

IoT Based Datalogger With Realtime Data Extraction

Malathi K¹, J.A.Desai², M.Selva Balan³, Shraddha K⁴

¹*Electronics and Telecommunication Engineering Dept., NBN Sinhgad School of Engg., Pune, India*

²*Instrumentation and Control Dept., Central Water and Power Research Station, Pune, India*

³*Electronics and Telecommunication Engineering Dept., NBN Sinhgad School of Engg., Pune, India*

⁴*Electronics and Telecommunication Engineering Dept., NBN Sinhgad School of Engg., Pune, India*

malathikhole@gmail.com

jai.desai@sinhgad.edu

instcwprs@gmail.com

shraddhakhot62@gmail.com

Abstract

There are many complex natural disasters surrounding us. Floods are among them which are very complex in nature to model. The development of flood prediction models that contribute to reduction of risk, minimize of the loss of human life, and reduce of the damage of property associated with Flood is an area of research. In this paper we are using a Data Logger for collecting data from different sensors like LM35 for temperature, DHT11 for humidity, optical laser sensor for calculating area and raspberry pi with camera for velocity calculation. We are using this data for processing, from that we are calculating discharge for flood estimation. And this processed data will go to Firebase Real time Database. The Firebase Real time Database is a database which is accessed through cloud platform. We are using firebase because it works on real time database, firebase remain responsive even when offline and it is easily accessed from a device which is mobile or any web browser.

Keywords - Flood, Data Logger, Discharge, Firebase, Real time Database.

I. INTRODUCTION

In this new generation the technology is advancing at a faster rate, solutions are found to an increasing number of problems. One of the most influential problems in water resources and hydraulic engineering is to Estimate the Flood which needs calculation of discharge. Initially a detailed literature review will be made on discharge measurement and flood. Optical laser sensor is used to compute the river bed elevation of a known river site, which is done at Rajaram Bridge (Pune). Velocity sensor will be used to acquire the velocity on surface[1]. This paper aims at the

proposed system to collect and store data in real time database. Here we are using data logger for storing and processing purpose. For which we are using Arduino with SD card interfacing. And we are sending data to firebase by using ESP8266 wifi module.

II. METHODOLOGY

A. Hardware Implementation:

A data logger is an electronic device that stores or logs the data over some time period and it is equipped with a in built instruments or sensors.[4]. The design of data logger is based on a digital processor (or computer). They generally are very small in size, powered by battery, transportable, and furnished with a microprocessor, internal memory for data storage, and sensors.

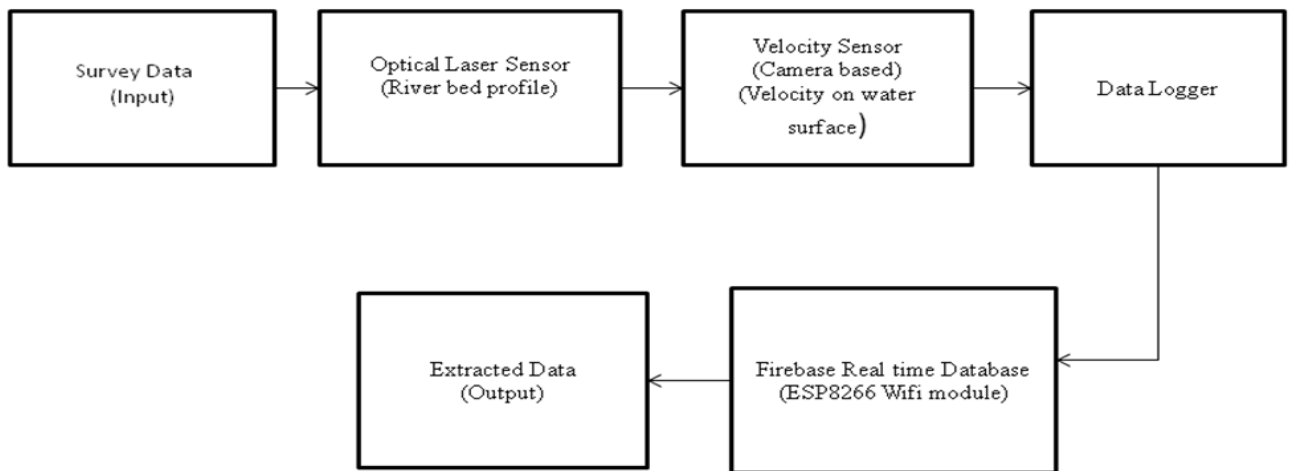


Fig.1. Block Diagram

i. Dataset Creation:

For estimation of flood, we have studied and created a dataset using past years data by using different parameters like temperature, Rainfall and Humidity. These values are collected from Indian Metrological Department (IDM) site which provides Day-to-Day weather report. The collected Day-to-Day weather report is then updated in an Excel sheet with required parameters. For the Proposed methodology at most 365 days data are collected. Here we have considered dataset of month August, 2019..

	A	B	C	D
1	Day	Temp.	Humidity	Rainfall
2	1	24	90	6.1
3	2	23.1	94	19.05
4	3	23.5	90	20.07
5	4			
6	5			
7	6			
8	7	23.9	91	6.1
9	8	24.3	86	6.1
10	9	24.1	87	3.05
11	10			
12	11			
13	12			
14	13	24.7	84	2.03
15	14	24.5	85	0.51
16	15	24.4	85	0.25

Fig.2. August,2019 Dataset

Monthly Average		
24.4	84.9	208.28

Fig.3. Monthly Average

In data logger we are storing the values of temperature, area, velocity and discharge. The velocity of water along with the dataset used contributes to the estimation of flood[2]. The value of area and velocity are used for calculating discharge. In which discharge is calculated by following equation:

$$D = A \times V$$

Where: D: Discharge, V: Velocity, A: Area

In this area is constant and velocity is in real time. And by using this we are calculating discharge values which are used for flood estimation.

ii. ESP8622 Wifi module:

The ESP8266 is a low-cost Wifi microchip, with a full TCP/IP stack. ESP8266 is a system on chip(SoC) which provides WIFI capability for embedded applications[6]. This enables internet connectivity to embedded applications. Esp8266 modules are mostly used in Internet of Things(IoT) applications[9].

Procedure to Setup Arduino IDE for NODEMCU ESP8266:

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- Install Arduino IDE Software on the system
- Open Arduino IDE software
- Preferences

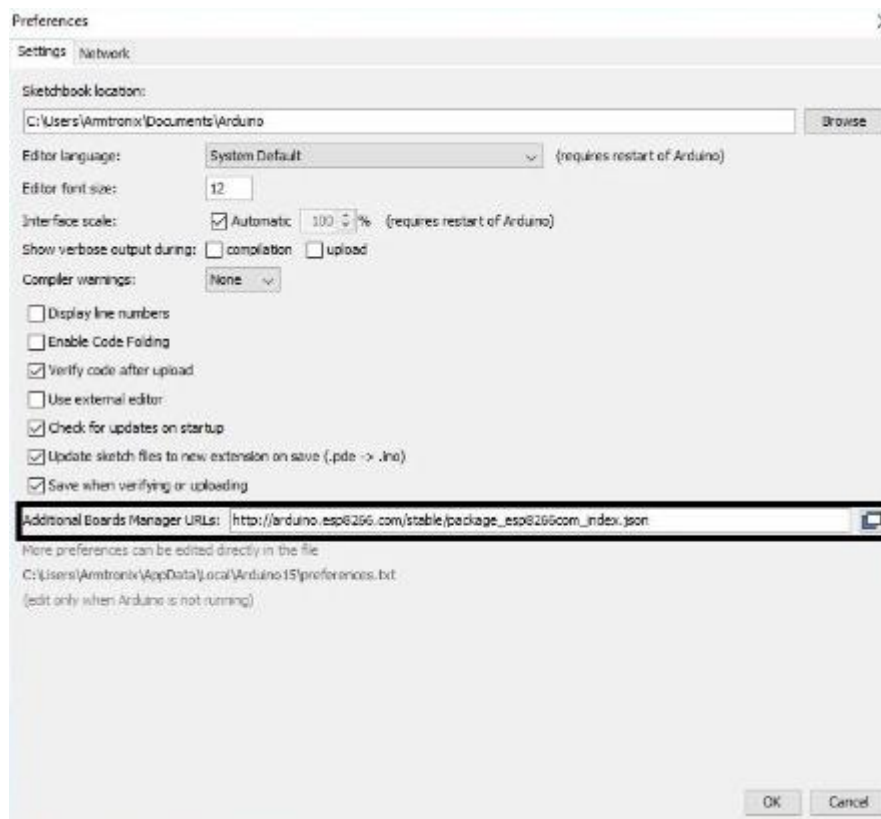


Fig.4.Preference Table

- Add ESP8266 Board Manager
- Select BoardStep
- ESP8266 Board Package
- Select ESP8266 Arduino Board
- Connect ESP8266 to the PC
- Select Example Program in Arduino IDE
- Select COM Port
- Upload the Program to ESP8266 Module

Step 12: Add Libraries

B. Software Implementation:

- Proteus Simulation:** Here we are using *Proteus Design Suite* which is very useful and easy to implement with a very powerful characteristics which help to enable the design, test the

circuit and build a layout of printed circuit boards. In this we used arduino controller which is interfaced with SD card. Here we are using SD card for storing purpose, and 16x2 LCD for displaying values.

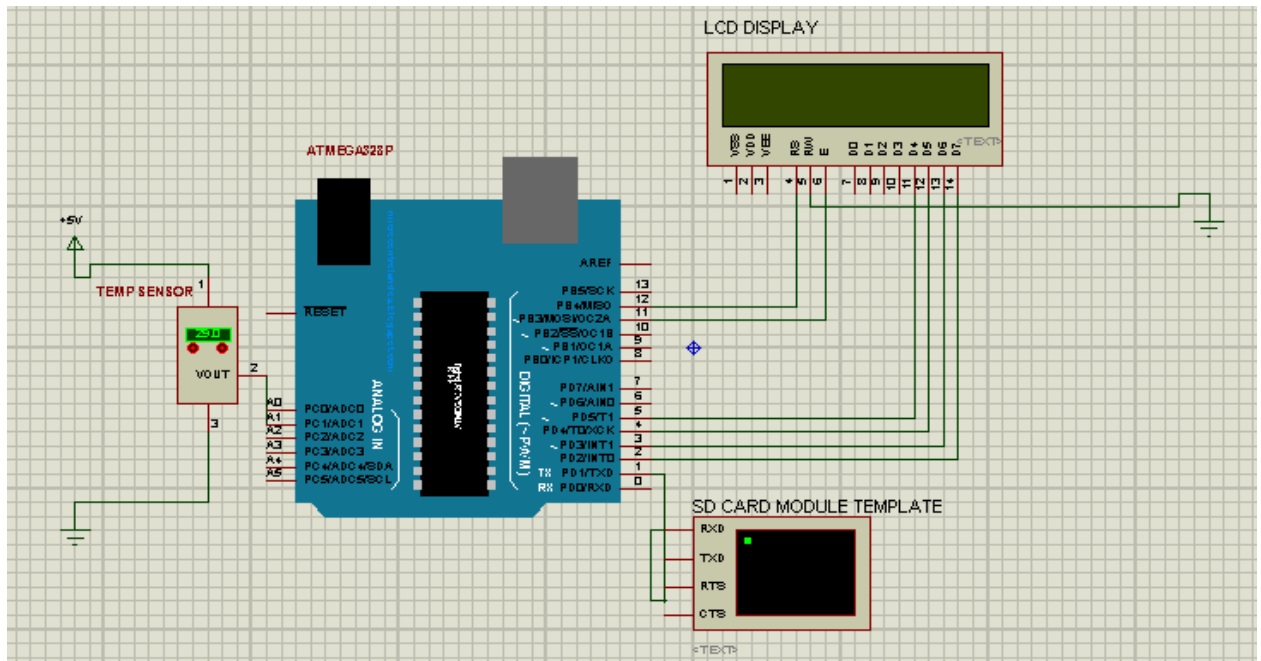


Fig.5.Connection Diagram

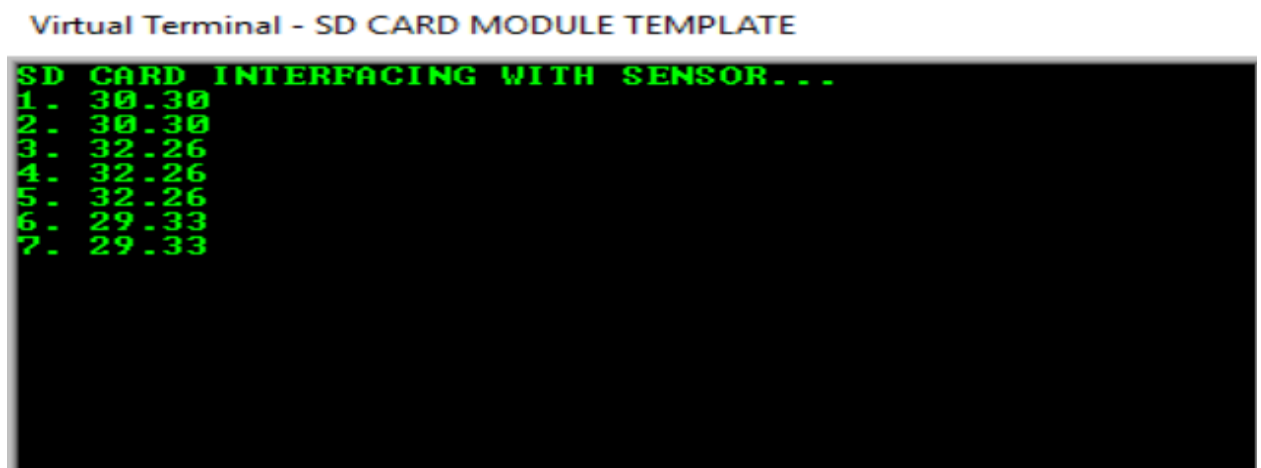


Fig.6.Virtual Terminal for SD card

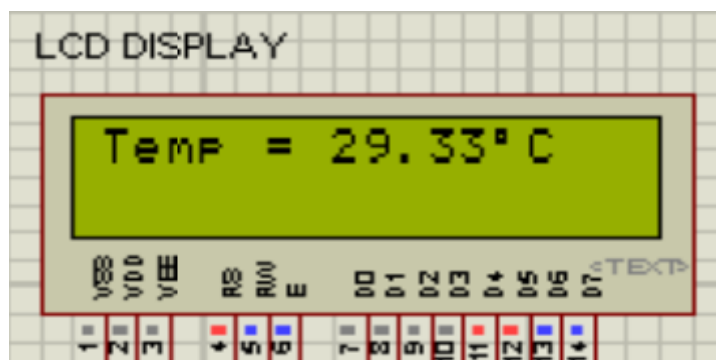


Fig.7.LCD Display

ii. Firebase Real time Database:

Firebase provides a database which is real-time in nature and back-end as a service. It store and sync data with our NoSQL cloud database. The service provides application developers an API that allows application data to be synchronized across clients and stored on Firebase's cloud[8]. Data is synced across all clients in realtime, and remains available when your app goes offline.

Working:

The Firebase Real time Database lets you build substantial, collective applications that allow a safe access to the database directly from client-side. Data is persevering locally, and even when we are offline, the events continue to fire, giving the end user a reactive experience. When the device retrieves connection, the Real time Database synchronizes the local data changes with the remote updates that occurred while the client was offline, merging any conflicts automatically.

The Real time Database is a NoSQL database and as such has different optimizations and functionality compared to a relational database [7]. The Real time Database API is designed to only allow operations that can be executed quickly. This enables you to build a great real time experience that can serve millions of users without compromising on responsiveness.



Fig.8. Created Database

III. RESULT

In result we are getting values like temperature, area, velocity and discharge in excel sheet which is stored in SD card. In data logger area is constant, velocity is in real time. Then discharge calculation will be done in data logger and then these values will go to firebase in real time by using ESP8266 wifi module.

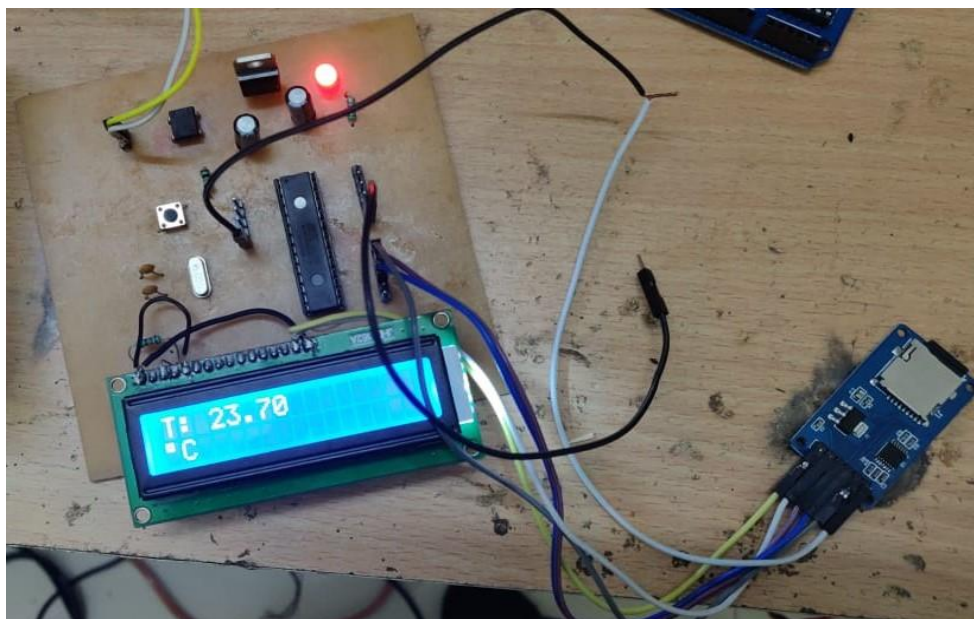
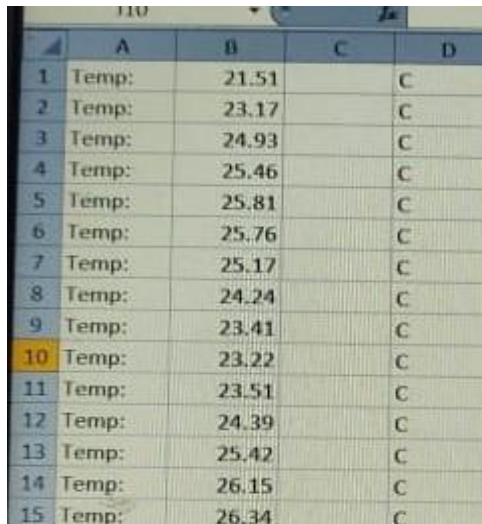


Fig.9. Data Logger Hardware



	A	B	C	D
1	Temp:	21.51		C
2	Temp:	23.17		C
3	Temp:	24.93		C
4	Temp:	25.46		C
5	Temp:	25.81		C
6	Temp:	25.76		C
7	Temp:	25.17		C
8	Temp:	24.24		C
9	Temp:	23.41		C
10	Temp:	23.22		C
11	Temp:	23.51		C
12	Temp:	24.39		C
13	Temp:	25.42		C
14	Temp:	26.15		C
15	Temp:	26.34		C

Fig.10. Excel sheet of stored values

IV.CONCLUSION

The Flood is estimated using the surface velocity and the past years dataset. The result obtained from this methodology can be beneficial for flood prone areas like, areas near a dam or canal and river side. The data logger is very reliable, easy, and cheapest and instances measurement approach for data collection and data calculation. Firebase real time database authorizes us to build a great real time experience that can serve numerous users without compromising on responsiveness.

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