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IOT BASED EARLY FLOOD DETECTION USING MACHINE LEARNING

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A B S T R A C T

Flood which is a complex phenomenon happening all over the world is the ultimate result of climate change. Although there are some gauging stations which are used to predict the occurrence of flood, but they are not really accurate. 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 proposes an wireless sensor networking technology as the reliable, low power and wide area communication for flood detection. Beside that we employee Convolutional Neural Network to detect the presence of living beings who got struck in the flood.

Keywords: Machine Learning, Rain Detection, Flood

1. 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 immediate effect 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.

2. LITERATURE SURVEY

Several flood prediction schemes have been proposed in 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. In addition, the LEACH clustering algorithm is used to show disruption, such as node or communication failure, leading to improved system utilization as well as fault tolerance mechanisms. In [5] a comprehensive study of the application of computational intelligence-based methods in flood management systems has been conducted. For example, Among the combined methods, the artificial neural network and the combination of the ANN with the genetic algorithm have the highest and lowest RMSE, respectively. Reference [6], predicted the water level in downstream by comparing multiple linear regression and MLP methods on a Malaysian river and conclude that MLP is better. 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 in all aspects of sensitivity, accuracy, F-Measure, Specificity, and recall. A predictive model based on the LSTM structure and sequenceto-sequence

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(seq2seq) learning suggests in [8] that estimates runoff for the next 24 hours and once every hour. The results of the model with and without considering upstream stations show that the correlation coefficient and NSE of the distributed model are higher and its NRMSE is less than the case without considering the upstream and other models. In addition, the more a station uses upstream station information, the more satisfying the results will be. In [8], the goal is to build real-time data-driven models that can 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 therefore performs better. Thus, 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 one day, two-day, and three-day flowrate forecasting ahead. The results by [11] show that if the input data of the model consists of the observed discharge data in all stations will forecasts the flow value better than the scenario that considers time series of both rainfall and discharge measured as the input data, because by [12] the correlation between the series of precipitation data and the flowrate at the target station is often significantly lower than the correlation between flowrate stations.

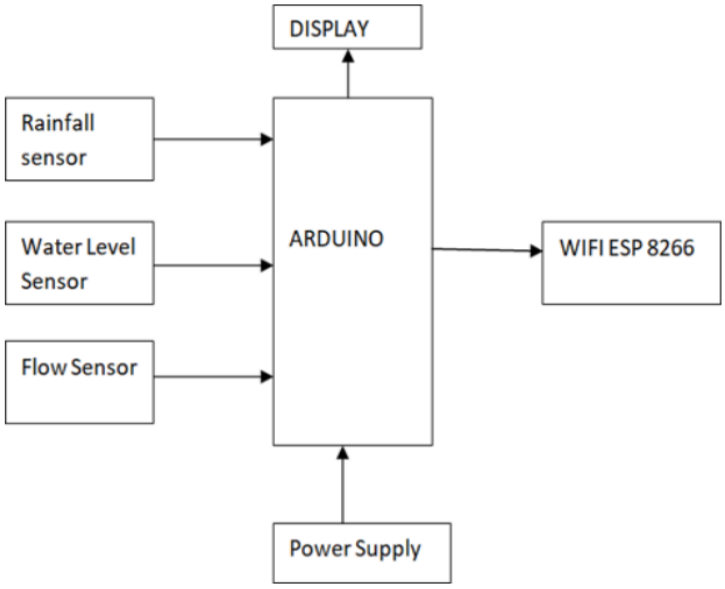
2.1. PROPOSED SYSTEM

- We have developed a low cost, reliable and real time flood detection and prediction system utilizingWireless Sensor Networking Technology in IOTenvironment.
- In this system, we are employing ConvolutionNeural Network algorithm to detect living beings inflood affected zone.

2.2. OBJECTIVES

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

3. ARCHITECTURE



4. METHODOLOGY

The design of WSN involves a set of nodes for sensing and a base station that link with each other. 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. Water level sensor is used to measure level of water whereas water flow sensor is used to measure the speed of flow of water [15] and rainfall sensor is used 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 and if any one sensor's reading crosses the threshold value then an instant alert message is sent to the TCP app via WIFI module [16] to concerned government authorities which aids in taking further action. Based on its design and implementation by [12] the system will also be able to detect the living beings who

got struck in the flood. It utilizes CNN algorithm, by [14] which process the image and assign a value to each pixel of image and passes it through the kernels/filters and classifies the image. The system also detects the various poses of human being.

4.1.SYSTEM REQUIREMENTS

Hardware Requirements:

1. Arduino uno:

Arduino is a micro controller which has 14 digital I/O pins and 6 analog I/O pins, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. "Uno"meansone in Italianandwas chosen to mark the release of Arduino Software (IDE) 1.0. 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 the first in a series of USB Arduino boards, and the reference model for the Arduino platform; for an extensive listof current,past or outdated boards see theArduino index of boards.

2. Water flow Sensor:

A water flow sensor is a scientific device that is used to 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 is a scientific device that is used to measure the level of water in a container. As the water rises and reaches the highest Level or danger level it works to send the message through IOT. The water level which we are using is Normally Close Typeand 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 an easy tool for rain detection. It can be used as a switch when raindrop falls through the raining board. It can also be used for measuring rainfall intensity. The module features, a rain board and a separate control board for more convenience, power indicator LED and an adjustable sensitivity though a potentiometer.

5. LCD

Liquid Crystal Display is a type of flat panel display which uses liquid crystals in its primary form of operation.

6. Wi-Fi ESP 8266

ESP8266 offers a complete and self-contained Wi-Fi networking solution, allowing it to either host the application or to offload all Wi-Fi networking functions from another application processor. When ESP8266 hosts the application, and when it is the only application processor in the device, it is able to boot up directly from an external flash. It has integrated cache to improve the performance of the system in Wi-Fi Module such applications, and to minimize the memory requirements. The ESP8266 Wi-Fi Module is a selfcontained SOC with integrated TCP/IP protocol stack that can 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 an extremely cost-effective board with a huge, and ever growing, community.

7. Power Supply

A power supply is a hardware component that supplies power to an electrical device. It receives power from an electrical outlet and converts the current from AC (alternating current) to DC (direct current), which is what the computer requires.

SOFTWARE REQURIMENTS

1. Arduino IDE

The Arduino integrated development environment (IDE) is a cross-platform application for Windows, macOS, Linux that is written in the programming language Java. It is used to write and upload programs to Arduino compatible boards, but also, with the help of 3rd party cores, other vendor development boards. The Arduino IDE supports the languages C and C++ using special rules of code structuring. It is an official Arduino software, making code compilation too easy that even a common person with no prior technical knowledge can get their feet wet with the learning process. The main code, also known as a sketch, created on the IDE platform will ultimately generate a Hex File which is then transferred and uploaded in the controller on the board. The main code, also known as a sketch, created on the IDE platform will ultimately generate a Hex File which is then transferred and uploaded in the controller on the board.

2. EMBEDDED C

Embedded C is an extension to C programming language that provides support for developing efficient programs for embedded devices. It is not a part of the C language. C is the most widely used programming language for embedded processors/controllers. Assembly is also 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 full of libraries, as long as programming the Arduino UNO in Embedded C language is possible because Arduino IDE can compile both Arduino code as well as AVR standard code.

3. Telegram Bots

Bots are third-party applications that run inside Telegram

CONCLUSION

It is impossible to predict how and when the Natural Disasters occur. The cause for Natural Disasters depend on various factor for example Water level in water bodies, Rainfall etc. In this project we have considered the water level in dams, flow of water and also rain fall detection by installing various sensors, so that continuous monitoring of water level, water flow and occurrence of rain is done, if the threshold value of sensor gets exceeded an intimation about the flood is sent. This project also aims at identifying the victims in the Disaster affected areas by [13] using CNN (Convolution Neural Network)which is a part ofANN (Artificial Neural Network). The predicted result came outto be 97.7722% accurate.

REFERENCES

[1] S. K. Sood, R. Sandhu, K. Singla, and V. Chang, "IoT, bigdata and HPC based smart flood management framework,"Sustainable Computing: Informatics and Systems 20, pp.102–117, 2018.

[2] P. Mitra et al., "Flood forecasting usingInternet of things and artificial neural networks," 7th IEEEAnnual Information Technology, Electronics and MobileCommunication Conference, IEEE IEMCON 2016, pp. 1–5,2016.

[3] K. Mekki, E. Bajic, F. Chaxel, and F. Meyer, "Acomparative study of LPWAN technologies for large-scaleIoT deployment," ICT Express, vol. 5, no. 1, pp. 1–7, 2019.

[4] G. Furquim, G. P. R. Filho, R. Jalali, G. Pessin, R. W.Pazzi, and J. Ueyama, "How to improve fault tolerance indisaster predictions: A case study about flash floods usingIoT, ML and real data," Sensors (Switzerland), vol. 18, no. 3,pp. 1–20, 2018.

[5] T. Perumal, M. N. Sulaiman, and C. Y. Leong, "Internetof Things (IoT) enabled water monitoring system," 2015IEEE 4th Global Conference on Consumer Electronics,GCCE 2015, pp. 86–87, 2016.

[6] I. R. Widiasari, L. E. Nugroho, and Widyawan, "Deeplearning multilayer perceptron (MLP) for flood predictionmodel using wireless sensor network based hydrology timeseries data mining," Proceedings - 2017 InternationalConference on Innovative and Creative InformationTechnology: Computational Intelligence and IoT, ICITech2017, pp. 1–5, 2018.

[7] M. Anbarasan et al., "Detection of flood disaster systembased on IoT, big data and convolutional deep neuralnetwork," Computer Communications, vol. 150, no.November, pp. 150–157, 2020.

[8] Rodriguez, K. M., Reddy, R. S., Barreiros, A. Q., & Zehtab, M. (2012, June). Optimizing Program Operations: Creating a Web-Based Application to Assign and Monitor Patient Outcomes, Educator Productivity and Service Reimbursement. In DIABETES (Vol. 61, pp. A631-A631). 1701 N BEAUREGARD ST, ALEXANDRIA, VA 22311-1717 USA: AMER DIABETES ASSOC.

[9] Kwon, D., Reddy, R., & Reis, I. M. (2021). ABCMETAapp: R shiny application for simulation-based estimation of mean and standard deviation for meta-analysis via approximate Bayesian computation. Research synthesis methods, 12(6), 842–848. https://doi.org/10.1002/jrsm.1505

[10] Reddy, H. B. S., Reddy, R. R. S., Jonnalagadda, R., Singh, P., & Gogineni, A. (2022). Usability Evaluation of an Unpopular Restaurant Recommender Web Application Zomato. Asian Journal of Research in Computer Science, 13(4), 12-33.

[11] Reddy, H. B. S., Reddy, R. R. S., Jonnalagadda, R., Singh, P., & Gogineni, A. (2022). Analysis of the Unexplored Security Issues Common to All Types of NoSQL Databases. Asian Journal of Research in Computer Science, 14(1), 1-12.

[12] Singh, P., Williams, K., Jonnalagadda, R., Gogineni, A., &; Reddy, R. R. (2022). International students: What's missing and what matters. Open Journal of Social Sciences, 10(02),

[13] Jonnalagadda, R., Singh, P., Gogineni, A., Reddy, R. R., & Reddy, H. B. (2022). Developing, implementing and evaluating training for online graduate teaching assistants based on Addie Model. Asian Journal of Education and Social Studies, 1-10.

[14] Sarmiento, J. M., Gogineni, A., Bernstein, J. N., Lee, C., Lineen, E. B., Pust, G. D., & Byers, P. M. (2020).Alcohol/illicit substance use in fatal motorcycle crashes. Journal of surgical research, 256, 243-250.

[15] Brown, M. E., Rizzuto, T., & Singh, P. (2019). Strategic compatibility, collaboration and collective impact for community change. Leadership & Organization Development Journal.

[16]Sprague-Jones, J., Singh, P., Rousseau, M., Counts, J., & Firman, C. (2020). The Protective Factors Survey: Establishing validity and reliability of a self-report measure of protective factors against child maltreatment. Children and Youth Services Review, 111, 104868.