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Flash floods prediction using real time data: An implementation of ANN-PSO with less false alarm
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Abstract
Flash floods and hurricanes are caused by the release of energy inside the oceans. Hurricanes are very sudden and may lead to heavy infrastructural damage with loss revenues associated human and animal's fatalities. Diversified techniques have been utilized to properly investigate the flash floods and hurricanes before the event. A hydro atmospheric and climatic change due to the hurricanes leads towards the high death toll. Approaches for the early prediction of flash floods and hurricanes may be categorized as (a) Modeling of the system (bathymetry), (b) Sensors and gauges-based measurement, (c) Radar-based images, (d) Satellite images and data, and (e) AI-based prediction. Comparative analysis of direct real-time data from the sensors and gauges, is more reliable compared to other techniques but it may contain some errors and missing information which leads towards the false alarms. Therefore, in this paper, a novel predictive hybrid algorithm (ANN PSO) has been applied to estimate the flash floods and hurricanes more precisely. A suitable combination of the sensors will give the benefit of better precision and improved accuracy when compare to the use of a single sensor. The combination of six process variables utilized in this paper for the measurement and investigation of the flash flood has been discussed. Real-time data of over forty eight (48) hours has been collected from PIR, Ultrasonic sensor, Temperature sensor, CO2 sensor, Rainfall module, Pressure, and temperature sensor. ANN feed-forward propagation is trained by using sample collected data from the multi-modal sensing device and applied for the classification of events while neurons are optimized by the particle swarm optimization (PSO), taking less processing time without requiring advanced complex computational resources. Results have proved that proposed AI based technique for the early identification of flash floods and hurricanes have worked more accurate and performance-wise better than the ongoing techniques. The results include flood probabilities and prediction analysis using proposed algorithm. © 2019 IEEE.

Author Keywords
Disaster management; Flash floods; Multi modal sensing; Sensors and instrumentation

Index Keywords
Disaster prevention, Disasters, Errors, Forecasting, Gages, Hurricanes, Hydrographic surveys, Particle swarm optimization (PSO), Temperature sensors, Ultrasonic applications; Comparative analysis, Computational resources, Disaster management, Flash flood, Missing information, Multi-modal sensing, Process Variables, Sensors and instrumentations; Floods

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