IoT Based Smart Flood MonitoringSystem in Nepal

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ABSTRACT:
Flood, a common water induced disaster of monsoon season mostly happened on riversides, is the recurring phenomenon in Nepal. It causes many deaths and injuries besides severe impacts on the vital infrastructures of the nation.
This paper aims to make use of latest technology like Internet of Things (IoT) in flood monitoring system for measuring and disseminate the water level of river in order to minimize the disaster due to flood.
KEYWORDS: Force Sensitive Resistor, IoT, Mqtt broker, nodeMCU, Flood, River, Ultrasonic sensor**.**

I. INTRODUCTION

Every year monsoon rainfall continues to trigger flooding and landslides across Nepal. This caused large amount of wealth destroys, deaths and economic losses.

Internet of things (IoT) is the ultimate game changer of this decade. IoT is being capable enough to draw the attention and stretch out to people as it is allowing sensor nodes integrated with numerous monitoring capabilities to have further facilities in traditional communication. According to Lee et.al [2] Internet of Things also called the Internet of Everything, is a new technology paradigm envisioned as a global network which is allowing internet to be connected into the real world by connecting physical objects with the internet. Saifuzzaman et.al [3] discussed about real life IoT application and Nava et.al [4] described its scope of being an automation and monitoring system.

This paper aims to connect IoT with the real world and make it better. It is designed to be implemented in theflood monitoring system to measure the water level and provide the information to the riverside inhabitants for minimizing the disaster effects. Further,it intended to develop a model by which real-time prediction of flooding in river can be measured.The development of prototype needs to follow specific steps. These steps will be discussed in the experimental method.IoT Based Flood Monitoring System aims to focus on predetermination of upcoming heavy flood on river to reduce the disaster before it happens by measuring the water level. People can easily pre-detect the upcoming flood just by checking the dashboard or know by alarm and take necessary step to prevent from it.

II. LITERATURE REVIEW

According to P.P.Ray [7] IoT is permitting users to acquire the best value by connecting devices to internet in health care [8], agriculture [9], industrial manufacturing [10], transportation [11], business [12], e-education [13], logistic [14], retail [15], e-governance [16], smart city [17], assisted living [18] and many more sectors. Gartner [19] stated that, 25 Billion things will be connected to internet and will be in use by 2020. This indicates that there will be connected device more than double of the world population [20]. Smart place allows to be interconnected with the environment by measuring, inferring and understanding the environmental indicators from the existing ecological, and natural resources. Granlund et.al [22] showed daily monitoring or alarming of the sewer and evaluated a prototype regarding this issue. Hlodversdottir et.al [23] showed their study was to consider the present and possible future floodhazard in the combined sewer system in Reykjavik city Centre. Nie et.al [24] showed in their research work about the possible outcomes in the Sewerage System, in the present situation, predicted and artificial climate scenarios which contains (1) surface flooding (2) basement flooding and (3) combined sewer overflow were defined to represent the adverse effects of climate change.

III. METHODOLOGY

The study is uses experimental method based on devices and technology of information communication technology. That is IoT. The procedure for the study is as shown below:
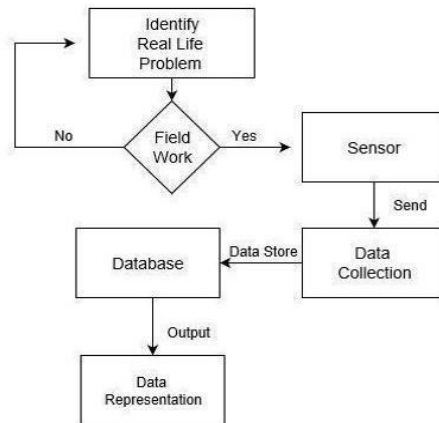
Fig.1. Workflow of IoT based Flood Monitoring System

IV.   IMPLEMENTATION

The concept described in methodology is implanted as:
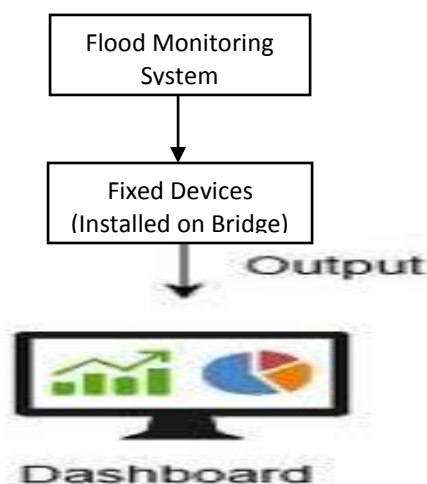
SOLUTION

Fig.2. Proposed IoT Based Flood Monitoring System

A. Field Work

During the fieldwork in association with National Disaster Risk Reduction and Management Authority (NDRRMA) of Nepal who is responsible for risk reduction due to disaster throughout the country. To work with the organization, we had to get the appointment via proper channel. We could have a primary discussion with the authority about the scenario of monsoon flood and disaster. Later on, we know about the major affected areas and visit one of those major area Kaligandakiriver for the study purpose.

B. Proposed Prototype

The proposed prototype combines Ultrasonic sensor, Force Sensitive Resistor (FSR) and MQTT Broker. These are fixed devices that needs to

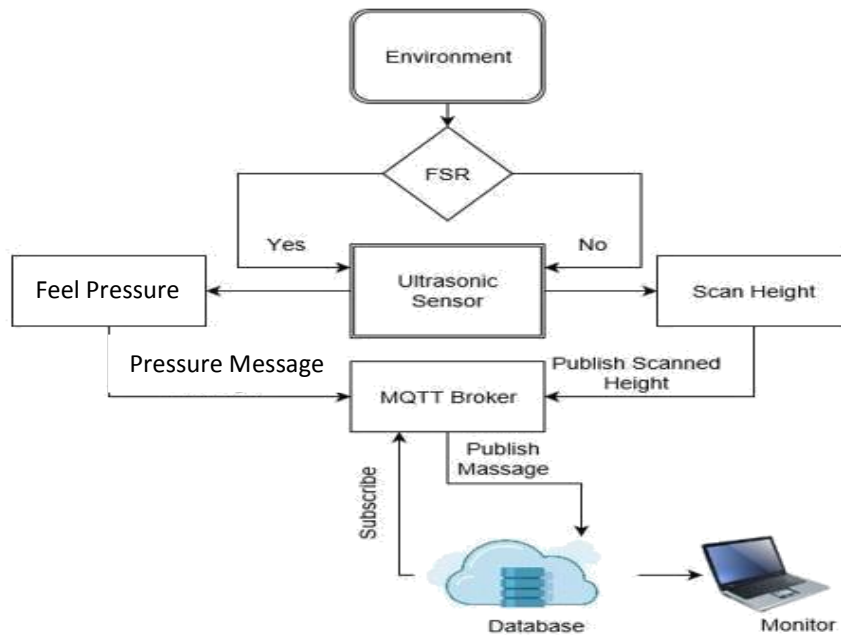be installed at river. The work flow of fixed device is   shown below:

Fig.3. Technical Architecture of Fixed Devices

FSR detects the pressure of water and ultrasonic sensor scans the water height. If FSR does not feel any pressure of water or dust, it generates signal 0.If FSR touches the surface of water or dust and feels the pressure, it generates signal 1 and the ultrasonic sensor scans the height of water and publishes the scanned height to the MQTT Broker. MongoDB subscribes the published message from the MQTT broker and displayed the message indicating danger on dashboard. After that red light with siren is given to the people for their attention.

In real life the device will be powered by the power of lamp post. The lamp post is powered by solar or DC current. Battery will be used as backup power. It will connect with the internet using Wi-Fi. The fixed device will be attached at bridge of river. The gateway will be wifi to connect with internet. The device will be turned on using the power of lamp post and the lamp post will be powered by DC current or solar. There will be a battery for backup power.

V.   CONCLUSION
The disaster due to flood during monsoon period in Nepal can be reduced with the help of IoT based smart flood monitoring system. The system is cost effective and user friendly. Once the system is installed at related area, it is easy to operate, handle and perform the task effectively.

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