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A Review on Atmospheric Parameter Monitoring System for SMART CITIES using Internet

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Abstract: Objects of everyday life will be equipped with microcontroller, microprocessor, embedded system and transceivers for digital communication with one another and with the users, becoming an integral part of internet. In this paper, we focus specifically to an urban internet for atmospheric parameter system. Through the mechanism of internet, we make a modem specially focused on atmospheric parameter which consists of three sensors for air, noise pollution and temperature measurement and the controlling of street light thus connected to the embedded system. This transmitted the data to the server and received by the pc or GUI modem. For this, modem is designed to support SMART CITY vision, which aims at exploiting the most advanced communication technologies to support added-value services for the administration of the city and for the citizens.

Index Terms: *GUI, PC, embedded system, smart city, urban internet, GIS map, GPRS, GSM model, sensors, Zigbee, RFID technology, WSN.*

I. Introduction

THE Internet is a recent communication paradigm. Internet is even more immersive and pervasive. By enabling easy access and interaction with a wide variety of devices such as, home appliances, surveillance cameras, monitoring sensors, actuators, displays, vehicles, and so on. The internet will foster the development of a number of applications that make use of the potentially enormous amount and variety of data. Which generated by such objects to provide new services to citizens, companies, and public administrations. This paradigm indeed finds application in many different domains, such as home automation, industrial automation, medical aids, mobile healthcare, elderly assistance, intelligent energy management and smart grids, automotive, traffic management, and many others.

Heterogeneous field of application makes the identification of solutions capable of satisfying the requirements of all possible application situations a difficult challenge. This difficulty has led to the propagation of different and, sometimes, incompatible proposals for the practical realization of Internet systems. Therefore, from a system view, the realization of an Internet network, together with the required backend network services and devices, still lacks an established best practice because of its novelty and complexity. In addition to the technical difficulties, the adoption of the effects of internet paradigm is also delayed by the lack of a clear and widely accepted business model.

From above complex discussion, the application of the Internet paradigm to an urban context is of particular interest. It responds to the strong push of many national governments to adopt ICT solutions in the management of public affairs, thus realizing the so-called Smart City concept. Although there is not yet a formal and widely accepted definition of "Smart City." The final aim is to make a better use of the public resources, increasing the quality of the services offered to the citizens, while reducing the operational costs of the public administrations.

Some papers are referred related to system work in which we found that, Mr. Andrea Zanella focused on all parameters of city such as traffic, building, air, light, energy consumption, etc. and He also described a practical implementation on an urban internet, named "Padova Smart city" that has been realized in the city Padova, Italy. Mr. A.R. Al Ali mainly focused on GPRS based distributed home monitoring and the freely available public services like GIS maps. Mr. Hui Yang focused specially on online monitoring geological CO2 storage & leakage based on wireless sensor networks.

All the journal's focused on different parameters' of the city but no one can specially focused on atmospheric parameter i.e. air, temperature, noise. All the atmospheric parameters such temperature (humidity), noise pollution, air (CO2/SO2) & controlling street light are focused in this system or paper. And also focused to maintain the data for long life as well as we see the graphically representation on web page also.

System related work

Atmospheric parameters related to proposed work for Smart City:

According to peak Research on Smart Cities, the Smart City market is estimated at hundreds of billion dollars by 2020, with an annual spending reaching nearly 16 billion. This market springs from the synergic interconnection of key industry and service sectors, such as Smart Governance, Smart Mobility, Smart Utilities, Smart Buildings, and Smart Environment. These sectors have also been considered in the European Smart Cities project to define a ranking criterion that can be used to assess the level of "smartness" of European cities. Nonetheless, the Smart City market has not really taken off yet, for a number of political, technical, and financial barriers.

Air Quality: The European Union officially adopted a 20-20-20 Renewable Energy Directive setting climate change reduction goals for the next decade. The targets call for a 20%

reduction in green house gas emissions by 2020 compared with 1990 levels, a20% cut in energy consumption through improved energy efficiency by 2020, and a 20% increase in the use of renewable energy by 2020. To such an extent, an urban internet can provide means to monitor the quality of the air in crowded areas, parks, or fitness trails. In addition, communication facilities can be provided to let health applications running on joggers' devices be connected to the infrastructure. In such a way, people can always find the healthiest path for outdoor activities and can be continuously connected to their preferred personal training application. The realization of such a service requires that air quality and pollution sensors be deployed across the city and that the sensor data is made publicly available to citizens

Noise Monitoring: Noise can be seen as a form of acoustic pollution as much as carbon oxide (CO) is for air. In that sense, the city authorities have already issued specific laws to reduce the amount of noise in the city centre at specific hours. An urban internet can fifer a noise monitoring service to measure the amount of noise produced at any given hour in the places that adopt the service. Besides building a space-time map of the noise pollution in the area, such a service can also be used to enforce public security, by means of sound detection algorithms that can recognize, for instance, the noise of glass crashes or brawls. This service can hence improve both the quiet of the nights in the city and the confidence of public establishment owners, although the installation of sound detectors or environmental microphones is quite controversial, because of the obvious privacy concerns for this type of monitoring.

Smart Lighting: In order to support the 20-20-20 directive, the optimization of the street lighting efficiency is an important feature. In particular, this service can optimize the street lamp intensity according to the time of the day, the weather condition, and the presence of people. In order to properly work, such a service needs to include the street lights into the Smart City infrastructure. It is also possible to exploit the increased number of connected spots to provide Wi-Fi connection to citizens. In addition, a fault detection system will be easily realized on top of the street light controllers. Automation and Salubrity of Public Buildings: Another important application of internet technologies is the monitoring of the energy consumption and the salubrity of the environment in public buildings by means of different types of sensors and actuators that control lights, temperature, and humidity.

City Energy Consumption: Together with the air quality monitoring service, an urban internet may provide a service to monitor the energy consumption of the whole city, thus enabling authorities and citizens to get a clear and detailed view of the amount of energy required by the different services (public lighting, transportation, traffic lights). In turn, this will make it possible to identify the main energy consumption sources and to set priorities in order to optimize their behavior. This goes in the direction indicated by the European directive for energy efficiency improvement in the next years. In order to obtain such a service, power draw monitoring devices must be integrated with the power grid in the city. In addition, it will also be possible to enhance these services with active functionalities to control local power production structures (e.g., photovoltaic panels).

In this project, belonging to internet developed a system. In which implementation of wireless sensor network for monitoring/automation of air, noise pollution for smart city. Furthermore, the implementation of atmospheric parameters such as noise, co2, temperature and controlling street lights all are the application of internet paradigms and all that are most essential in this project.Let's the focused on all those parameters which are affected on city life. Starts with air, the quality of the air in crowed area, parks or fitness trails and on road are polluted. The climate changes every day/every time. In such a way, people can always find healthiest path. The realization of service required air quality and pollution sensors is developed across the city. Noise form acoustic pollution as much as carbon oxide. In that case, reduce the amount of noise pollution from city. The realization of noise monitoring for reduced and measured the amount of noise. Atmospheric concentration of the key greenhouse gas co2 (carbon dioxide) well above pre-industrial levels constitute the main cause for the predicted rise at average surface temperature on the Earth and the corresponding change of the global climate system. Because of this, the realization of CO2 monitoring. We see daily changes in climate. Sometimes the temperature becomes hot or cool. Because of that many time people are faced many problems. To avoid that people many know the changes about temperature. And in this project see the daily or a single moment changes of the temperature.

Controlling street lights also the essential parameter of this project. In street light, we see that many time street lamps are ON at day time also. For properly work, of street light such a service needs to include the street light into smart city infrastructure. The realization of sensors and actuators that control lights.

By controlling all these parameters, indeed, it is possible to enhance the level of comfort of the persons that live in these environments, which may also have a positive return in terms of productivity, while reducing the costs for heating/cooling.

Objectives:

Following are the objectives of this project:-

1. To monitors CO2 & CO at remote location through GPRS.
2. To display daily atmospheric temperature.
3. To monitor the noise pollution.
4. To Control the street light.

III. Literature Review

1. **Andrea Zanella [1]** as analyzed the solutions for the implementation of urban internet. This technology is not yet a formal and widely accepted definition of "Smart City." The final aim is to make a better use of the public resources, increasing the quality of the services offered to the citizens, while reducing the operational costs of the public administrations. This paper hence provides a comprehensive survey of the enabling technologies, protocols, and architecture for an urban Internet which is useful to support "Smart city vision".

The limitation occurred in this system as, even if this system is a simple application of the Internet concept, it still involves a number of different devices and link layer technologies, thus being representative of most of the critical issues that need to be taken care of when designing an urban Internet. Here also limitations in smart parameters like structural health, air quality monitoring, noise monitoring, smart lighting as seismograph difficult to integrate, greenhouse gas sensors not be cost effective, the sound pattern detection scheme difficult to implement and requires intervention on existing infrastructures.

2. **Sean Dieter Tebje Kelly [2]** he developed the system in which installing the Smart sensing units and setting up a ZigBee based WSN at few houses. These technologies that will drive the future Internet will be related to Smart sensor technologies including WSN, Nanotechnology and Miniaturization. The environmental parameters (temperature, humidity and light) are important aspects for deciding whether equipment such as (fans, electric heaters or lamps) should be switched on or off in a wireless monitoring network used for energy management in the home. And generated real time graphical representation of the sensing information on the effects of internet website.

   The limitation is that, in this project better compression techniques can't be implemented for minimizing storage requirements and effective retrieval of data. Also, security issues and study related to comparison of ZigBee based data transmission and 6 LowPan network for Smart Home environment with heterogeneous smart sensors will be performed.
3. **A. R. Al-Ali [3]** has presented the design and implementation of a compact, low-cost, low-power single-board integrated home monitoring system. That utilizes GPRS and the freely available public services like GIS Maps. The monitoring service is accessible through the mobile phone or through the Internet (using GIS Maps). This server is developed using a published software interface from a freely available Internet-based GIS. The Online Maps server dynamically shows the status of any home in an Internet browser running either on a normal computer or a mobile phone. In addition, database and convenient interfaces to services providers like home security firms and the municipality are also provided.

   Here the some limitation is presented as the system shall take a maximum of two hours to be installed & the system is only useful for home owners. The system should only accept valid SMS messages from registered modems.
4. **Joaquin Gutierrez [4]** has represented the automated irrigation system implemented was found to be feasible and cost effective for optimized water resources for agricultural production. This system developed proves that the use of water can be diminished for a given amount of fresh biomass production. Significantly important for organic crops and other agricultural products that are geographically isolated, where the investment in electric power supply would be expensive. Graphical user interface software was developed for real time monitoring and programming of irrigation based on soil moisture and temperature data. The software application permits the user to visualize graphically the data from each WSU online using any device with Internet. The limitation is the development of microcontroller and WSN only within rural area presented.
5. **Hui Yang [5]** has represented the sensors for CO2, temperature, humidity and light intensity. The equipment which is suitable for the surface CO2 concentration monitoring was developed. In order to realize remote real-time acquisition of multivariate information in the monitoring of CO2 geological storage. The General Packet Radio Service (GPRS) network will send the collected data to the data center server, and then simultaneous data query, analysis and monitoring can be achieved on multiple clients.

   This system is difficult to accurately locate the source position and time accuracy of CO2 leaks or to meet the needs of real-time monitoring and early warning of near surface leakage and migration of small-scale CO2 geological storage. And also lack of study of quantitative analysis and dynamic simulation of the process of CO2 geological storage, leakage, diffusion and migration under complex air environment.

IV. System Architecture

In our system design there is basically five steps process. First step consists of sensors for air, noise, temperature. Second step of embedded system. Third step for GSM model. Fourth step of server. And last step of GUI.

System Description –

Above Fig1, shows the system block diagram of the models. The sensors are connected to the system. The embedded based system connected to the three type's sensors here, i.e. air, noise, and temperature. These three sensors are connected to the transmitter via embedded system. The transmitter used like GSM/zigbee model. The transmitter gives all data to the server. The GSM/zigbee model places an important role in communication.

GSM/Zigbee–based technology has been used in local monitoring and controlling of home appliances with in homes. For example, Zigbee-based remote information monitoring devices for smart homes and home automation systems were developed and reported. Monitoring and protection building electrical safety system utilizing ZigBee was also presented. RFID technology has also been utilized in home access points and GSM/GPRS modems. Typically, such systems have been implemented using two or three hardware boards to perform the monitoring and control task. However, advances in technology have enabled the design and development of integrated monitoring and control systems that are cheaper, smaller, consume less power, have enhanced functionality and utilize publicly available GIS navigation services such as online maps. Using publicly available networks enhances and extends the monitoring and control beyond the home to include additional service providers like security firms, fire departments, civil defense, police, home insurance, municipalities, and others. In turn, such services enhance the quality of life aspects related to safety and comfort of a home owner.

The receiver (R^X) received the transmitted data via server using TCP/IP. The receiver details info about air, noise, and temperature sensors which shows on PC of the municipalities' officer. To check the result, officer checks all details on him PC. The monthly records are stored in the system. We want to check and compare the monthly record that also easily done in this system. The result shows by graphical representation. This system can also be utilized by security firms, civil defense organizations and municipalities to continuously monitor and locate trouble some spots in residential neighborhoods and compounds using free GIS Maps.

V. Result

From the proposed work, the system measurement and variation are observed in result. Update the result delay duration of 3 sec. The result of the monitoring atmospheric parameters such CO, CO2, NOISE and TEMPERATURE and controlling street light showed as below.

Fig. 5.1 Show the result of atmospheric parameters

Above Fig. 5.1 shows the monitoring atmospheric parameter's result on LCD screen. In which T indicates for Temperature, N indicates for Noise and C indicates for CO, C2 indicates for CO2. The result shows as:

T = 19.53 ^{o}C; N = 0017 %

C = 029 PPM % C2 = 0001 PPM %

The result varies after 3 sec. To observe variation in result of Noise put the mobile near microphone mike and see the variation occurred on the noise result. When the noise is greater the result gets increased and when the noise is less, it gets decreased. Shown in following Figure,

Fig. 5.2 Shows Variation in result

Above Fig.5.2 shows variation in noise. In fig. 5.1 the noise is N=0017 and now N=0033.

Similarly, observer the other parameters which are also gets change. And also for huge change, make smoke the result gets change mainly difference occur in CO and CO2.

Above represented the atmospheric parameter result and their variation occurred in result. Now, observe the street light. In the system four light are presented such as S1, S2, S3 and S4. In result see the controlling of street light ON/OFF via mobile.

Firstly, call to SIM card numbered and the call will be received automatically. Then open dial pad and dial **1** to ON Street light 1 i.e.S1. Similarly for S2 dial **3,** for S3 dial **5** and for S4 dial **7**.

All these function shown in following fig.5.3, fig. 5.4, fig. 5.5 and fig 5.6:

Fig. 5.3 dials 1 to start street light 1

Fig. 5.4 street light 1st and 2nd both ON (for S2: dial 3)

Fig. 5.5 three street lights are ON (for S3: dial 3)

Fig 5.6 all four streets light are ON (for S4: dial 7)

Now for OFF the street light, dial **2** to OFF the S1 i.e. street light 1 gets OFF. Dial **4** to OFF the street light 2 i.e. S2. Dial **6** to OFF the S3 and to OFF the S4 (street light 4) dial **8**. That's means to OFF the street light S1, S2, S3 and S4 dial 2, 4, 6 and 8.

Shown as following fig.5.7, fig.5.8, fig.5.9 and fig. 5.10:

Fig. 5.7 S1 gets OFF when dial 2

Fig. 5.8 S2 (street light 2) gets OFF; Dial 4

Fig. 5.9 dial 6 to OFF S3 (street light 3)

Fig.5.10 all light gets OFF (for OFF S4: Dial 8)

From above figures, the controlling of street light via mobile presented.

The status of the street light ON/OFF and atmospheric parameters such CO, CO2 and temperature also shown in web page. In URL write the website:

"http://aim2-swapmail.rhcloud.com"

One page is open then goes to click **connect** button to connect the server to the system. Then in **log page** block the complete result of monitoring atmospheric parameter and controlling street light shows.

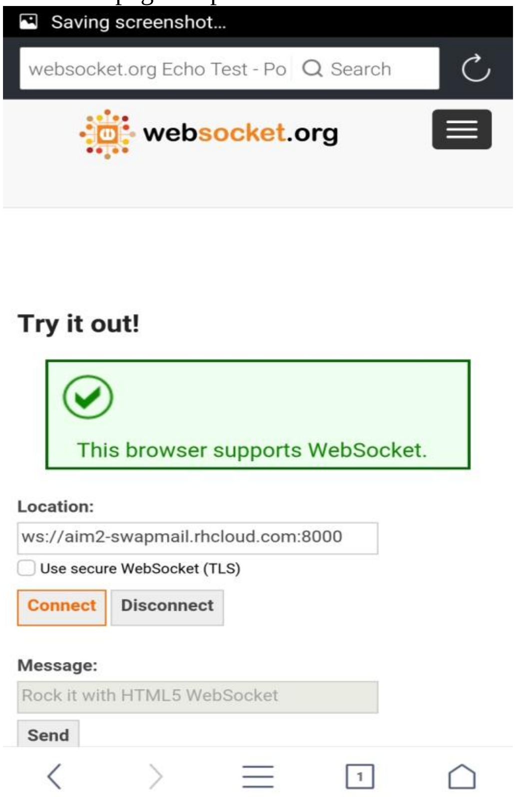
For instant result, firstly click **clear log** immediately instant result represented in log page block.

To download complete result of the atmospheric parameters and street light click on **download** button. The downloaded file will give complete data from the day of started work to present day.

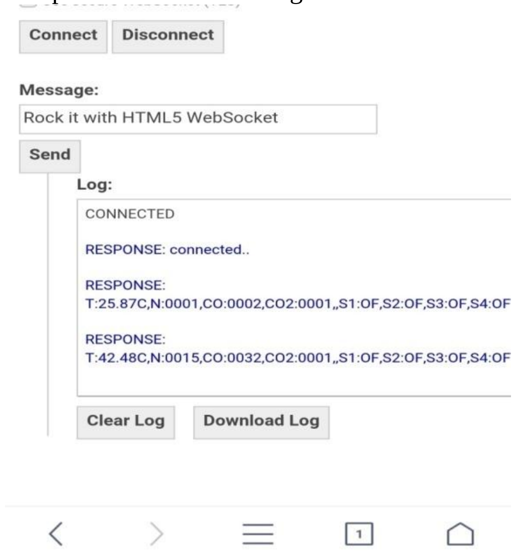
All the above information of the system has shown as STEP wise as follows:

STEP1: In URL, type the web site and click to **'Go'**

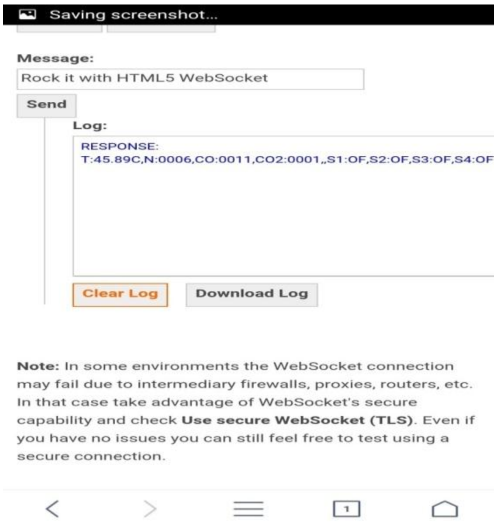
STEP2: One web page is open then clicks on 'Connect'



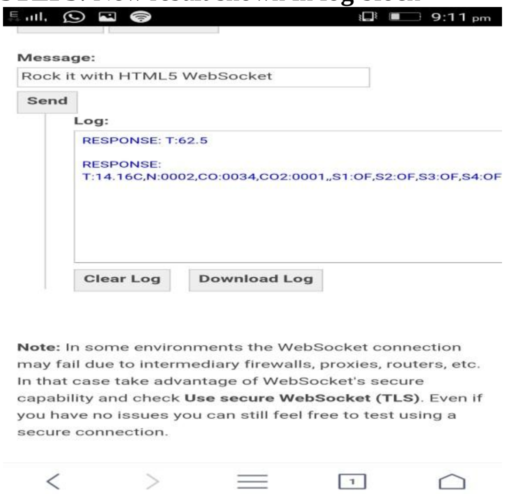
STEP3: RESPONSE: connected and shows the result of atmospheric parameter and street light



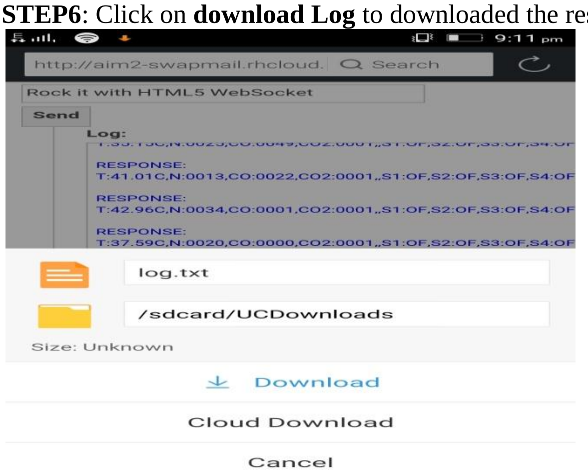
STEP4: For instant result click on 'clear log'



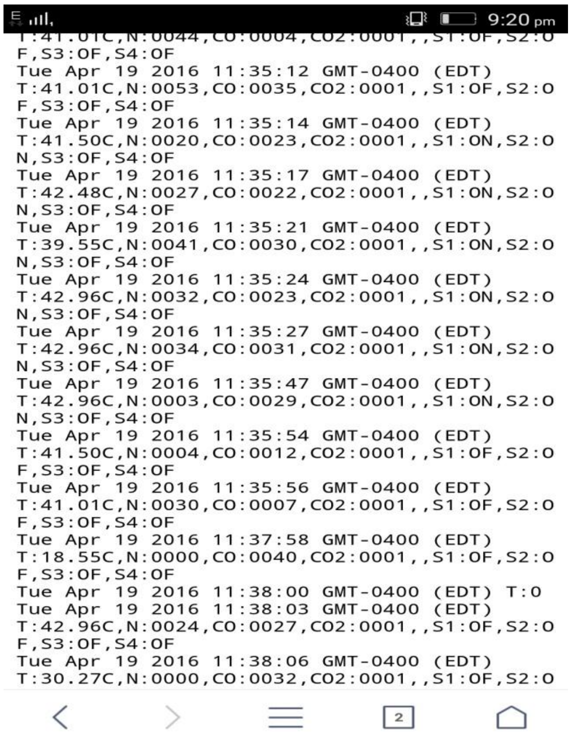
STEP5: New result shown in **log** block



STEP6: Click on **download Log** to downloaded the result



STEP7: Downloaded file shows variation in result of atmospheric parameters such as temperature- T, CO- C, CO2- C2, Noise- N and controlling street light ON/OFF delay duration of 3 sec (S1 and S2 gets ON for few sec)



Atmospheric Parameter Monitoring System for Smart Cities using Internet shows the result description above. The Atmospheric parameters such as CO, CO2, Temperature and noise and controlling street light result measured which is useful in SMART CITY development. The result updated itself after time duration of 3sec. The result will shows on the LCD of the system as well as on the web page. And user can get the information of daily changes in climates on their mobile phones or PC very easily.

VI. Conclusion

The atmospheric parameter sensors are connected to server through TCP/IP using internet. The data gives by those sensors used for analysis. In this project, the daily changes in climate are observed on mobile phone or PC very easily.

We are focused specially on three atmospheric parameters such as air, noise & temperature monitoring. The simple mechanism is developed to monitor CO, CO2, noise & Atmospheric Temperature. By using internet, the data is transmitted to the server or GUI modem.

The controlling of street lights ON/OFF via mobile phone will be handling just by calling the SIM card number.

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