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Flow Management System And Runoff Model For River Beds

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ABSTRACT

The history, culture, current and future socio- economic status and environmental sustainability of India and its people are intricately linked to the water resources which are available from dams. These water resources available through dams are one of the main sources available for the usage to industries, livestock, irrigation etc. and there is a critical need to ensure the safety of the water level at these dams against any natural or anthropogenic threats and to develop an effective Water Level Management system using IoT. This paper gives an outline for the development of an information system based on the existing systems with the utilization of some sensors and IoT. This paper also proposes a novel idea of collecting and sharing real-time information about water levels to an authorized central command center through far field communication.

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I. INTRODUCTION

River discharge is an important hydrological factor in river and coastal planning/management, control of water resources, and environmental conservation. Therefore, establishing the method and technology for streamflow measurement is a crucial issue. However, it is very difficult to measure cross-sectional average velocity, distance covered by water and time required to reach certain destination in unsteady flows or during extreme hydrologic events, such as flooding.

For continuous measurement of water discharge, a few different pieces of equipment are available e.g. Acoustic velocity meters (AVMs) and horizontal acoustic Doppler current profilers (ADCP). The main drawback of previously presented methods is that the number of velocity sample points in the cross-section of a stream is often insufficient for estimating cross-sectional average velocity. ADCP's can measure a horizontal profile of velocity in unsteady flow of water.

Thus, innovative methods and/or equipment for continuous measurement of river discharge are needed. In this study, For continuous measurement of water, the system contain number of nodes placed at different points. In river each node have flow sensors which will measure flow with respect to river bed. All nodes will send respective data to a basestation. Basestation will collect the data and display the results.

II. LITERATURE SURVEY

In many cases, river discharge is indirectly estimated from water level or streamflow velocity near the water surface. However, these methods have limited applicability. In this study, an innovative system, the fluvial acoustic tomography system (FATS), was used for continuous discharge measurement. Transducers with a central frequency of 30 kHz were installed diagonally across the river. The system's significant functions include accurate measurement of the travel time of the transmission signal using a GPS clock and the attainment of a high signal-to-noise ratio as a result of modulation of the signal by the 10th order M-sequence. In addition, FATS is small and lightweight, and its power consumption is low. Operating in unsteady streamflow, FATS successfully measured the cross-sectional average velocity. The agreement between FATS and acoustic Doppler current profilers (ADCPs) on water discharge was satisfactory. Moreover, the temporal variation of the cross-sectional average temperature deduced from the sound speed of FATS was similar to that measured by a temperature sensor near the bank.

The use of acoustic Doppler current profiers (ADCPs) from a moving boat is now a commonly used method for measuring streamflow. The technology and methods for making ADCP-based discharge measurements are different from the technology and methods used to make traditional discharge measurements with mechanical meters. Although the ADCP is a valuable tool for measuring streamflow, it isonly accurate when used with appropriate techniques. This report presents guidance on the use of ADCPs for measuring streamflow; this guidance is based on the experience of U.S. Geological Survey and Water Survey of Canada employees and published reports, papers, and memorandums of the U.S. Geological Survey.

The continuous measurement of river discharge for long periods of time is crucial in water resource studies. However, the accurate estimation of river discharge is a difficult and labor-intensive procedure;thus, a robust and efficient method of measurement is required.Continuous measurements of flowrate have been carried out in a wide, shallow gravel bed river (water depth 0.6 m under low-flow conditions, width115 m) using Fluvial Acoustic Tomography System (FATS) that has 25 kHz broadband transducers with horizontally omnidirectional and vertically hemispherical beam patterns. Reciprocal sound transmissions were performed between the two acoustic stations located diagonally on bothsides of the river. The horizontal distance between the transducers was 301.96 m. FATS enabled the measurement of the depth- and range-averaged sound speed and flow velocity along the ray path. In contrast to traditional point/transect measurements of discharge, in a fraction of a second, FATS covers the entire cross section of river in a single measurement.The flow rates measured by FATS were compared to those estimated by moving boat Acoustic Doppler Current Profiler (ADCP) and rating curve (RC) methods. FATS estimates were in good agreement with ADCP estimates over a range of 20 to 65 . Thus, the flow rates derived from FATS could be considered reliable. horizontally omnidirectional and vertically hemispherical beam patterns. Reciprocal sound transmissions were performed between the two acoustic stations located diagonally on bothsides of the river. The horizontal distance between the transducers was 301.96 m. FATS enabled the measurement of the depth- and range-averaged sound speed and flow velocity along the ray path. In contrast to traditional point/transect measurements of discharge, in a fraction of a second, FATS covers the entire cross section of river in a single measurement.The flow rates measured by FATS were compared to those estimated by moving boat Acoustic Doppler Current Profiler (ADCP) and rating curve (RC) methods. FATS estimates were in good agreement with ADCP estimates over a range of 20 to 65 . Thus, the flow rates derived from FATS could be considered reliable.

The measurement of unsteady or tidally affected flow has been a problem faced by hydrologists for many years. Dynamic discharge conditions impose an unreasonably short time constraint on conventional current-meter discharge-measurement methods, which typically last a minimum of 1 hour. Tidally affected discharge can change more than 100 percent during a 10-minute period. Over the years, the U.S. Geological Survey (USGS) has developed moving-boat discharge measurement techniques that are much faster but less accurate than conventional methods. The advent of the acoustic Doppler current profiler (ADCP) made possible the development of a discharge-measurement system capable of more accurately measuring unsteady or tidally affected flow. In most cases, an ADCP discharge-measurement system is dramatically faster than conventional discharge-measurement systems and has comparable or better accuracy.

III. METHODOLOGY

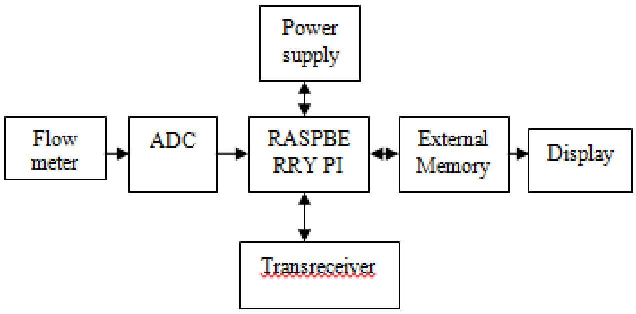

Fig 1. block diagram

The working of System:

1. For continuous measurement of water, the system contain number of nodes placed at different points
2. In river each node have flow sensors which will measure flow with respect to river bed
3. The system will calculate velocity, distance covered by water and time taken to reach certain destination
4. If average flow exceeds over a particular value the system will send an alert to user via mail.
5. The results will be stored on cloud so that user can access data from anywhere.

IV. CONCLUSION

The low cost, efficient, real-time water flow analyzing and alerting system has been implemented and tested. Through this system the officials can keep track of flow rate of water released and send immediate warnings to public. This can prevent flood situations. Quick actions can be taken to prevent losses occurring due to flood. The system can be easily installed, with base station kept close to dam and task of monitoring can be done.

Internet of things and its services are becoming part of our everyday life, ways of working and business. There is great deal of research on developing crucial building blocks and models for the next generation internet service supported by a plethora of connected things

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