Flood forecasting using Internet of things and Artificial Neural Networks With FFEIS

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Abstract— **Floods are the major challenges for human society both present and future. Effective and scientific management of water resources requires a good understanding of water cycles, and a systematic integration of observations can lead to better prediction results. This utilizes various types of ANNs in an attempt to assess the relative performance of existing models. A ahead forecast in particular proves to be of fairly high precision, especially when an error prediction technique is introduced to the ANN models. The model uses a modified mesh network connection over ZigBee for the WSN to collect data, and a GPRS module to send the data over the internet.**

The Proposed introduces a Water Resource Management Enterprise Information System (WRMEIS) that integrates functions such as data acquisition, data management and sharing, modeling, and knowledge management. A system called FFEIS (Flood Forecasting Enterprise Information System) based on the WRMEIS structure has been implemented. It includes operational database, Extraction-Transformation-Loading (ETL), information warehouse, temporal and spatial analysis, simulation/prediction models, knowledge management, and other functions. The results of the analysis which are also appended show a considerable improvement over the currently existing methods.

Keywords—**Wireless Sensor Network; Internet of things; Artificial Neural Network; ZigBee**

I. INTRODUCTION

Environmental changes and geographic conditions are the catalysts of disasters such as floods in river basins. Heavy rainfall and poorly developed systems, such as underdeveloped dams, cause a very rapid increase in water levels. The lack of cost-efficient but effective monitoring systems leads to devastating effects before flooding can be controlled. Every year, floods lead to significant damages to agriculture, economy and infrastructure.

Certain factors such as rainfall or storm paths can be accurately tracked with current technology. However, several other factors are required, such as water level, flow rate which can be collected from sensors. The Internet of Things (IoT) paradigm allows combining a wireless sensor network and a communication framework to rapidly transmit the data to specific control centers. These centers, in turn, can analyze the data and provide suitable countermeasures against floods.

Flood control presents several challenges for an IoT approach. It involves a complex set of parameters, with several interdependencies; this includes rainfall, pressure and flow rate. Depending on the parameters chosen, the sensor network has to be designed. The number of sensors and their interconnection depends significantly on the dimensions of the river itself. However, in general, a significant number of sensors are required for accurate prediction. Therefore, choice of topology determines communication time, with the likelihood of poor conditions during floods being another point of consideration.

Several flood prediction schemes have been proposed in literature. Traditional flood forecasting methods have been based on physical parameters, as used in hydrological models and tend to be deterministic. Other approaches involve statistical models, such as the Markov method. Machine learning approaches are also possible for flood forecasting. This may include support vector machines, artificial neural networks, fuzzy logic etc.

II. HOW DO THEY WORK?

Generally, watermarking involves the selection of a watermark carrier, and the design of two complementary processes: embedding and decoding. In the registration, we collect the watermark signature. The watermark embedding process inserts the information by a slight modification of some property of the carrier. The watermark decoding process detects and extracts the watermark (equivalently, determines the existence of a given watermark). To correlate encrypted connections, we propose to use the inter-packet timing as the watermark carrier property of interest. The embedded watermark bit is guaranteed to be not corrupted by the timing perturbation. If the perturbation is outside this range, the embedded watermark bit may be altered by the preserving.

The attribute data values the original values are grouped into new assigned key values that hide some sensitive pattern mining rules. To generate modified hiding data values be modified by reversible by one or more items from them or even adding key to the data by turning some items from various columns. The data formation in the form of sanitized group. This approach slightly modifies some data, but this is perfectly acceptable in some real application

In practice, the number of packets available is the fundamental. Limiting factor to the achievable effectiveness of our watermark based correlation. This set of experiments aim to compare and evaluate the correlation effectiveness of our proposed active watermark based correlation and previous passive timing-based correlation under various timing perturbations. By embedding a unique watermark into the inter-packet timing, with sufficient redundancy, we can make the correlation of encrypted flows substantially more robust against random timing perturbations. We can correlate the watermark signatures and identify it’s the positive or negative correlation, if positive occurs it detect it is the authenticated user otherwise, if negative occurs it detect it is an Intruder.

The watermark tracing approach exploits the observation that interactive connections are bidirectional. The idea is to watermark the backward traffic (from victim back to the preserving) of the bidirectional attack connections by slightly adjusting the timing of selected packets. If the embedded watermark is both robust and unique, the watermarked back traffic can be effectively correlated and traced across stepping stones, from the victim all the way back to the preserving, assuming the preserving has not gained full control on the attack target, the attack Target will initiate the attack tracing after it has detected the attack. Specifically, the attack target will watermark the backward traffic of the attack connection, and inform across the network about the watermark. The stepping stone across the network will scan all traffic for the presence of the indicated watermark, and report. To the target if any occurrences of the watermark are detected.

One simple technique to achieve this is to use a secret key to generate a pseudo-random sequence of randomized double seeds key distribution values with reordering data to hiding and secure key distribution for secure recovery of data from watermarking area. This technique is hereinafter referred to as parameter randomization.

This parameter exchange does not affect the effectiveness of lossless recoverability, because we can now recover the original pixel values by the compound mappings. We will refer to this technique in the sequel as mapping key randomization. We may also combine this technique with the parameter double key randomization technique to enhance the security. Finally, the Authenticated user takes the file in zip format with proper password

The recovery data restores the original data from the reversible hiding approach, and the original data is verified by the watermarks. After perturbing the mining data of PDE will have significantly small difference from the original data false points where PDE have a good privacy protection and lower information loss.

III. MODULES DESCRIPTION

1. Flood Monitor Subsystem

This system serves flood control watchers with some intonation, including the real-time water and rainfall situation, and the real-time project status, the forecast and operation results, flood control locale image. It also provides the function of alarm. The monitored objects mainly include the key reservoirs and flooded area.

2. Flood flow prediction

The reason these periods were chosen was to produce more general models. First a medium flow period was used for training, then a low flow period was used for testing and finally a high flow period, with values over those in the previous data sets, was used to validate the ability of the produced ANN to generalize. The aim was to create models that could forecast the flow with a lead-time that can be used for operational applications.

3. Neural Network Accelerators and Processors

NN-based accelerators are emerging as a promising domain specific accelerator, and researchers have investigated their features from various aspects. The study reveals that many applications can be fulfilled by different kinds of NNs, thus demonstrating the broad application scope of NN-based accelerators. A lot of researchers how to improve the versatility of neural processors and apply them to different areas. Approximation-based program transformation has been proposed to offload the approximate code onto the neural circuit.

4. FFEIS (Flood Forecasting Enterprise Information System)

Intonation service Subsystem. This system provides users with the comprehensive flood control information, including the real-time water and rainfall situation, and the real-time project status, the flood forecast and operation results, the flood disaster evaluation results, and all kinds of basic flood control materials, which are shown by the simple and intelligible interfaces with images, tables, texts, and videos. In the system, the different users can obtain different information service. Flood Forecast Subsystem. According to the real-time water and rainfall intonation and the rainfall forecast process, this system chooses related models to work out flood forecast results.

5. Decision Making Consultation Subsystem

This system is an important role in the process of flood control decision-making. Making use of some new technologies, such as communication, network, video and audio, it sends the visual thematic information oriented flood control to the consultation screens rapidly to support the decision making.

6. Flood Control Organization Subsystem

This system can manage the intonation about routine from the flood control department. The managed information mainly includes personnel, departments, flood fighting crew, flood control Materials, documents, fiancées, and projects. The system also can transfer flood control briefings, publish flood control alarms, and arrange and monitor flood control decision-making activities.

IV. CONCLUSION

At present the design and development of has FFEIS been fished successfully, and every subsystem is running normally and has played an important role in flood control Organization Subsystem. Each subsystem should be integrated and managed compactly, which makes FFEIS be a non-gap system. It should be an intelligent one. So some techniques, such as intelligent models, workflow, and data warehouse (DW), and data mining (DM), must be researched further. It is considerable to make use of spatial analysis of flood flow prediction, which will improve the capability of flood control decision- making.

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