LITERATURE SURVEY

1) **Project Title:** Disaster Management Project Using Wireless Sensor Networks and artificial intelligence.

Authors:

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Abstract:

There are numerous projects dealing with disaster management and emergency response that use wireless sensor networks technologies. Indeed, WSNs offer a good alternative compared to traditional ad hoc networks. Air pollution monitoring, forest fire detection, landslide detection, natural disaster prevention, industrial sense and control applications, dangerous gas leakage, water level monitoring, vibration detection to prevent an earthquake, radiation monitoring are examples of the WSN applications related to disaster management. This paper presents an overview of the recent projects using WSN to collect data in disaster areas.

Drawbacks:

A big disadvantage of AI is that it cannot learn to think outside the box. AI is capable of learning over time with pre-fed data and past experiences, but cannot be creative in its approach.

2) **Project Title:** RoboCup Rescue: Search and Rescue in Large-scale Disasters as a Domain for Autonomous Agents Research.

Authors:

Kitano, H., Tadokoro, S., Noda, I., Matsubara, H., Takahashi, T., Shinjou, A., & Shimada, S. (n.d.).

Abstract:

Disaster rescue is one of the most serious social issue which involves very large numbers of hetergenious agents in the hostile environment. RoboCup-Rescue intends to promote research and development in this socially significant domain by creating a standard simulator and forum for researchers and practitioners. While the rescue domain intuitively appealing as large scale multi-agent domains, it has not yet given through analysis on its domain characteristics. In this paper, we present detailed analysis on the task domain and elucidate characteristics necessary for multi-agent systems for this domain.

Drawbacks:

1. RoboCup is designed to ensure smooth transfer of technologies developed in current RoboCup soccer, as well as promoting innovation by itself as it complements features missing in soccer.

2. RoboCup-Rescue has both simulation and real robot aspects, each of which initially focus on different aspects of overall activities.

3. This paper focused on overall strategy planning aspect using a simulation. As it is clearly illustrated, RoboCup-Rescue is a rich source of research, and direct contribution to the society is expected.

3) Project Title: Automated Disaster Monitoring From Social Media Posts Using AI-Based Location Intelligence and Sentiment Analysis

Authors:

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Abstract:

Worldwide disasters like bushfires, earthquakes, floods, cyclones, and heatwaves have affected the lives of social media users in an unprecedented manner. They are constantly posting their level of negativity over the disaster situations at their location of interest. Understanding location-oriented sentiments about disaster situation is of prime importance for political leaders, and strategic decision-makers. To this end, we present a new fully automated algorithm based on artificial intelligence (AI) and natural language processing (NLP), for extraction of location-oriented public sentiments on global disaster situation. We designed the proposed system to obtain exhaustive knowledge and insights on social media feeds related to disaster in 110 languages through AI- and NLP-based sentiment analysis, named entity recognition (NER), anomaly detection, regression, and Getis Ord Gi* algorithms. We deployed and tested this algorithm on live Twitter feeds from 28 September to 6 October 2021. Tweets with 67 515 entities in 39 different languages were processed during this period. Our novel algorithm extracted 9727 location entities with greater than 70% confidence from live Twitter feed and displayed the locations of possible disasters with disaster intelligence. The rates of average precision, recall, and F_1-Score were measured to be 0.93, 0.88, and 0.90, respectively. Overall, the fully automated disaster monitoring solution demonstrated 97% accuracy. To the best of our knowledge, this study is the first to report location intelligence with NER, sentiment analysis, regression and anomaly detection on social media messages related to disasters and has covered the largest set of languages.

Drawbacks:

1. Inaccuracy in classifying a disaster related tweet
2. Limited support of language
3. Limited support of disaster types
4. Inaccuracy in identifying disaster location

4) **Project Title:** Distributed Event Detection in Wireless Sensor Networks for Disaster Management

Authors:

Bahrepour, M., Meratnia, N., Poel, M., Taghikhaki, Z., & Havinga, P. J. M. (2010).

Abstract:

Recently, wireless sensor networks (WSNs) have become mature enough to go beyond being simple fine-grained continuous monitoring platforms and become one of the enabling technologies for disaster early-warning systems. Event detection functionality of WSNs can be of great help and importance for (near) real-time detection of, for example, meteorological natural hazards and wild and residential fires. From the data-mining perspective, many real world events exhibit specific patterns, which can be detected by applying machine learning (ML) techniques. In this paper, we introduce ML techniques for distributed event detection in WSNs and evaluate their performance and applicability for early detection of disasters, specifically residential fires. To this end, we present a distributed event detection approach incorporating a novel reputation-based voting and the decision tree and evaluate its performance in terms of detection accuracy and time complexity.

Drawbacks:

1. For fast and accurate detection of disastrous events using WSNs, in this paper we propose a distributed event detection technique. Our proposed approach is based on detecting events using decision tree classifiers running on individual sensor nodes and applying a voting to reach a consensus among detections made by various sensor nodes. The motivation behind choosing decision trees is their simplicity and explicit form of expression as if-then-else rules that full fill the requirements posed by resource limitations of WSNs.

2. The experimental results on residential fire datasets show that this approach not only achieves a high detection rate but also has a low computational overhead and time complexity.

5) **Project Title:** The Use of Artificial Intelligence in Disaster Management

Authors:

1) Vimala Nunavath - Center for Artificial Intelligence Research Group, University of Agder Department of ICT, Grimstad, Norway.

2) Morten Goodwin- Center for Artificial Intelligence Research Group, University of Agder Department of ICT, Grimstad, Norway.

Abstract:

Whenever a disaster occurs, users in social media, sensors, cameras, satellites, and the like generate vast amounts of data. Emergency responders and victims use this data for situational awareness, decision-making, and safe evacuations. However, making sense of the generated information under time-bound situations is a challenging task as the amount of data can be significant, and there is a need for intelligent systems to analyze, process, and visualize it. With recent advancements in Artificial Intelligence (AI), numerous researchers have begun exploring AI, machine learning (ML), and deep learning (DL) techniques for big data analytics in managing disasters efficiently. This paper adopts a systematic literature approach to report on the application of AI, ML, and DL in disaster management. Through a systematic review process, we identified one relevant hundred publications. After that, we analyzed all the identified papers and concluded that most of the reviewed articles used AI, ML, and DL methods on social media data, satellite data, sensor data, and historical data for classification and prediction. The most common algorithms are support vector machines (SVM), Naïve Bayes (NB), Random Forest (RF), Convolutional Neural Networks (CNN), Artificial neural networks (ANN), Natural language processing techniques (NLP), Latent Dirichlet Allocation (LDA), K-nearest neighbor (KNN), and Logistic Regression (LR).

Drawbacks:

1) Converse the risk and its uncertainty.

2) The drawback of AI in disaster response is that it's very challenging to properly train the models to accurately interpret a disaster.