



International Journal of Advance Engineering and Research Development

Volume 4, Issue 4, April -2017

IOT BASED SMART CITY

Analysis of data through sensors and actuators

Aishwarya Narkar¹, Khushboo Parab¹, Samiksha Parkar¹, Prof.P.R.Rodge¹

¹Department of Computer Engineering, Shivajirao S. Jondhale College Of Engineering, Dombivali, India

Abstract— Standard of living has been improved due to internet and new technologies relying on internet and this may improve the quality of life of citizens by relying on new paradigms, such as the Internet of Things (IOT) and its capacity to manage and interconnect thousands of sensors and actuators scattered across the city. The Internet of Things (IOT) shall be able to interconnect transparently and seamlessly to a huge number of heterogeneous systems, at the same time providing open access to required cluster of data for the enhancement of a different and large number of digital services. Creating a robust and general architecture for the IOT is hence a very tedious job, as there are involved extremely large variety of devices, link layer technologies, and service. In this paper, we focus on bringing the different and various unknown conditions of our surrounding to the people based on different applications of IOT domain. Urban IOTs, in fact, are designed to provide better communication, administration and enhancement of services of the city and for the citizens. This paper hence provides a way of applying technologies, protocols and architecture of an urban IOT in an effective manner.

Keywords— IR(inductive proximity) sensor, float sensor, MQ6 gas sensor, micro switch, Arduino ATmega328, Dashboard, Pubnub.

I. INTRODUCTION

Internet will become a basic need in near future as it will be the root network for the objects that will be used daily in our everyday life. These objects will be equipped with highly smart sensors and microcontrollers. Various devices such as cameras, sensors, actuators, home media, vehicle automation applications and many more integrating with IOT and working on variety of data generated by such objects will provide new services to citizens, companies, and public administrations. . This system indeed finds many services and provide applications 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 other. In this system the concept of application of IOT of an urban context is of specialized interest, because it realizes the idea of smart city and gives solutions on public affairs. 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. This objective can be pursued by the deployment of an urban IOT, i.e., a communication infrastructure that provides unified, simple, and economical access to a plethora of public services, thus unleashing potential synergies and increasing transparency to the citizens. An urban IOT, indeed, may bring a number of benefits in the management and optimization of traditional public services, such as transport and parking, lighting, surveillance and maintenance of public areas, preservation of cultural heritage, garbage collection.¹ Furthermore, the availability of different types of data, collected by a pervasive urban IOT, may also be exploited to increase the transparency and promote the actions of the local government toward the citizens, enhance the awareness of people about the status of their city, stimulate the active participation of the citizens in the management of public administration, and also stimulate the creation of new services upon those provided by the IOT . This has made, the application of the IOT concept to the Smart City striking to local and regional administrations that may become the early adopters of such technologies, thus acting as catalyzers for the adoption of the IOT paradigm on a wider scale. The objective of this paper is to discuss a general reference framework for the design of an urban IOT. We describe the specific characteristics of an urban IoT, and the services that may drive the adoption of urban IOT by local governments. We then overview the web-based approach for the design of IOT services, and the related protocols and technologies, discussing their suitability for the Smart City environment. The rest of the paper is organized as follows. Section II overviews the services that are commonly associated to the Smart City vision and that can be enabled by the deployment of an urban IOT. Section III provides a general overview of the system architecture for an urban IOT. More in detail, this section

describes the web service approach for the realization of IOT services, with the related data formats and communication protocols, and the link layer technologies.

II. LITERATURE SURVEY

The interdisciplinary Tales of Things and electronic Memory (TOTeM) project investigates new contexts for augmenting things with stories in the emerging culture of the Internet of Things (IOT). Tales of Things is a tagging system which, based on two-dimensional barcodes (also called Quick Response or QR codes) and Radio Frequency Identification (RFID) technology, enables the capturing and sharing of object stories and the physical linking to objects via read and writable tags. Within the context of our study, it has functioned as a technology probe which we employed with the aim to stimulate discussion and identify desire lines that point to novel design opportunities for the engagement with personal and social memories linked to everyday objects. In this paper, we discuss results from fieldwork with different community groups in the course of which seemingly any object could form the basis of a meaningful story and act as entry point into rich inherent ‘networks of meaning’. Such networks of meaning are often solely accessible for the owner of an object and are at risk of getting lost as time goes by. We discuss the different discourses that are inherent in these object stories and provide avenues for making these memories and meaning networks accessible and shareable. This paper critically reflects on Tales of Things as an example of an augmented memory system and discusses possible wider implications for the design of related systems.[1]

Environmental monitoring brings many challenges to wireless sensor networks: including the need to collect and process large volumes of data before presenting the information to the user in an easy to understand format. This paper presents SensAR, a prototype augmented reality interface specifically designed for monitoring environmental information. The input of our prototype is sound and temperature data which are located inside a networked environment. Participants can visualize 3D as well as textual representations of environmental information in real-time using a lightweight handheld computer. [2]

Smart cities are expected to improve the quality of life of citizens by relying on new paradigms, such as the Internet of Things (IOT) and its capacity to manage and interconnect thousands of sensors and actuators scattered across the city. At the same time, mobile devices widely assist professional and personal everyday activities. A very good example of the potential of these devices for smart cities is their powerful support for intuitive service interfaces (such as those based on augmented reality (AR)) for non-expert users. In our work, we consider a scenario that combines IOT and AR within a smart city maintenance service to improve the accessibility of sensor and actuator devices in the field, where responsiveness is crucial. In it, depending on the location and needs of each service, data and commands will be transported by an urban communications network or consulted on the spot. Direct AR interaction with urban objects has already been described; it usually relies on 2D visual codes to deliver object identifiers (IDs) to the rendering device to identify object resources. These IDs allow information about the objects to be retrieved from a remote server. In this work, we present a novel solution that replaces static AR markers with dynamic markers based on LED communication, which can be decoded through cameras embedded in smartphones. These dynamic markers can directly deliver sensor information to the rendering device, on top of the object ID, without further network interaction.[3]

Cities nowadays face complex challenges to meet objectives regarding socio-economic development and quality of life. The concept of “smart cities” is a response to these challenges. This paper explores “smart cities” as environments of open and user-driven innovation for experimenting and validating Future Internet-enabled services. Based on an analysis of the current landscape of smart city pilot programmers, Future Internet experimentally-driven research and projects in the domain of Living Labs, common resources regarding research and innovation can be identified that can be shared in open innovation environments. Effectively sharing these common resources for the purpose of establishing urban and regional innovation ecosystems requires sustainable partnerships and cooperation strategies [4]

III. PROPOSED SYSTEM

Flood in the city is detected by the float sensor and respective readings are displayed on the dashboard.,When car is already parked, metal of that car is detected by the inductive proximity sensor and parking is not available is displayed on the dashboard, We can also keep a track on the local garbage bin to check whether it is full or empty. A diode light is placed on the top end of the dustbin and on the opposite side an electronic plate is placed if the light continuously fall on the plate that means dustbin is empty and if there is obstacle of light then dashboard shows garbage bin is full. For detection of Traffic in an area a micro switch is placed below the speed breaker and the time is noted ,if the time between

switch pressed and released is more that means traffic is more in that area. Lastly Street light access (ON or OFF) through pubnub commands (e.g. we can keep alternate lights On) can be done. The Dashboard (Data for end user) is accessible through smart phones (new implementation).

3.1 ARCHITECTURAL DESIGN

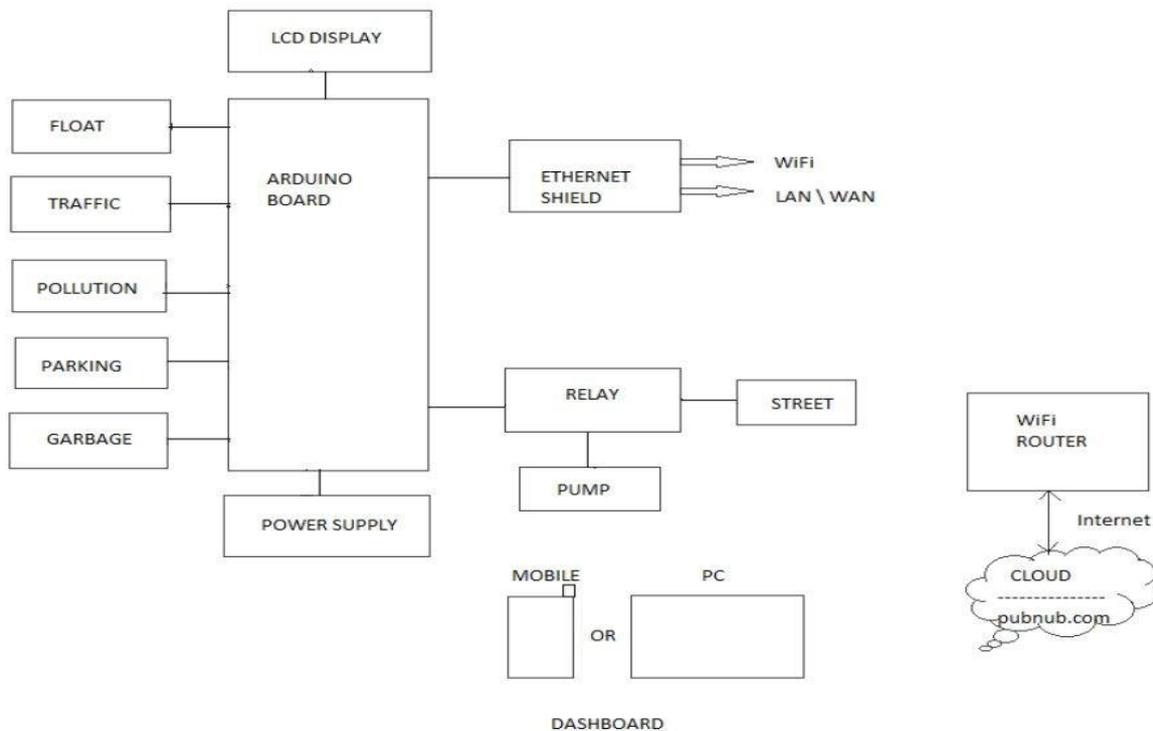


Fig. 5.1 Block Diagram

- 1) In block diagram, logical implementation of the project is depicted.
- 2) Arduino board is used to acquire data which is located in traffic node which are suited all over the city.
- 3) This Arduino board will acquire data which is as follows:
 - Current traffic status of that area.
 - Current pollution level of that area.
 - Is there parking available?
 - Flood is present or not in that area?
 - Current status of the garbage bin.
- 4) To make this board work, we need to connect power supply to this board.
- 5) We also need to check whether this board is functioning properly or not so we connect LCD display in which current status of the project will be displayed
- 6) Clock and reset are built in pins in Arduino board.
- 7) The data acquired by Arduino board is given as an input to Ethernet shield.
- 8) Ethernet shield transfer data to the internet.
- 9) Data can be send through LAN cable or Wi-Fi to the Cloud.
- 10) Cloud can be called as a third party server which acquires the data cloud service is providethrough Pubnub.com
- 11) Client can access the data which is a present in cloud through mobile or PC.
- 12) For a graphical representation of data dashboard is used.
- 13) The data acquired by cloud is in the form of text / string / database so user cannot access this data. For this

purpose dashboard is used.

3.1 SENSORS :

Combustible gas sensor

- This sensor is used in gas leakage detecting equipment for detecting LPG, iso-butane, propane, combustible gases.
- This sensor needs 10 min of warm up time after first power is supplied.
- During this warm up time sensor reading should be ignored.
- This sensor needs 5V to operate.
- This sensor consists of heater plates and sensing plates
- The output of sensing plates appears across load register.

Inductive proximity switch

- To check whether parking is available or not we make use of inductive proximity switch.
- If no metal is present in front of this sensor then output is zero
- This sensor contains oscillator and phase lock loop.
- If no metal is present oscillating frequency is constant then output is zero.
- If ferrous metal comes in front of this sensor oscillation frequency changes and output is not zero.

Float sensor

- To detect the level of water present we keep a float which is connected to a shaft.
- With the help of shaft this float can be raised up to a certain height and angular potentiometer is connected to it.
- When float rises voltage of angular potentiometer also rises...
- Thus, higher the voltage higher is the water level
- When float is at the ground, voltage is also zero.
- The output of this sensor is connected to A0 pin.

Bump sensor

- Bump sensor is basically a micro switch used to determine traffic.
- It contains a spring inside.
- Average speed of the vehicle is considered as a factor to determine traffic.
- When vehicle passes on road, spring gets pressed and metal contacts are short.
- A small pulse is generated when vehicle passes and pulse width is more when less number of vehicles pass on road.
- This pulse width will give average speed of the moving vehicle.

3.2 USE OF PUBNUB IN OUR PROJECT

- Pubnub is used for the purpose of storing data.
- The data flow is from Ethernet shield to pubnub and then from pubnub to freeboard.
- When we create an account in pubnub we get set of keys called publish key and subscribe key.
- Publish key is used while coding in Arduino board.
- Subscribe key is used in dashboard.
- Thus three main factors considered are channel name, publish key and subscribe key.

3.3 USE OF DASHBOARD IN OUR PROJECT

- In our project we are going to develop a smart city that will automatically send data on an online cloud service.
- We can store this data in the cloud using pubnub.
- It is much better to present data visually.
- The first step is to create an account on freeboard.io.
- Site is <https://www.freeboard.io>
- Inside this interface, we can create a new dashboard.
- There will be main interface from which we can monitor everything.

IV. APPLICATIONS

Smart surveillance, safer and automated transportation, smarter energy management systems and environmental monitoring all are examples of internet of things applications for smart cities. Smart cities are the real substantial solutions for the troubles people usually face due to population outburst, pollution, poor infrastructure and shortage of energy supplies. Here are some examples of IOT devices at work.

- Libelium has launch a new Smart Parking solution for Smart Cities that allow citizens to detect available parking spots .The new surface parking device with LoRa WAN and Sigfox- features smaller size ,higher accuracy and faster time of detection facilitation lower installation costs.
- Smartly detection of flood, in a given area or surrounding the float sensor will be place if the level of water rises above the normal initialize level then it will detect flood and announce that the area is flooded.
- Traffic detection in an area using bump sensor. The bump sensor will note the time between the pressures applied and release if the time is more there is traffic in that area and if the time is less then no traffic.
- Condition of garbage bin, there will be a sensor which will detect the level of garbage bin if it is full the it will notify .This application is more useful for the municipal cooperation service.
- The excess presence of gases like methane, butane, propane can be detected with the help of sensors which are used in this project.
- Based on a patented presence –detecting technology City Sense is a smart and wireless outdoor lighting control system .With features like adaptive lighting it helps in saving electricity by intuitively adjusting brightness of streets lights based on presence of automobiles and pedestrians. It is smart enough to filter interferences like animals and trees
- Big belly smart waste and recycling system is a smart waste management system for smart cities. A completely modular system, big belly gives historical as well as real-time and data collection capability via cloud –based services. It helps with smart trash picking ,avoid overflows and generate notifications making waste management truly smart
- Detection of wearables / citizen data sharing.
- Detection of climate
- Transportation
- Waste water management
- Data management
- Data visualization

V. EXPERIMENTAL RESULT

F stands for Flood, G (PPM)stands for Gas, T stands for traffic, G stands for Garbage and P stands for Parking. On the freeboard or dashboard Gauge and Indicator Light is used for display to the End user. Fig 1 shows the overall model of the project “IOT based Smart City”. Fig 2 shows the display screen with the results of the working sensors and lastly Fig 3 shows the freeboard design used to show the result of the project for the End user.

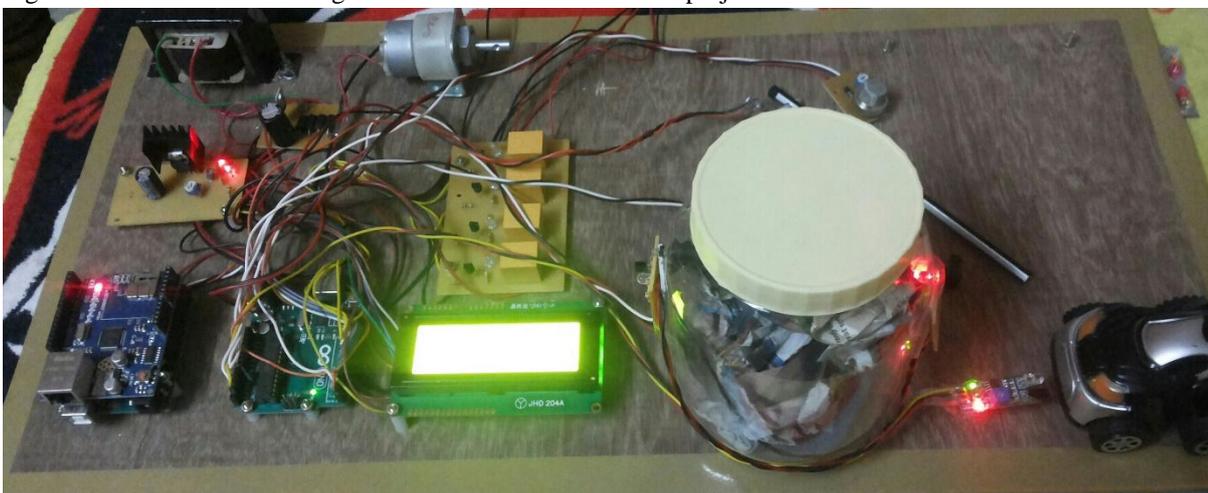


Fig: overall project view

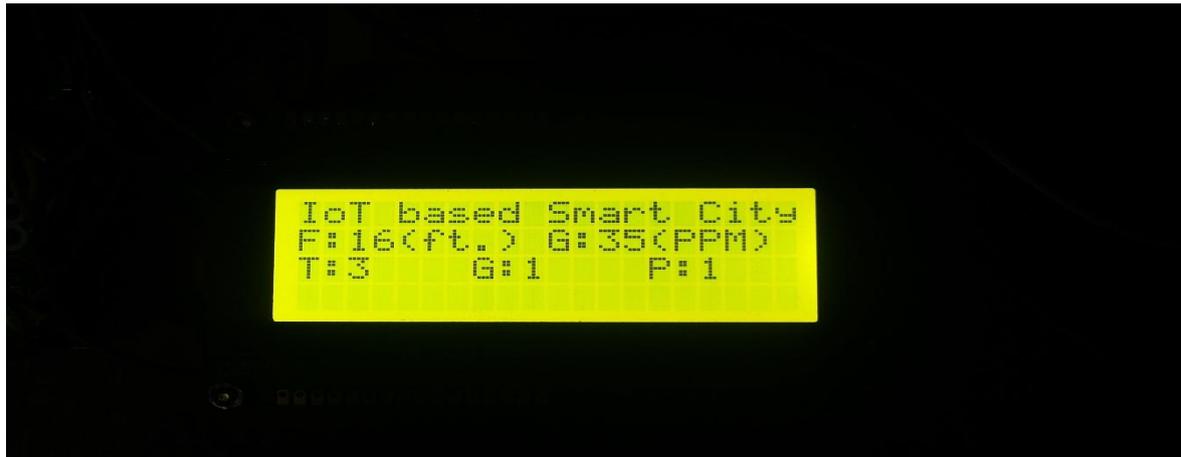


Fig: Result on display Screen

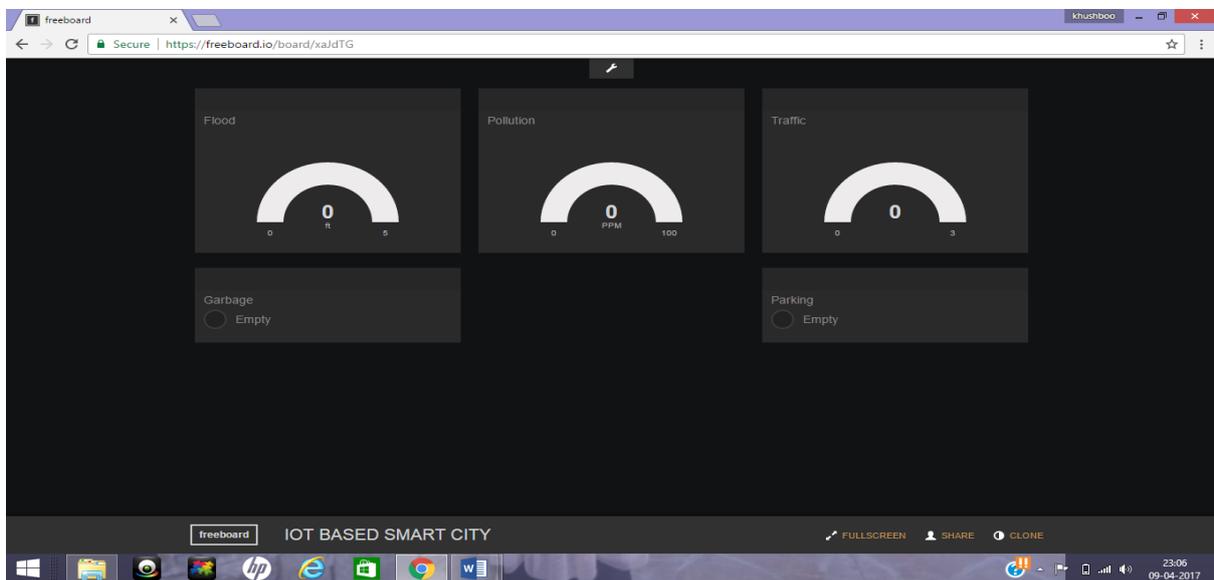


Fig: Display screen for End user

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