IoT Based Early Flood Detection Using Machine Learning

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Abstract— Flood which is a complex phenomenon happening all overthe world is the ultimate result of climate change. Although there are some gauging stations which are usedto predict the occurrence of flood, but they are not reallyaccurate. Unexpected occurrence of flood is causing damage not just to the lives of people but also to the valuable infrastructure. The purpose of our project is to develop a real time and reliable flood monitoring and detection system using deep learning. This paper proposesan wireless sensor networking technology as the reliable, low power and wide area communication for flood detection. Beside that we employee Convolutional NeuralNetwork to detect the presence of living beings who got struck in the flood.

I. INTRODUCTION

Now a day's the occurrence of flood happens to be a common problem all over the world especially in coastal regions. This unexpectedness of flood is the direct result of climate change.When we look at the reason behind the occurrence of flood, we find that the dominant cause behind occurrence of flood is the rainfall. We usually think flood as just a natural process, but certain activities of mankind such as deforestation, infrastructure failures, bridge construction, flood embankments etc.. also contribute majorly for the occurrence of flood. The effects of flood is devastating, where immediateeffect includes loss of human life, damage to valuable property, crop destruction and water borne diseases such as cholera and Hepatitis B and aftermath effects make land ineligible for further cultivation.

II. RELATED WORK

Several flood prediction schemes are proposed within the literature. Reference [4], has proposed and evaluated the performance of a fault-tolerant system for flood prediction by using ns-3, MLP, and RPL routing protocol. additionally, the LEACH clustering algorithm is employed to point out disruption, like node or communication failure, resulting in improved system utilization likewise as fault tolerance mechanisms. In [5] a comprehensive study of the appliance of computational inelligence-based methods flooding management systems has been conducted for instance, Among the combined methods, the unreal neural network and therefore the combination of the ANN with the genetic algorithm have the best and lowest RMSE, respectively.

Reference [6], predicted the water level in downstream by comparing multiple simple regression and MLP methods on a Malaysian river and conclude that MLP is healthier. In [7], a flood detection system using IoT, big data, and CDNN has been proposed. Comparing CDNN with DNN and ANN shows that CDNN performed better altogether aspects of sensitivity, accuracy, F-Measure, Specificity, and recall. A predictive model supported the LSTM structure and sequence- to-sequence (seq2seq) learning suggests in [8] that estimates runoff for the following 24 hours and once every hour. The results of the model with and without considering upstream stations show that the parametric statistic and NSE of the distributed model are higher and its NRMSE is a smaller amount than the case without considering the upstream and other models. additionally, by [13] the

more a station uses upstream station information, the more satisfying the results are going to be. In [8], the goal is to make real-time data-driven models that may use existing data to simulate and predict the rainfall runoff process. By [12] LSTM is more stable than ANN, and has less RMSE and MAE, and so performs better. Thus, by[11] LSTM is more capable of nonlinear simulation. Reference [9] shows that deep learning in both learning and validation phases performs better than MLP and SVM. An LSTM model was developed by [10] to forecast discharge for in the future, two-day, and three-day flowrate forecasting ahead. The results by [11] show that if the computer file of the model by[12] consists of the observed discharge data altogether stations will forecasts the flow value better than the scenario that considers statistic of both rainfall and discharge measured because the input file, because by [12] the correlation between the series of precipitation data and therefore the flowrate at the target station is usually significantly by [13] below the correlation between flowrate stations.

III. PROPOSED SYSTEM

- We have developed a coffee cost, reliable and real time flood detection and prediction system utilizing Wireless Sensor Networking Technology in IOT environment.
- In this method, we are employing Convolution Neural Network algorithm to detect living beings flooding affected zone.

IV. OBJECTIVES

- To estimate the occurrence of flood and alert the people living around the flood zone.
- Detection of living beings swollen affected areas.

V. HARDWARE AND SOFTWARE REQUIREMENTS

- Hardware Requirements:

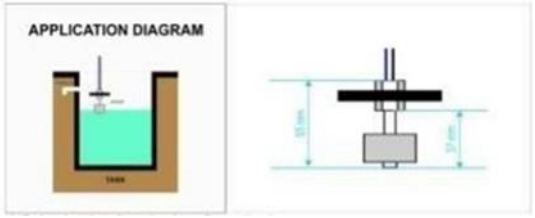
1. Arduino uno

Arduino could be a micro controller, it consists of has 14 digital I/O pins and 6 analog I/O pins, a 16 MHz quartz, a USB connection, an influence jack, an ICSP header and a push button. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Uno board is that the first in a very series of USB Arduino boards, and therefore the reference model for the Arduino platform.

2. Water flow Sensor

A water flow sensor may be a scientific device that's accustomed measure the flow of water. The sensor comes with three wires: red (5-24VDC power), black (ground) and yellow (Hall effect pulse output). By counting the pulses from the output of the sensor, one can easily calculate water flow. Each pulse is approximately 2.25 milli litres.

3. Water level Sensor



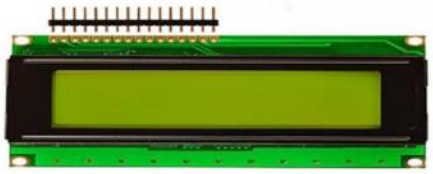
A water level sensor may be a scientific device that's wont to measure the extent of water in a very container. because the water rises and

reaches the very best Level or danger level it works to send the message through IOT. The water level which we are using is generally Close Type and Corrosion Free Material with Advance Magnetic Technology. This level sensor operates mainly on 2 to 12V DC and Current 5 to 50mA DC, its Maximum Switch Current is 500 mA (DC) and Maximum Switch Watt is 10W.

4. Rain fall sensor

The rain sensor module is a straightforward tool for rain detection. It may be used as a switch when raindrop falls through the raining board. It may be used for measuring rainfall intensity. The module features, a rain board and a separate board for more convenience, power indicator LED and an adjustable sensitivity though a potentiometer.

5. LCD



LED (Liquid Crystal Display) could be a style of flat panel display which uses liquid crystals in its primary sort of operation.

6. Wi-Fi ESP 8266

ESP8266 offers an entire and self-contained Wi-Fi networking solution, allowing it to either host the appliance or to dump all Wi-Fi networking functions from another application processor. When ESP8266 hosts the appliance, and when it's the sole application processor within the device, it's able to boot up directly from an external flash. it's integrated cache to enhance the performance of the system in such applications, and to reduce the memory requirements. The ESP8266 Wi-Fi Module may be a self- contained SOC with integrated TCP/IP protocol stack that may give any microcontroller access to your WiFi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command set firmware. The ESP8266 module is a very cost-effective board with a large, and ever growing, community.

Wi-Fi Module

7. Power Supply

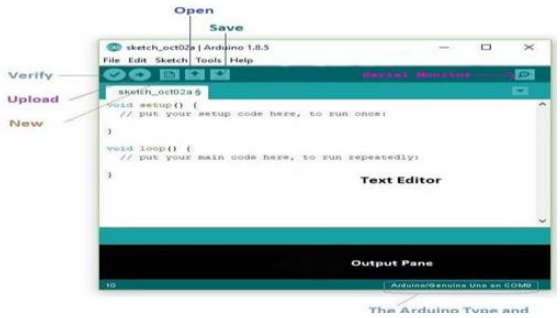
A power supply could be a hardware component that supplies power to an device. It receives power from an receptacle and converts the present from AC (alternating current) to DC (direct current), which is what the pc requires.

- SOFTWARE REQURIMENTS

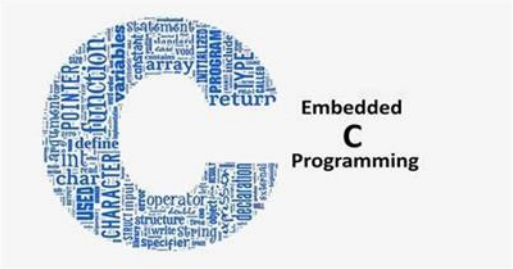
1. Arduino IDE

The Arduino integrated development environment (IDE) may be a cross-platform application for Windows, macOS, Linux that's written within the programing language Java. it's accustomed write and upload programs to Arduino compatible boards, but also, with the assistance of 3rd party cores, other vendor development boards. The Arduino IDE supports the languages C and C++ using special rules

of code structuring. it's an officer Arduino software, making code compilation too easy that even a standard person with no prior technical knowledge can get their feet wet with the educational process. the most code, also referred to as a sketch, created on the IDE platform will ultimately generate a Hex File which is then transferred and uploaded within the controller on the board by [21]. the most code, also referred to as a sketch, created on the IDE platform will ultimately generate a Hex File which is then transferred and uploaded within the controller on the board.



2. EMBEDDED C



Embedded C is an extension to C artificial language that gives support for developing efficient programs for embedded devices. it's not a component of the C language. C is that the most generally used artificial language for embedded processors/controllers. Assembly by [20] is additionally used but mainly to implement those portions of the code where very high timing accuracy, code size efficiency, etc. are prime requirements.

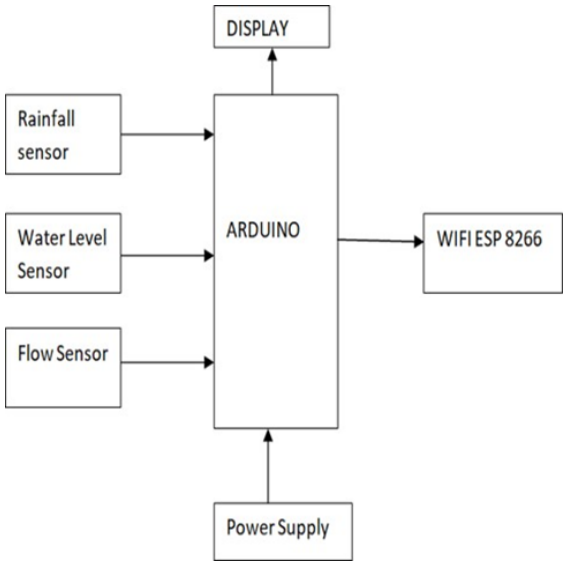
Arduino IDE (Integrated development Environment) is fully developed into functionality of filled with libraries, as long as programming the Arduino UNO in Embedded C language is feasible because by [19] Arduino IDE can compile both Arduino code further as AVR standard code.

8. TCP APPLICATION

TCP Application receives the worth from the sensors and Arduino. it's connected to ESP8266 Wi-Fi module.

The values from TCP application is useful for state officials to stay track of floods and take precautionary measures.

SYSTEM DESIGN



METHODOLOGY

The design of WSN involves a collection of nodes for sensing and a base station that link with one another. The set of nodes include Arduino microcontroller, set of sensors and a wireless transducer. The set of sensors include water level sensor, water flow sensor and rainfall sensor. By [18] water level sensor is employed to live level of water whereas water flow sensor is employed to live the speed of flow of water by [17] and rainfall sensor is employed to detect the rain fall. These three sensor nodes are programmed accordingly and are connected to Arduino microcontroller. Each sensor will measure the parameters at regular intervals and update its information timely. The updated data is stored in BLYNK Cloud. Each sensors have their own threshold value by [16] and if anybody sensor's reading crosses the brink value then a moment alert message is shipped to the TCP app via WIFI module to concerned government authorities which aids in taking further action. Based on its design and implementation by [12] the system will be ready

to detect the living beings who got struck within the flood. It utilizes CNN algorithm, by [14] which process the image and assign a worth to every pixel of image and passes it through the kernels/filters and classifies the image.

By [14] the system also detects the varied poses of kith and kin.

CONCLUSION

It is impossible to predict how and when the Natural Disasters occur. The cause for Natural Disasters rely on various factor as an example Water level in water bodies, Rainfall etc. during this project by [16] we've considered the water level in dams, flow of water and also rain fall detection by installing various sensors, in order that continuous monitoring of water level, water flow and occurrence of rain is completed, if the edge value of sensor gets exceeded an intimation about the flood is distributed. This project also aims at by [15] identifying the victims within the Disaster affected areas by [13] using CNN (Convolution Neural Network) which may be a a part of ANN (Artificial Neural Network). the anticipated result came resolute be 97.7722% accurate.

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