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Water Resource Management using Internet of Things (IoT): Literature Survey

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Abstract: IOT is rapidly becoming an innovative and easy way to access the physical objects or devices which are connected through internet. IOT can access any devices which has built in sensors, unique address identifier with the ability to collect and transfer the data without any human intervention. Using IOT we can control the devices from anywhere efficiently and safely. Water is natural, limited resource and precious gift by nature on the earth. Water is required in every sphere of life and field wiz. Drinking, Irrigation, Agriculture, Domestic use, Plantation, Wildlife, Recreation, Fishing etc. The advancement of ICT has been playing vital role for management of water resources. The IOT is latest technology which could help tremendously for managing the water resources locally as well as remotely. In this literature survey we studied the various research papers which proved the role of IOT for efficient water resource management.

Keywords: IOT, Water management, Internet, ICT, Communication.

I. INTRODUCTION

Internet plays a major role in today's success of the people. Internet is a Global network using which we can access any information stored within it from any corner of the world. Internet has changed the living style and working style of humans. It has made fast and easy online communication. Internet of Things represents concept in which, network devices have ability tocollect and sense data from the world, and then share that data across the internet where that data can be utilized and processed for various purposes [1]. IoT includes RFID technology, sensor & detection, Internet, computing technology. As it demands communication between objects, everybody should be able to fetch any content from any device at any point of time from anyone located anywhere and who is a part of any business or service, through any path or network [2].With the development of critical technologies in the Internet of things (IoT), the IoT applications (e.g., smart home, digital healthcare, smart grid, smart city, Railway monitoring and management, Road safety and management) become widely used in the world.While enjoying the convenience and efficiency that IoT brings to us, new threats from IoT also have emerged[3]. Billions of devices are connected through internet involves use of billions of data, these data need to be secured. IOT security and IOT privacy are of great importance. Water is one of the major requirements for human survival, conservation and management of the water resources must be given most importance [4]. Water management is defined as the activity of planning, developing, distributing and managing the optimum use of water resources. Water resource management is only possible with help of IoT which includes the applications in monitoring the flow of water, monitoring quality of water, monitoring and controlling level 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 process we require the human power and observation skills. To overcome these IoT plays the major role [5].

II. WHY INTERNET OF THINGS

1) *It Saves Time:* the amount of time in monitoring is reduced as it reduces the human efforts due to automation in IoT platform Instead of repeating the same jobs daily, it enables people to invest time in doing other inventive jobs.
2) *Efficient Result:* Efficient results are obtained because of machine to machine interaction. High efficiency results in high profit.
3) *Information:* In real time because of network of devices, data and information can be easily accessed from any corner of the world, without being physically present at the location.
4) *Automation:* Managing everyday tasks without human intervention. Automating tasks in a business increases the quality of services with less human intervention. The devices or machines are able to communicate with each other without human intervention results in quicker and appropriate results.
5) *Useful in Monitoring:* It provides an advantage of knowing things in advance. With this, the exact quantity of supplies, water distribution and consumption, intelligent energy management, and security distribution gets collected easily. It also takes necessary action in case of disasters and emergencies [6].

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6) *Connected Computing:* IoT allow you to stay connected to all IoT devices. The connected devices like phone, vehicle, and television will track all your daily activities, even if you are at remote place [7].
7) *Improved Safety and Security:* IoT services combined with sensors and video cameras help monitor workplace to ensure equipment safety and protect against physical threats [8].
8) *Cost Saving:* The improved asset utilization, productivity, and process efficiencies can save your expenditures.

Figure 1.1 : Internet of Things

III. LITERATURE SURVEY

There are many research work and studies carried out by researcher for water resource management using IoT and which shows the uses of this technology for proper management of water resources.

Dan Koo et al. [9] used conceptual model of IoT and Big Data technology for collecting the data from water clients. They present schematic development of IoT applications which consists downstream and upstream data collection using wireless sensor network technologies connecting to IoT. Client data of water users is collected from downstream and for upstream data they used SCADA system, ultimately this all data converged to build Big Data collection. In this paper their aim was to introduce new technology to enable both utility and consumers to manage their water uses systematically. They presented conceptual development of IoT and its implementation in water supply system and describe the benefit of IoT and Big Data technology.

Sangeeta Sarkar et al.[10] proposed a smart, automatic water management model for residence using IoT. This proposed system is composed of hardware and software. Hardware used in this system are Arduino, sensor, filter, heater, cables, solenoid valve and the application is programmed using c/c++ language. They divided their entire work into six stages. Next stage can be started only after completing the current stage increasing accuracy of the system. WIFI module is used for wireless communication , it connects the mobile app. Main purpose of this model is to analyse, design and develop an IoT based water management system, to maintain normal, hot and filtered water supply by using mobile application and to check the water level in the tank and fill up water tank automatically, when the tank will be empty.

Dr.M.Yuvaraju et al.[11] In this paper they have developed an IoT based automated irrigation and crop field monitoring system for effective and efficient use of water resources for agriculture thus improving the agricultural fields yield. The system is based on low power microcontroller.They introduced a new design of embedded web server making use of raspberry pi technology and IoT. The system consists of distributed sensor network of soil moisture sensor, temperature sensor, humidity sensor, water level and colour sensor. Real time monitoring is utilized and performance is tracked.PC based software is used to interface the board and control the motor on/off timings. Automatic motor controller is used to control the pump automatically.

Carlos Kamienski et al. [12] developed the project "SWAMP : An IoT Based Smart Water Management Platform for Precision Irrigation in Agriculture " In their, Project, they used five layer architecture. In layer 1 IoT Services for sensor and actuator technologies to acquire soil moisture ,temperature, vegetation index, canopy temperature,air temperature , humidity, precipitation, solar radiation, wind speed,etc. and that will be tested during the project. In layer2 Virtual Entity and Data Storage. IoT Service descriptions are annotated with contextual metadata about the physical environment to create Virtual Entity (VE) representations of physical entities. Distributed databases composed of cloud and fog nodes work together for dealing with a massive amount of data coming from sensors and make them available to the upper layers. Layer3 for Data Analytics, Layer4 for Water Data Management and Layer5 for Water Application Services.

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Chellaswamy C et al. [13] In this study, they Internet of Things (IoT) based dam water management system (IoT-DWM) for reducing the wastage of water. The proposed IoT-DWM have field sensing section, IoT network section, and dam control section, etc. The real data observed through different sensors placed in the agriculture area and updated it in the cloud. The dam controller receives the real data of the particular area and estimates the water requirement. The IoT nodes is an essential device for monitoring the water requirement, collect and store the data which is received from different nodes, and to be updated in the cloud for access.The simulation result shows that the proposed IoT-DWM provides better results, save water in a considerable amount and leads to reduced water scarcity. It provides easy web services which enable the information generated by most of the devices used in the context of agriculture.

Mo Xiaocong et al. [14] In this research paper they proposed an integrated system based on internet of things (IoT) for water resources monitoring and management. The system has three layer architecture (1) equipment perception layer (2) information transmission layer (3) data application layer. In equipment perception layer, Sensor network for monitoring water information is constructed. In information transmission layer, real-time information transmission is achieved. In data application layer, water information are stored, managed, applied and shared on internet by users.

Tomas Robles et al. [15] they represent and IoT based reference architecture for smart water management process. In this paper they presented reference architecture for water management based on integrating IoT capabilities to achieve a scalable and feasible industrial system. They define the management exploitation layer, coordination layer, subsystems layer and administration layer and the interfaces that enable layer interaction. They also consider the physical model, which defines the physical elements executing water management processes in a hierarchical way, and also, the process model, which organizes the execution of particular processes in water management subsystems. They also briefed the benefit of IoT Viz. Efficiency increase , Cost savings , Asset utilization , Productivity increase , Expansion of new and existing business models , Internet-oriented , Thing-oriented , Knowledge-oriented etc.for water management.

IV. CONCLUSION AND FUTURE SCOPE

In modern era, the whole world is transforming into IoT based technology. IoT has become the part of our every day life and all devices/objects having internet are become easy to access and control. IoT is the integration of many technologies viz. web technology, network, wireless communication, sensors etc. In this literature study we found that many researchers carried-out/studied the work using IoT technology for water resource management. They found the IoT may be very helpful technology to acquire and transfer the data efficiently. The system can be controlled remotely and in efficient way. Water resource Data is generated from sensors installed in each device, which is called IoT, and transferred through Internet network system. Application of IoT consists of smart sensors capturing water data and data analysis to retrieve the useful information through data platform and control system.The IoT has the capabilities to enhancement and extension of existing services.

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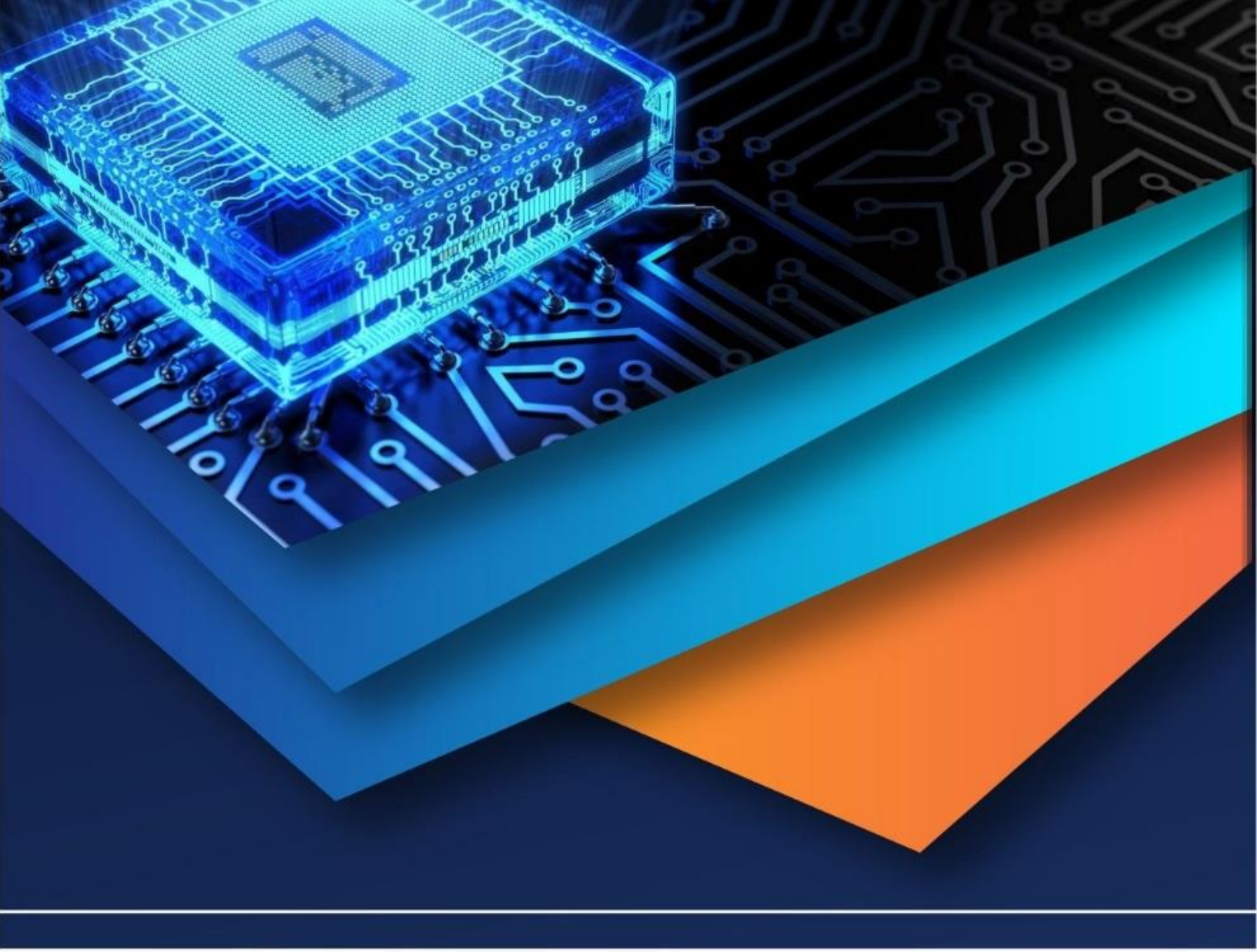

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