Transport Route Optimization Using AI Disaster Management

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***Abstract*—Because of its unique geo-climatic circumstances, our earth has always been subject to catastrophic disasters. Despite the fact that we cannot prevent an earthquake or a tsunami, we can prepare for them. Prevent a storm from forming or a volcano from erupting. We can put scientific knowledge to use. Disaster risk reduction requires both technical and scientific understanding. Disaster risk and disaster management supervision Scientific knowledge and evidence-based technique copying are heavily reliant on events. with dangers One of the most difficult issues is determining if something is natural or caused by human activity. of science and technology's applications Artificial intelligence has the potential to help with a variety of issues. By mobilising relief resources more efficiently and effectively, the damage can be minimised. It has the ability to accelerate. aid delivery and enhance the decision- making of front-line relief workers AI's application is quickly becoming the norm in database management, with the goal of carrying out operations and objectives. Prepare effectively, respond promptly and swiftly, efficiently allocate resources, repair damages, restore functionality, protect the community, and reduce the negative impact of disasters.**

I. INTRODUCTION

In recent years, earthquakes have become more common, and China has been one of the hardest hit countries. The earthquake wreaked havoc on the country's economy and social development. It is vital to conduct route study in this situation. In the earthquake optimization through an examination of the current earthquake situation. This study discusses the earthquake disaster emergency road logistics. Effects of route selection on transportation, such as distribution lines, total delivery time, and traffic volume the capacity of road traffic and the safety variables that influence decision-making are discussed, as well as the aim. That is something that the earthquake disaster emergency logistics management must accomplish. The introduction of the minimum time and maximum flow theory, then build the model and determine the choice of transport route of the earthquake disaster emergency logistics system, the basic train of thought to clear the way and set volume limitation conditions of the cargo, set the logistics emergency system by earthquake disaster road transport route choice model and propose some solutions for this model algorithm. Finally, the study validates the feasibility of the model and the algorithm using an example.

II. LITERATURE SURVEY

We will explore numerous approaches and methodologies for transportation route optimization utilizing AI disaster management in this survey.

The approaches employed by Daekyo Jung et al [1] are with climate change, natural disasters have grown in frequency and intensity when compared to those in the past. As a result, combining a huge data store and machine learning, we suggested a support system for disaster response decisions in this study. We concentrated on forest fires and hot/cold disasters, which each year result in enormous loss of lives and property. Current disaster relief solutions, which Rely on basic data collection methods, efficient visualization, storage systems, and big data analysis, are insufficient. In other nations, video data is mostly used in big data analysis during the full disaster management process, including prevention, preparation, response, and recovery. As well as social media we created a big data analysis technique to help decisions for heat wave disasters based on past research and advocated its use. In addition, a basic example of employing a CNN to detect fire in a surveillance video was presented.

Yougendra M [2] suggested a paradigm in which the primary source of this research is a questionnaire for the study of artificial intelligence and how it may be used to manage disasters while being sensitive to management and effect reduction. A second source the secondary data was gathered from online websites and articles about technologies and their use in disaster risk reduction, and the data analyst was used to study Artificial Intelligence for Disaster Management using a questionnaire that identifies the areas where AI is needed and the challenges associated with it. The data is crucial in this case because it can be utilized to analyze the conditions and crises that arise during a disaster and come up with a solution. As a result of these crisis situations, management has taken on a new role.

Sheikh Kamran Abid and colleagues [3] suggested a scenario in which MOBILISE, A new AI platform is designed to build resilient communities through cross-agency collaboration. MOBILIZE provides civil protection agencies with real-time information, enabling them to collaborate on disaster preparedness under one roof [60]. The MOBILIZE platform is an easy-to-use API that allows authorities to interactively upload and examine hazard, exposure and vulnerability data to develop a shared understanding of local risks and implement disaster risk reduction measures .The MOBILIZE server, the on which the risk information is based is hosted on Microsoft's Azure cloud platform. MOBILIZE also has a virtual reality interface. This virtual reality interface allows users to view 3D representations such as textured point clouds or meshes captured by airborne detection devices such as drones. MOBILIZE is an online platform that visualizes modeled hazards and the impact of disasters. MOBILIZE Real-time 3D data visualization aids disaster relief by presenting information in layered form, e.g. B. Flood prone areas, forecast rainfall and drainage lines.

Two options were given by Hamid Tikani et al. [4]. One of them is the Genetic algorithm, which is a sophisticated meta-heuristic search algorithm that has emerged as a powerful resilient optimization in many real-world applications. Holland was the one who first presented the idea (1975). The algorithm was motivated by Darwin's survival of the fittest notion and evolutionary dynamics. To establish an initial population, it mimics natural genetics. Each population is made up of different individuals (chromosomes) that are encoded answers to the challenge at hand. The objective function is used to calculate each individual's fitness. Following that, members of a population go through an evolution process that includes selection, cross-over, and mutation operators, as well as the tabu search method, which is a meta-heuristic strategy proposed by Glover (1989, 1990). To avoid the earlier local optimum, it uses an adaptable memory called tabu list. The technique iteratively evaluates certain neighbor solutions to find the solution space. These solutions are created by making minor changes to an existing solution on a local level. During the searching process, the flexible memory collects the used operations and applies stored information to forbid previously visited solutions for a certain period of time.

P. M. Kikin et al. [5] suggested a method for semantic segmentation of roadways utilizing various remote sensing data, including UAV, satellite, and SAR. Our workflow was broken down into three distinct stages. The raw remote sensing data was calibrated and converted to geocoded images in the first preprocessing stage. We created a few models for pixel-based road state recognition during the second step, segmentation, to assess different deep learning approaches. - data from optical satellites separately - data from SAR satellites separately - data from optical and SAR together - data from UAVs separately we created a road state map from the outputs of the constructed models in the final phase, mapping.

The approaches employed by S. Azimi et al. [6] are two types of rescue operations that were implemented in a multi-agent-based simulation environment. In the first type of rescue operation, after determining the MWNVD for each emergency centre, the appropriate emergency centre is assigned to the demand location based on the generated MWNVDs. The ambulance is delivered to the demand location by the emergency centre due to the priority of the demand. The ambulance route is planned with the purpose of reducing route length and travel time at the start of its journey, but it is unable to update when it encounters a closed roadway. The PSO iterative process in the MWNVD reduces the difference between the first and second types of rescue operations. The supply (the population expected to use the services in the region) and demand (the predicted population living in the region) are calculated. As a result, each emergency center's optimal PSO-MWNVD and ambulance number are calculated. The ambulance from the proper emergency centre, which is located in PSOMWNVD and includes the location of the wounded, is deployed to the wounded location, based on the severity degree of the wounded and the emergency center's existing ambulances.

P. M. Kikin and colleagues [7] presented a two-part self-cr system. 1. the managed system, which consists of a state representing the disaster-affected region and operations to modify the state, which reflect disaster managers' actions in the disaster-affected region; and 2. the managing system, which consists of a four-phase MonitorAnalyze-Plan-Execute (MAPE) feedback loop (Kephart and Chess 2003), a paradigm commonly used to engineer self-adaptive software-intensive systems. The self-cr system is constantly sensing crucial information from the Auckland region, such as changes in resourcing in Auckland, as sensed by, for example, the self-cr system. Reports on travel conditions throughout the region, e.g., online traffic tracking services, social media analysis, and eyewitness accounts, from health-care professionals at clinics, hospitals, or triage stations, and reports on travel conditions throughout the region, from e.g., online traffic tracking services, social media analysis, and eyewitness accounts.

Wei Wang et al. [8] devised a technique that solves typical multi-objective programming problems using idle points. For objective functions P(Ψ, t) and C(Ψ), we obtain the positive ideal points PΨ (, t) and C(Ψ), as well as the negative ideal points P(Ψ, t) and C(Ψ). Then, using Equation (5), we calculate proximity to validate the relative proximity of each feasible plan to the ideal spots. A higher value denotes a superior solution. The initial multi-objective problem has now been reduced to a challenge of achieving maximum closeness.

$\varepsilon = R\ R{+}r\ (0 \leq \varepsilon \leq 1)$

$R = \omega 1\ P(\Psi, t)\ P(\Psi,t) + \omega 2\ C(\Psi)\ C(\Psi)$

$r = \omega 1\ P(\Psi, t)\ P(\Psi,t) + \omega 1\ C(\Psi)\ C(\Psi)$

where w1 and w2 are the weights assigned to the feasibility of the feasible strategy and the cost of rescue, respectively. Experts determined their values, and w1 + w2 = 1

Subash Humagain and colleagues [9] proposed To find, dispatch, and route electric vehicles, most emergency management systems require dedicated software. EVs have installed software such as Sygic and Infoware that uses specialised traffic information to guide the driver to the emergency site. To ensure that EVs arrive at their destinations on schedule, route optimization software is used. Path-based optimization: Taking the shortest path between an EV's source and its intended destination appears to be the most efficient way to reduce travel time. Dijkstra's shortest path algorithm is well-known in computer science for such optimization, and several of the surveyed works expand it in some way. Time-based optimization: When it comes to EV routing, the real time it takes to get at the emergency site is more essential than distance, cost, or fuel consumption. Cooke and Halsey were the first to offer theoretical insights into shortest path algorithms with varying transit times between vertices based on physical characteristics. For EVs, Hadas and Ceder used the shortest path technique to generate various time-based paths.

Xiaowen [10] several depots are chosen as intermediary places to collect goods from the manufacturer and then distribute them to local areas, according to the approach utilized to improve service efficiency. Let N = 1, denote the number of areas, and K m = 1, denote the number of possible depot locations. Each prospective depot site k K has a limited storage capacity hk and an opening fee gk. As a result, we model the location routing problem as a directed graph G V E = (,), where V N K = and E I j I j V I j = (,) (,) represents the arc set from one location to the next (except for arcs with two depots). We define nodes 0k and (1) n + k as the origin and destination points of vehicles departing from candidate depot location k, which is the selected depot in practice. For delivering supplies from the designated depots to the areas, a set R of homogeneous vehicles, each with a storage capacity Q and a fixed cost C, is provided. None of the vehicles are privately owned by any of the depots, and they can be assigned to any depot to transport goods as needed on a daily basis.

Xuejie Bai [11] suggested a novel model that solves a new two-stage optimization strategy for a multi-supplier, multi-affected area, multi-relief, and multi-vehicle emergency supplies allocation problem.The major members of the emergency logistics network are aid providers and affected localities. In the emergency supply allocation dilemma, there are two steps to the decision-making process. In any disaster scenario, the first stage addresses the selection of a set of candidate relief suppliers and the number of different vehicles, whilst the second stage considers vehicle routing and reliefs allocation.

Charles Petrie [12] developed a concept in which data is retrieved from a GIS as needed. A web service is a generic approach to do this without committing to any single technology, as long as the API has inputs and outputs. A GIS can thus be queried by the planning system when the alarm system wants to know which valleys will be flooded or which evacuation routes will be used. In a first prototype, we've proved this. We are working on the SANCTUM project to demonstrate how to codify a comprehensive catastrophe management model that focuses on disaster responses. This concept presupposes the French government's current distributed problem-solving approach. A central crisis management group, let's call it CCMG, is formed when a disaster is expected. When a calamity is expected, a central crisis management group, or CCMG for short, calculates the most likely scenarios. apologizes to the impacted agencies and requests contingency arrangements.

AUTHORS	METHODOLODY	CONTRIBUTION
Daekyo Jung	The self-care system continuously collects important information fromthe Auckland area.	Self-adaptive system monitors analysis level execution feedback loop.
Yougendra	A new AI platform called MOBILIZE is designed to build a resilient community to leverage thecollaboration of multiple.	This study reviewed various AI applications and identified themethods and approaches implemented during the disaster management phase.
Sheikh Kamran Abid	SDLC was used to develop thesystem.	Developing mobile and web applications for emergency response for people trapped in acollision site.
Hamid Tikani	Path-based optimization Time- based optimization.	Optimization and preemption canprovide a solution to reduce the response time.
P. M. Kikin	AIIDSS with multifunctional AIalgorithm.	Providing automatic fire detectionand appropriate response.
S. Azimi	Efficient metaheuristic method based on ACO of hybrid framework.	Timely and cost effective This method provides a better operational plan for decisionmakers.
P. M. Kikin	Roads semantic segmentation the usage of distinct far flung sensing data: UAV, satellite tv for pc and SAR.	SAR data is useful for road assessment and mapping during emergency response.
Wei Wang	GIS can be queried by planningsystem.	Request information from GISas needed.
Subash Humagain	Two-step optimization procedure for emergency supply allocation problem.	Emergency response allocation plans can provide rapid and effective guidance for scientific decision making and disaster management assistance.
Xiaowen	Data analysis	The AI system has the ability tolearn and analyze.
Xuejie Bai	Multi-agent-based model foroptimal ambulance allocation.	Focused on smarter urbanfacilities to improve remedy.
Charles Petrie	The problem is a typical multi- purpose planning problem and this paper uses ideal points to solve it.	The proposed algorithm waseffective because it was able to find the optimal scheme in a fewiterations.

III. APPLICATIONS OF TRANSPORT ROUTE OPTIMIZATION IN DISASTER MANAGEMENT USING AI

An ambulance is a vehicle designed to transport sick or injured individuals. Ambulances are normally dispatched to persons in crises to transport them to the hospital. MAN's multi- functional rescue vehicles are uniquely prepared to deal with a wide range of emergency scenarios, including car accidents, floods, earthquakes, riots, and so on. Light masts, ladders, cranes, hydraulic cutters, electric generators, and other emergency items are included in the vehicles. It is critical for emergency vehicles such as police cars, ambulances, fire engines, and multi-functional rescue vehicles to get at the destination or hospital as soon as possible in order to save people's lives. Using various optimization techniques, we aim to discover the best solution in terms of distance and time to get to the destination or hospital as quickly as feasible.

IV. IMPLEMENTATION

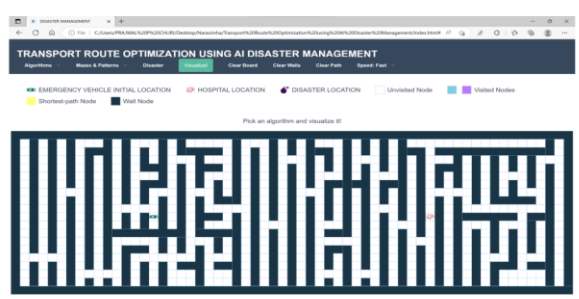

Figure : The Above Figure Showes the Maze that is generated when the option is selected

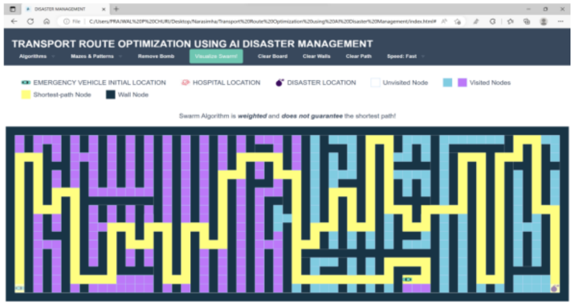

Figure : The Above Figure Showes the Route That is generated when the generate button is clicked

IV. CONCLUSION

Based on satellite imagery data, unmanned aerial vehicles (UAVs), and SAR employing various image analysis algorithms, a strategy for detecting damage and detecting the state and availability of the road network has been developed. We want to create an AI-driven software that can follow emergency vehicles and advise the quickest route for the driver to get to their destination in the lowest amount of time.

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