Internet of Things Based System for Water Resource Engineering

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Abstract: Internet of things (IoT) is collection of devices which enable us to sense, data collectionand management and monitor the system without being physical with the devices. These systems consist of sensors, networks, storage devices and computer systems. In this computerized and automated world for the betterment of society we need to bring new technologies in the existence which provides the accuracy, cost effectiveness, time saving with less human power consumption. In this paper we are focusing on the different applications of internet of things in water resource engineering.

Keywords: *IoT, water resources, online monitoring, WebGIS*

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I. INTRODUCTION

Internet of things has been in demand for the modernization of the conventional systems. Internet plays major role for internet of things. We can deploy IoT technology with help of sensors and networks in almost each and every major fields like Home automation, Smart cities, Railway monitoring and management, Road safety and management, Water resource management etc. IoT devices are in demand of consumer usability which includes Car, Entertainment, Wearable devices, Medical Equipments and Smart retail. Consumer IoT user provides the experience and interface for the advancement of the IoT.

Now a day's different types of smart sensors are developing for the safety and security in emergency management strategy. Smart water management is only possible with help of IoT which includes the applications in monitoring the flow of water, Management of valves, fault detection within valves, Data analysis through Observations from different meters etc. in conventional method for each and every individual processes we require the human power and observation skills. To overcome these IoT plays the major role.

II. LITERATURE REVIEW

An automatic water information monitoring system based IoT is constructed using techniques of sensor network, wireless communication network, Internet, database and WebGIS. And in this system, water resource information acquisition, transmission and remote monitoring data receiving and application are integrated through software and hardware [1]. In this paper author framework for IoT based water resource monitoring & management system. Where he bifurcate the system in four layers, these are perception layer, network layer, middleware layer and application layer.

In another system author proposes smart water management model integrating Internet of Things technologies for decoupling decision support systems and monitoring from business processes coordination and subsystem implementation. The proposed smart water management model makes specific vendor equipment interoperable and manageable in a water management domain in a homogeneous way[2].

The concept of the Internet of things to its extent and improve the functioning of the device. By using this peripheral device, the farm fields will be monitored continuously through sensors and necessary measures will be taken without human power. Thus agriculture production percentage will increase without any loss of grain by water. The main aim of author is to supply water when the farm is dry and remove water when in excess. So we are using a sensor. That acts as a water level detector. This gives signals to the mobile phone whether to supply water in case of dry farm or suction of water in case of in excess case[3].

In another paper IoT based water consumption system was developed in Loughborough University in the UK and deployed in Sosnowiec in Poland and Skiathos in Greece. Two parts are sharing a same central database system. The household water consumption monitoring system is designed for collecting detailed information on the amount and the way water is used in a household. The system consists of a local wireless monitoring unit in each household and a remote central server. The local wireless monitoring unit includes a few wireless data collectors, a WiFi router and a WiFi gateway. The wireless monitoring

unit is responsible for collecting local water consumption details in each household [4].

In [5] buildingIoT based water meter aims to implement smart meter which will provide high data analyzing capability at lower cost. Unlike other technologies such as ZigBee, Bluetooth and GSM based water meters, this meter will allow user to access real time as well as historical data anytime and from anywhere. The proposed system uses RESTful based web services for communicating between the water meter and the IoT cloud .

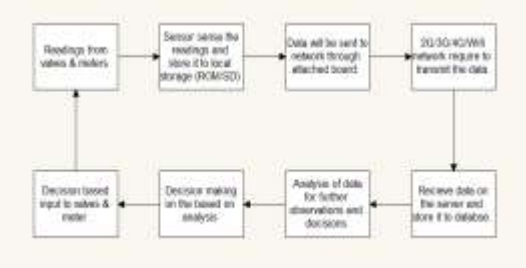

Fig.1 Flow Diagram of IoT based Water monitoring and management system from one sensor location.

IoT Framework for WRE

In Fig.1shows framework of the automated system for water resource management using IoT. In this systemneed to take data from various kinds of meters used in water resource engineering with the help of sensors which is placed with meters and valves at known spatial locations. These sensors stores the temporary data on the SD cards attached to the sensors and then send it to the network. We can use different types of network connection as per the usage and data size. If the data is small as in numberswe can use 2G connection. But if data is large as pictorial data we need to use 3G or 4G connection. We can also set a Wifi network over the system for smooth running of the system. Now these data from different sensors received by the server and store it to the geo databases and further preprocess the data. Analysis part can be start when the data preprocessing ends. Analysis can be done on the basis of temporal observations. Now analyzeddata is used to take decision at decision support system. And decision based input is sent to the valves or meters.

Whereas in Fig.2 we collect the location based data from different sensor locations. At the time of placing sensor with valve/meter we must have to take GPS point of that particular point for tracking and up gradation on WebGIS. Here we are collecting data of sensor 1 to N for analysis purpose of any area of water supply or monitoring system.

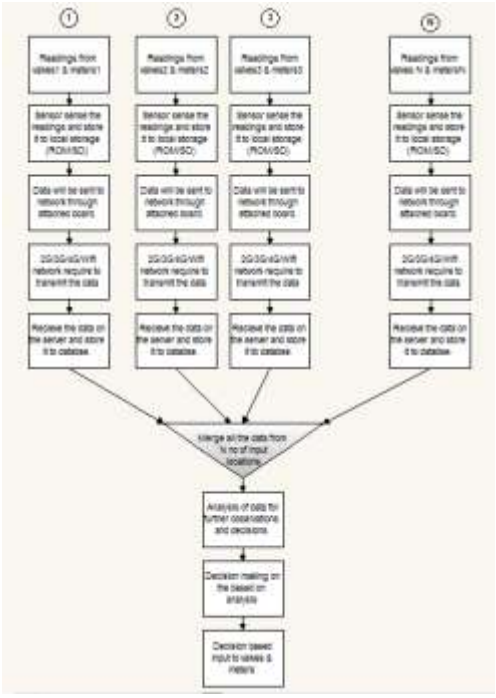

Fig.2 Flow Diagram of IoT based Water monitoring and management system.

Applications of IoT in WRE

Drainage management

Drainage system is another major challenge in the water resource engineering. Drainage system mechanism can be another application of Internet of things. Removing of blockages from the manhole smartly by using Internet of things and smart sensors gives betterment and advancement to the society. With the help of sensors we are able to detect various parameters of the drainage system which affects the system. The main parameters are water level and various gaseous present in the manholes. These parameter can be sensed by gas detection sensor and water level sensors. In the manhole water level can be increase or decrease as per the situation and climatic conditions. Such as in monsoons water level increase because of flood water, whereas in another case it increases in the festivals like holi when water consumption increases by the public. Increase or decrease of water consumption can be change in a day; morning time is the peak time of increase in water consumption. So the water level in the drainage system can be managed according to the time, for this proper monitoring is required. It can be done when the water level increase, water level sensor send the data to the server through the network which stores in the database, where the analyst analyze the temporal data stored and take suitable decisions and suggestions. These decisions and suggestions can be approved by higher authorities for further actions. Which

resemble with the proper management of the drainage system.

Irrigation

IoT for water resource engineering can be applied for the smart irrigation system. It can be used for supply of water at right place right time. It can be done through analyzed data from various sensors with the help of wireless sensor network. For the development of irrigation department automation is require and for automation irrigation department must have to employ the IoT technology to the irrigation system. Which reduces the farmer's hand held work. The sensors which should be applying must be capable of sensing the different parameters of the irrigation, such as the moisture. Moisture plays a major role in the irrigation system. Soil moisture sensor detects the moisture of the soil of the plant and the data shows when to water it.

Water quality monitoring

There are many types of water bodies like ponds, rivers, lakes, canals, dams and reservoirs which should be regularly monitored by the managing authorities, but this task is bit difficult because of visiting each and every water body at remote location and take necessary quality parameters observation is tedious job. These parameters will be pH, dissolved oxygen (DO), conductivity (salinity), temperature etc.

By using IoT our aim is to equipped each and every water body with multiple sensors that measure the most relevant water quality parameters, even we can equip various sensor at swimming pools. This could be the platform for smart water monitoring, chemical leakage detection and remote measurements of water level at various water bodies.

Conclusion

IoT based water resource management can be useful for monitoring, tracing and manage the remote location valves and meters. In conventional systems a person is employed for such remote location valves and meter management. In this paper our aim is to focus on different applications of IoT in water resource engineering which reduces the human effort and overcome the drawbacks in the conventional system. With the help of IoT we can develop a better water management and monitoring system which includes the internet, databases, WebGIS, with inclusion of software and hardware.

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