Usability of Internet of Things [IoT] For Dam Safety and Water Management

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ABSTRACT- Monitoring Dams safety and water management is extremely important considering both the situations like water scarcity and excess of water. It is of crucial importance and needs to develop information system based on existing system allowing utilization of intelligent sensors network. Basic idea is to describe possibilities of IoT applications in Dam Safety and water management. Here the entire dam and the main pipeline is sensed 24x7 through various sensors. These wireless sensor nodes connected with each other and transmits the data to a gateway. Common storage space 'CLOUD' stores and provides on line information to the observer. Employing an IoT for the said purpose will definitely help saving the most precious natural resource the water. Here in this paper an attempt is made proposing an electronic circuit design employing an Internet of Things concept for the purpose.

Index Terms: Monitoring, Managing, Intelligent Sensor, IoT (Internet of Things)

1. INTRODUCTION

Water being one of the most precious natural resources needs to be saved and utilised with great care. During both the extreme conditions like water scarcity and excess water and even normally monitoring the dam i.e. safety parameters and water management is very necessary **[1] [2] [3]**.

In the modern age the dam safety needs to be based on physical parameters and supported technically **[4] [5]**. IoT (Internet of Things) plays a vital role in meeting the above requirements and can make available the online information about both the parameters to the remote operator.

Generally the dams and the water management are monitored through traditional surveillance techniques except the water level in some of the dams which is atomized.

If the different sensors are deployed in various clusters of the dam then the various parameters like 1. Water level 2. Pressure on the wall of dam 3. Vibrations on the dam wall 4. Water flowing out from the dam through main pipe line i.e. flow rate of water and 5. Sensing of the pipeline leakage that to with approximate location can be sensed and the information regarding the concern parameter be made available to the observer at a glance.

This will definitely leads to proper utilization of the natural resource water and ultimately it will be a great support towards the Nation.

2.IoT AND ITS STRUCTURE:

IoT is basically a technique to connect the things through an Internet for which the frequency range is in between 100 MHz to 5.8 GHz and it can be broadly explained as a 4-Layered structure;

2.1. Tagging Things: Wherein the various objects can be tagged through RFID or similar techniques with which the tracing and addressability of an item can be done.

2.2. Feeling Things: Various sensors acts as a primary devices to collect data from the various things in the environment.

2.3. Shrinking Things: Miniaturization motivated the ability of smaller things to interact and connect within the "things" [Embedded Technology] and

2.4. Thinking Things: Embedding intelligence in devices through sensors and forming the network connection to the Internet can make the "things" realizing the intelligent control.

3. Proposed Electronic Design:
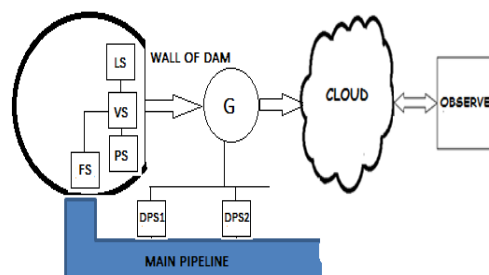
LS-Level Sensor VS- Vibration Sensor PS-Pressure Sensor FS- Flow Sensor DPS1/2- Differential Pressure Sensor 1, 2,….

Here in this proposed electronic design the dam area is divided in various clusters and the different sensors sensing independent parameters are deployed as shown. All the sensors in the cluster of dam namely Level Sensor (LS) / Vibration Sensor (VS) / Pressure Sensor (PS) and Flow Sensor (FS) senses Water level / Vibrations on the wall of dam / Pressure exerted on the wall of dam and the water flowing out from the dam into the main pipeline in Liters per minute respectively.

While the sensors DP1, DP2,.. are the Differential Pressure sensors fitted periodically along the main pipeline which will sense the pressure difference because of the breaking or leakage of the pipeline and will immediately be communicated to the observer. All these sensor nodes are connected together through gateway to common storage area CLOUD and the observer can access the on line information from the cloud.

4. CONCLUSION:

Here in this paper application of upcoming technology like Internet of Things [IoT], Wireless sensors network with software for dam safety management is given which results in improving the functionality of dams **[6]**. Demand for connecting information system with the real world is growing day by day and it can be possible with the advancement in Sensor technology, computer technology and network technology. Linking diverse technologies in this fertile market environment, integrators are offering new solutions for plant security, industrial controls, meteorology, geophysical survey, flood monitoring, risk assessment, tracking, environmental monitoring, defense, logistics and many other applications **[7]**.

Internet of Things, as a technology allows sensors to become intelligent by connecting them to the Internet. This allows sensors to communicate with each other.

Implementation of the system for managing and monitoring dam safety and the implementation of new technology reduce the risk of a major failure of the dams in future.

Finally the conclusion can be drawn as;

a] 40-50% wastage due to cracking of pipelines can be brought down to appreciable level.

b] In both situations; Water Scarcity or Excess water, the dam safety as well as water
   management can be done.

c] Saving natural resource is a major contribution towards entire Nation

d] Standard protocol leads to better Global Governance

e] Interoperable technologies expected and last but not the least

f] Cyber Security will be a big Concern

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