking, node discovery and interdevice communication.

2. Smart Meters

A smart meter system has benefits for the customer and the company. It consists of smart meters, communication infrastructure, and control devices. Smart meters can calculate electricity usage, and provide information to the company to regulate power and monitor and control devices.

1. Himanshu K. Patel, TanishMody, Anshul Goyal (2019) proposed a system that removes human intervention in meter readings and bill generation thereby reducing the error that usually causes chaos and energy related corruption. The proposed system is implemented using a GSM shield module on microcontroller (Arduino®) together with LDR sensor and relay. Existing metering

system can be minutely modified to implement the proposed meter. The proposed scheme is to connect an LDR sensor with the blinking LED and send the data to microcontroller via GSM shield. RTC provides delay and acts an interrupt. The system includes a provision of sending an SMS to user for update on energy consumption along with final bill generation along with the freedom of load re-configuration via SMS. The disconnection of power supply on demand or due to pending dues was implemented using a relay.

Merits

Hardware implementation results suggest that the accuracy of the proposed system is slightly greater than that of existing smart meters.

The cost of system has been estimated to be less than the available smart meters, offering the same functionality. Bilateral communication between user and system sets it apart from the commonly available smart meters.

Demerits

1. The system doesn't have any theft protections. Even though the system is designed to fit for domestic use only.

2. A. R. Al-Ali, T. Landolsi, M. H. Hassan, M. Ezzeddine, M. Abdelsalam, M. Baseet (2018) proposed An integrated 3-in-1 residential utility meter is designed utilizing the IoT technology. The meter measures electricity, water and gas consumptions and reports the readings to the utility server for further processing. Homeowners and utility operators can access the meter anytime from anywhere through Wi-Fi links. The status of the meter is displayed on a Google map with color attributes; green for in-service and red for out of service. A prototype was built and tested. The meter was within 97% accuracy when compared to the actual readings of the commercial meters that were connected to the same loads.

Merits

The accessibility to the proposed meter through mobile devices while displaying the meter status on a Google Map, and the utility can access the meter to change the tariff at the peak demand.

Demerits

1. In-Home Display should continue to display energy use and enable you to retrieve readings without needing to access the meter however their ability to communicate with the smart meter may be inconsistent and in some cases, they stop working entirely.

3. Intelligent Transportation System

ITS uses modern techniques of communication and media technology in urban areas for the taxi system, mass rapid transit (MRT), light rail transit (LRT), electronic road pricing (ERP), road information management system (RIMS), traffic signal optimization system, electronic communication system, and automobile navigation systems to face many challenges in various means of transport. Smart transport systems contribute to the rational exploitation of existing infrastructure without resorting to the establishment of new facilities. The objective of ITS is: 1-improve the economic productivity of current and future systems, 2-energy conservation and environmental protection, 3-improve the level of traffic safety 4- increase the prosperity of travelers, 5-increase the operational efficiency of the transportation system, 6-reduce commuting time and cost, and 7-predict the movement of traffic and events that may affect the future.

1. Fenghua Zhu, Yisheng Lv, Yuanyuan Chen, Xiao Wang, Gang Xiong, and Fei-Yue Wang (2018) present visions and works on integrating the artificial intelligent transportation systems and the real intelligent transportation systems to create and enhance "intelligence" of IoT-enabled ITS. Based on IoT, Parallel transportation systems are built up in 3 steps. First, Artificial transportation

systems are set up to model and describe the actual transportation system. Second, computational experiments are designed and conducted to predict future evolutions and evaluate control plans. Finally, the actual and artificial systems are executed in an interactive parallel mode. In parallel execution, instead of guiding the virtual systems to approach to the status of the actual system, as we usually do in transportation simulation, we aim to guide the actual system to approach to the ideal status in the artificial systems. Accordingly, there are also three functions in PTS, descriptive analytics, predictive analytics and prescriptive analytics. Besides helping to improve transportation systems, PTS also has a promising future in building smart cities.

Merits

IoT-driven intelligent transportation systems (ITS) have great potential and capacity to make transportation systems efficient, safe, smart, reliable, and sustainable.

Demerits

It is not includes verifying the reliability of the data collected using social sensors.

2. Herrera-Quintero, L. F., Vega-Alfonso, J. C., Banse, K. B. A., & Carrillo Zambrano, E. (2018) proposed a cheap and versatile serverless and microservice architecture approach that focuses on the Internet of Things for the transportation planning in BRT systems. The proposed model follows the SOA, which is a successful paradigm to integrate systems that implement the NoSQL approach. The NoSQL approach helps to handle vast amounts of data and integrate them into IoT-enabled devices, which are a revolutionary trend in the intelligent transportation field. The cloud providers Amazon web services and Google Cloud are used to produce the serverless and microservice architecture. Thus, this architecture reduces the operative charge in creating and deploying new functionalities and

provides new provision for the resource for the same ones. In fact, the engineers in the surveillance and maintenance process can improve the daily IT processes for this system.

Merits

The proposed devices offer benefits compared to the previous innovating system because a single cheap device can accomplish the tasks that were meant to be performed by several devices such as computers, servers and sensors.

Moreover, the proposed device assists the fast deploy of ITS solutions, reduces the cost, and increases the reliability because of the versatility, flexibility and easy access of the internet-of-things approach.

Demerits

1. It didn't implement message channels in the architecture

4. Smart Home

The papers reviewed had different views of the smart house. Some viewed the house in terms of its dependence on modern technology. However, we view the modern smart house as controlled by the occupant/owner. The smart house obeys the owner's wishes in terms of protection and comfort. Technologies that support the communication of the smart house with the owner are mobile, computer, and internet networks, whether the owner is inside or outside the home. The goal of smart building is to satisfy both the owner and the occupant, and not everything that one customer requests is requested by another. One solution provided by a smart building is lighting control; an intelligent lighting system provides lighting everywhere so that the occupant never has to enter a dark room. Energy and temperature controls provide cooling or heating in the home. Security and safety are provided by temperature and movement sensors, which can also turn off lights and lock doors when you exit, and sound the alarm if intruders appear.

Entry and exit is controlled by pass codes entered on a keypad.

1. Laila Salman, Safa Salman, Saeed Jahangirian, Mehdi Abraham, Fred German, Charlotte Blair, Peter Krenz (2016) proposed Energy Efficient IoT-Based Smart Home. Smart Home technology is the future of residential related technology which is designed to deliver and distribute number of services inside and outside the house via networked devices in which all the different applications & the intelligence behind them are integrated and interconnected. These smart devices have the potential to share information with each other given the permanent availability to access the broadband internet connection. Hence, Smart Home Technology has become part of IoT (Internet of Things). In this work, a home model is analyzed to demonstrate an energy efficient IoT based smart home. Several Multiphysics simulations were carried out focusing on the kitchen of the home model. A motion sensor with a surveillance camera was used as part of the home security system. Coupled with the home light and HVAC control systems, the smart system can remotely control the lighting and heating or cooling when an occupant enters or leaves the kitchen. This paper summarizes the antenna module mounted on a smart LED as well as the one mounted on the HVAC system. The ability to control these devices under different environmental scenarios will assist in making the smart home more energy efficient.

Merits

The proposed system has energy efficient. This Smart Home initiative allows subscribers to remotely manage and monitor different home devices from anywhere via smart phones or over the web with no physical distance limitations.

Demerits

The biggest problems, con or disadvantage of a smart home system is the cost. There are

quite a number of companies that provide the smarty home system, but all of them are quite expensive.

2. Roshmi Sarmah, Manasjyoti Bhuyan and Monowar H. Bhuyan (2019) propose a secure and efficient smart home system that enable to protect homes from theft or unusual activities and parallelly saves power. Our system is developed by exploiting the features of IoT that facilitates us to monitor an IoT enabled home from anywhere anytime over the Internet when data are stored in the cloud. This system uses a motion detector to detect a moving object from the environment where the system is deployed. The proposed system is evaluated using real-time deployment at KU campus considering 30 rooms for 60 days and found really useful in terms of safeness from any theft and saving power in comparison to existing systems.

Merits

Secure IoT-enabled smart home system that increases safeness from theft and parallelly saves enormous power cost.

This system adds advantage by eliminating the use of traditional personal computers (PC) and its peripheral devices during execution.

Demerits

1. The basic requirement for the smart home system is the internet. Without a good and strong internet connection, you will not be able to take control of this.

5. Smart Water

A smart city uses a variety of techniques and systems that contribute to reducing water use. Poor management and suboptimal use of water have large negative consequences. We need to have smart systems to maintain our natural wealth through 1-monitoring and control of environmental water such as natural rainfall, surface water, groundwater, wastewater and agriculture water, 2-analysis and response to the data to improve the efficiency of use, which requires cooperation

with all stakeholders, 3-ensuring the safety and health of the network and making sure ongoing maintenance is performed, 4-controlling pollution and strengthening the capacity to respond in an emergency, 5-using smart water meters that predict the population's consumption of water, 6-designing green spaces which help reduce evaporation, and 7-using local plants and trees which require little water.

1. Ms. A. Madhuraveni, G. Athithan, S. Thilagavathi, R. Vignesh (2018) proposed an internet-based approach to measuring water quality and delivery systems on a real-time basis. The results of the various parameters of water quality are verified that the system achieved the reliability and feasibility of using it for the actual monitoring purposes. The WSN network will be developed in the future comprising of more number of nodes to extend the coverage range. In our proposed system, water level can be monitored continuously from anywhere using web browser. Motor can be controlled automatically full smart automation is achieved. It is a robust system & small in size. This Project uses ultrasonic sensors which provide more accurate and calibrated information for water level in tank. An electromagnetic box is used to drop the chlorine power in the tank by automated system and show the various parameter of water in a web browser that can be viewed anywhere by user.

Merits

The system achieved the reliability and feasibility of using it for the actual monitoring purposes.

Motor can be controlled automatically full smart automation is achieved. It is a robust system & small in size.

Demerits

The drawbacks of such systems are additional cost

2. Vennam Madhavireddy1, B. Koteswarrao (2018) proposed Smart Water Quality Monitoring System Using Iot Technology. Drinking water could be precious for all people as water utilities face more challenges. These challenges arise due to the high population, fewer water resources, etc. So, different methods are used to monitor in the real-time water quality. To make sure that safe distribution of water is done, it must be observed in real time for a new method in the "Internet of Things (IoT)" based water quality has been projected. Realtime water quality observation is examined by data acquisition, method, and transmission with an increase in the wireless device network method in the IoT. Microcontroller and the processed values remotely to the core controller ARM with a WI-FI protocol are used to interface the measured values from the sensors. This projected the water quality observation interface sensors with quality observation with IOT setting. WQM selects parameters of water like temperature, pH level, water level and CO2 by multiple different device nodes. This methodology sends the information to the web server. The data updated at intervals within the server may be retrieved or accessed from anyplace within the world. If the sensors do not work or get into abnormal conditions, then a buzzer will be ON.

Merits

The time is reduced, and the cost is low in this environmental management.

For the monitoring process, the system is achieved with reliability and feasibility by verifying the four parameters of water.

Demerits

1. The system has high complexity and low performance.

6. Smart Health Care

Smart cities provide multiple solutions, but require cooperation among local hospitals and private networks for the exchange of the necessary information to increase efficiency

for the treatment of patients and link with pharmacies to provide drugs quickly and easily. Special wireless access to emergency departments can help with medical emergencies by transmitting vital information. Automated diagnosis and health care can be provided for the patient in a dangerous situation. Sensor devices can be put on the patient's clothes or skin and information sent to the hospital. The devices can monitor temperature, rate of breathing, etc. in real time.

1. K. Dinesh, K. Vijayalakshmi, C. Nirosha, I. Siva Rama Krishna (2019) describes E-Health Monitoring (EHM) and presents an architectural framework to describe the entire monitoring life cycle and highlights the essential service components. It serves as a fundamental basis for achieving robust, efficient and secure health monitoring. The primary aim of this paper is to design an IOT based architecture for health related issues such as Diabetics, Heart Monitoring system ,to check body temperature, Pulse rate and kidney functioning. we are analyzing different methods and techniques used for healthcare monitoring system where doctor can continuously monitor the patient's condition. The Data obtained through sensors are uploaded to the Ethernet module which is an IOT connected device to cloud and collected data is accessed by Authorized person through internet. Also the patient history will be stored in the web server and doctor can access the information whenever needed from any corner of the world. If there is any sudden change in the health condition of the person who are using this health care system module, automatically the data of the patient will be uploaded to the concerned doctor, within few minutes user will get a prescription for his current situation. This will connect us with the doctors who are very far from us, and the immediate action will increase the health rate of people. This health care system will be most useful in rural and remote areas.

Merits

In the designed system the enhancement would be connecting more sensors to internet which measures various other health parameters and would be beneficial for patient monitoring i.e. connecting all the objects to internet for quick and easy access.

This health monitoring has a wide range of applications and can save rural and remote area people in emergency conditions

Demerits

Privacy can be potentially undermined. Systems get hacked and lots of attention will need to be focused on data security, which requires significant additional spending.

2. Dr.Ashfaq Amir Shaikh, Rashida Wasiullah Ansari ,Sabaah Amin Navlekar , Shubham Dinesh Singh (2018) proposed Internet of Things(IoT)Based Smart Healthcare System. The proposed system is a health care app in collaboration with an IOT based medicine box for people suffering from neurological defects such as Alzheimer's, Dementia, Parkinson's as well as other age related problems. It is an initiative made to target the most common symptom that is forgetfulness. The medicine box is an integration of sensing hardware system and an android application that generates notifications based on various patients activities. This app also incorporates patient's details and medicine schedule. In the modern healthcare system, this medicine box can act as a great tool to help the patients organize their medicine schedule and adhere to it as prescribed by their physician thus improving their quality of lives.

Merits

IoT based smart Healthcare System” we tried to reduce the burden on the caretaker by providing a smart solution by using IoT and integrating the medicine box with android application.

Using this system patient will be able to take medicines on time thus improving their quality of lives.

Demerits

1. Unauthorized access to centralization. There is a chance that dishonest interlopers may access centralized systems and realize some cruel intentions.

7. Smart Food

A smart food system consists of a tracking system which monitors the food supply, production, processing, transportation, and risk control. Another element is ensuring compliance with health and safety systems. An emergency system can provide early warning of food security problems.

1. Nikesh Gondchawar¹, Prof. Dr. R. S. Kawitkar (2018) proposed IoT based Smart Agriculture. Hence the project aims at making agriculture smart using automation and IoT technologies. The highlighting features of this project includes smart GPS based remote controlled robot to perform tasks like weeding, spraying, moisture sensing, bird and animal scaring, keeping vigilance, etc. Secondly it includes smart irrigation with smart control and intelligent decision making based on accurate real time field data. Thirdly, smart warehouse management which includes temperature maintenance, humidity maintenance and theft detection in the warehouse. Controlling of all these operations will be through any remote smart device or computer connected to Internet and the operations will be performed by interfacing sensors, Wi-Fi or ZigBee modules, camera and actuators with micro-controller and raspberry pi.

Merits

Implementation of such a system in the field can definitely help to improve the yield of the crops and overall production.

Demerits

1. The smart agriculture needs availability of internet continuously. Rural part of most of the developing countries do not fulfil this requirement.

CONCLUSION

There are a few methodologies with respect to the issue of smart cities and sensor frameworks inside them, which essentially rely upon the individual's profession or logical field. Here and there the thought about smart cities can be influenced by the way that somebody is from the city, so issues of this city are nearer and more clear to him. Subsequently, it ought to be accomplished more on the improvement of the interdisciplinarity and participation in the investigation of the issues of smart cities to deliver progressively complete and better arrangements

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