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VIRTUAL REALITY BASED SYSTEM FOR POST FLOOD RELIEF MANAGEMENT

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Abstract : This paper outlines a virtual reality-based post flood relief management system that can identify and provide for the needs of flood victims right after the effect of the flood without human intervention. Floods have damaging effects on people, the environment, and the economy. Food shortages can occur; some may be unable to consume available food because of diseases/fever that can spread, leading to sickness. People can lose their belongings and in some emergency cases, there are shortfalls of medicine and other critical supplies. Supplying the correct and necessary need for the victim is crucial, so misinterpretations in this process can lead to shortage of supplies. Hence, we have proposed a strategy that leverages VR projection technology to help people from these adverse impacts. Using this projection-based model, it allows the victims to choose their desired needs by blocking the respective option on the projection and the dispatch component of the model can then distribute supplies according to their requests with the help of a dispensing system using a Microcontroller.

IndexTerms - *Flood relief, VR projection, machine learning, yolo v3, dispensing system*

I.INTRODUCTION

Urban flooding is increasingly seen as a threat to property and human life. In the Indian state of Sikkim in the northeast, heavy rains in 2023 caused a glacial lake to overflow its banks, resulting in flash floods that rushed down a mountain valley and left 14 people dead and 102 missing. Days of heavy rainfall in late July and early August 2019 wreaked havoc across many states including Madhya Pradesh, Kerala, Gujarat, Maharashtra, Goa, Odisha, Andhra Pradesh, Pune, Punjab, Assam and Bihar. Tamil Nadu experienced record-breaking rains and flooding in December 2015. There have been major floods in northern India as well. The heavy precipitation led to flooding in Chennai. Residents came together to rescue others when water levels rose dangerously high in their homes. Life came to a complete standstill. Many were left homeless and dependent on disaster relief due to weather-related damage. The unexpected nature of the Chennai flood made it especially difficult for those with disabilities. While some still require rescue, others are in much greater danger because they misplaced vital equipment that was washed away or raced out when the waters began to rise. Food, water, blankets and medicine were among the supplies provided by the government. When people needed medication, they were given it in exchange for food, even if the medicine was unnecessary or unsuitable for their needs. In the traditional ways, a helicopter is being used to deliver flood relief supplies to victims, and to communicate the requirements of the victims, hands gestures are used and based on that interpretation distribution of provisions are done from the helicopter. This leads to misguide of information and wastage of the supply resources. To overcome this challenge, we propose a novel method utilizing virtual reality projection remotely from a helicopter.

II. LITERATURE SURVEY

Jeeva et al. [1] introduced a digital holographic system aimed at streamlining post-flood relief efforts by facilitating automated assessment and distribution of essential supplies. Utilizing holographic projection and computer vision, flood victims can select needed items, triggering a response from Arduino microcontrollers to dispense the requested supplies. While the prototype demonstrates feasibility, further development is required for robust field deployment. Shashikala V et al. [2] presented an augmented reality-based smart restaurant system, leveraging holographic projection for automated menu ordering. Customers interact with a 3D hologram menu projected onto dining tables, streamlining the ordering process. Orders are wirelessly transmitted to the kitchen, reducing errors and workload for restaurant staff. Additionally, the system automates billing, enhancing the overall dining experience. Purnomo et al. [3] developed a virtual reality application for flood disaster simulation

and education, providing an immersive platform for training and preparedness. Users navigate a 3D environment representing flood-prone areas, receiving instructions and alerts based on flood warning stages. This application demonstrates the educational potential of VR technology in disaster management. Bhatt et al. [4] introduced a wireless sensor network deployed via aerial vehicles for real-time data collection during floods. Custom-designed sensor nodes collect emergency data, optimizing resource allocation and rescue operations. Through simulations, this network demonstrates improved efficiency compared to existing protocols, highlighting its potential in flood disaster management. Achutha et al. [5] proposed a virtual reality technology for efficient relief distribution, utilizing holographic images projected from helicopters. By allowing victims to select needed supplies through blocking images, this system streamlines relief efforts and ensures targeted aid delivery. Through machine learning and microcontroller automation, relief supplies are dispatched effectively. Pandiyan et al. [6] introduced a virtual reality system that projects interactive touch controls onto walls, offering a novel approach to human-machine interaction. By analyzing hand gestures and shadows, users can trigger actions without physical buttons, improving flexibility and user experience. This system has potential applications in industrial safety, enabling remote equipment control and adaptability to user needs. In summary, these studies contribute valuable insights into innovative post-disaster management technologies, offering opportunities for the development of tailored systems to enhance flood response efforts.

III.METHODOLOGY

The methodology involves using projection to identify the victim's need, processing the selected image through machine learning, transmitting the data, and controlling motors through an Esp32 microcontroller and relay to dispatch the required material to the flood victims.

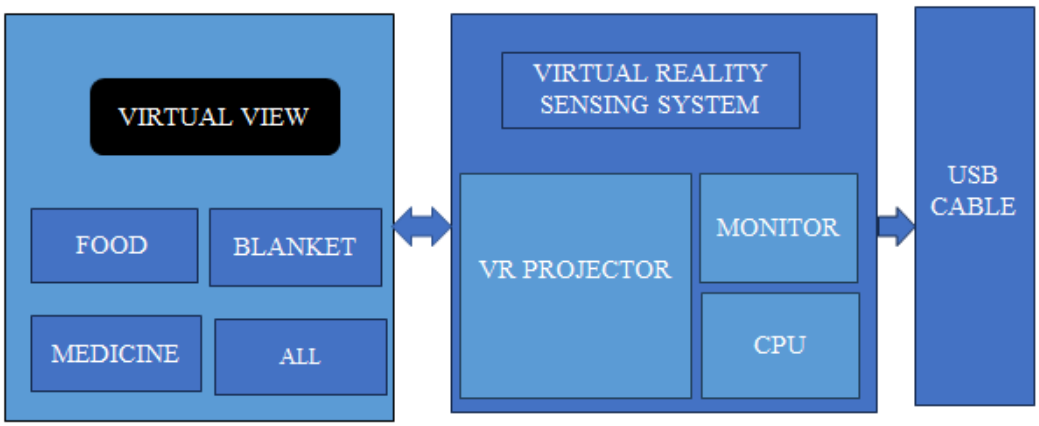

Fig1. Transmitting section

The above figure 1 represents the transmitting section of the post-rescue management system designed for flood scenarios, the process begins with the conclusion of the virtual environment projection. Once this projection ends, victims within the virtual reality environment are presented with an interface through which they can interactively communicate their specific needs. This interface allows them to select from a range of options, indicating their requirements for assistance, such as food, blankets, medicine, or other essentials relevant to their situation.

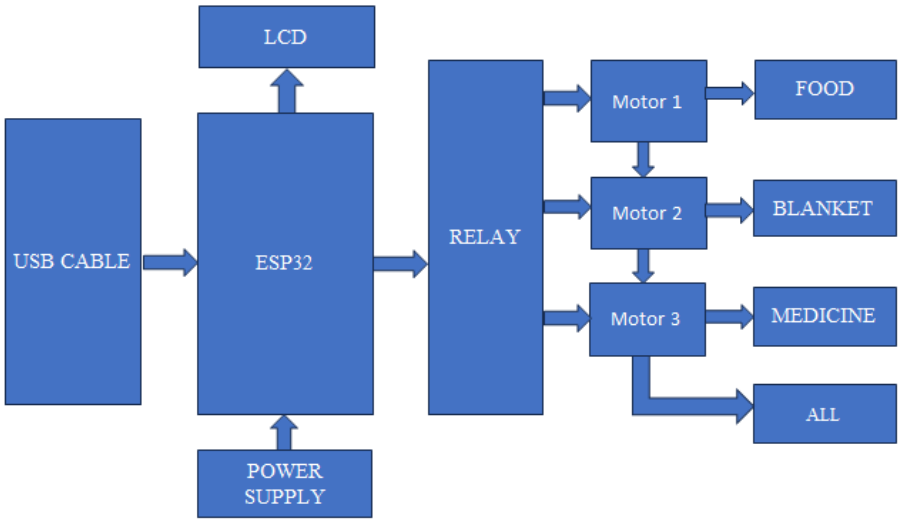

Fig2. Receiving section

In the receiving section as shown in figure 2, the transmitted data is received by the ESP32 microcontroller through a data cable connection. The ESP32, equipped with the YOLO object detection algorithm, acts as the central processing unit responsible for deciphering the received data and extracting meaningful information from it. Using the YOLO algorithm, the ESP32 analyzes the transmitted data to identify and categorize the victims' needs effectively. This algorithm enables precise recognition and classification of objects or items indicated by the victims, ensuring that their requirements are understood accurately. Once the needs are identified, the ESP32 initiates appropriate actions based on the received information. For example, if a victim selects "food" as their requirement, the ESP32 triggers relays and a DC motor to dispense food supplies. Similarly, for other needs such as blankets or medicine, corresponding actions are taken to provide the necessary assistance. Furthermore, to provide feedback and confirmation to both victims and rescue personnel, the identified needs are simultaneously displayed in real-time on an LCD screen within the virtual reality environment. This display ensures that victims are aware that their requests have been acknowledged and are being addressed promptly.

IV.IMPLEMENTATION STEPS

1. Virtual Reality (VR) Projection:
First implementation step is projection of an image that contains options of various items like food, medicine, blanket, and all. The image is projected using a projector.

2. Victim's Requirement Selection:
The flood victim blocks or selects from the projected image representing their specific need (food, medicine, blanket, or all).A web camera senses the blocked or selected image.

3. Image Detection and Processing:
The webcam detects the blocked image using an machine learning algorithm YOLOv3.Machine learning techniques are used to detect and recognize the selected image based on object detection.

4. Wired Communication:
The data representing the selected image is transmitted using a data cable on the transmission side. The receiving side receives the data through the same.

5. Microcontroller and Relay Control:
The respective data is sent to an ESP32 microcontroller using UART communication. [DOUBT]The esp32 microcontroller activates a 12V relay based on the received data.

6. Motor Activation and Material Dispatch:
The activated relay supplies power (12V) to a specific motor corresponding to the selected item (food, medicine, blanket, or all). The motor operates to dispatch or drop the required material safely to the flood victim
7. Display:
An LCD display is used to indicate the function or material being dispatched based on the flood victim's need.

Finally, we can deploy the system in a real-world setting, i.e. a helicopter, to detect the options blocked or selected by the victims and to dispense the respective items. Overall, this is a high-level summary of the procedure. Depending on the project's specific requirements, real implementation may necessitate extra phases or revisions.

V.RESULTS

The proposed virtual reality based post-flood relief system aims to address the challenges faced by flood victims in receiving appropriate relief materials. The system utilizes cutting-edge technologies such as virtual reality projection, machine learning, and wired communication to bridge the gap between the needs of flood victims and the distribution of relief supplies. The implementation of this system has the potential to revolutionize the way disaster relief operations are conducted, ensuring that the right aid reaches the right people in a timely and efficient manner. The above fig.4.1. shows us the real time implementation of the selection process performed by the victims once they witness the projection from the helicopter. As we can observe here the food option is blocked and that hand is identified and that particular block section is selected. Now through wired communication the selected block data is transmitted to the esp32 microcontroller which is integrated with relays and a lcd. On the LCD the text “food dispensing " will appear once food option is opted and the first relay (relay out 1) will turn on. The similar process takes place for the other two options. For the last ‘all’ option, i.e., all the 3 options are to be provided to the victims, is blocked and this data is transmitted to the esp32 which will enable the LCD to display the text " all units dispensing " and all the 3 relays will turn on respectively. Overall the process demonstrates how victims select their needs following the projection. When a choice is made, such as food, the system displays "food dispensing" on the LCD and activates the first relay. Similarly, selecting medicine triggers "medicine dispensing" on the LCD and activates the second relay. The choice of blankets results in "blanket dispensing"

on the LCD and activates the third relay. Opting for all options prompts "all units dispensing" on the LCD, activating all three relays. This system streamlines victim selection and provides real-time feedback on the LCD. The results presented in the paper demonstrate the potential of this system to significantly improve the efficiency and accuracy of post-flood relief efforts. By eliminating the need for physical interaction or communication barriers, the system ensures that the right aid reaches the right people, reducing the likelihood of mismatched or inappropriate relief distribution. This not only optimizes the use of available resources but also contributes to the overall well-being and recovery of the affected communities.

Fig3.Projection of victims requirements

Fig4. Proposed model

CONCLUTION

In conclusion, the virtual reality based post-flood relief management system proposed in this paper represents a innovative and promising solution to the challenges faced during disaster relief operations. By seamlessly integrating cutting-edge technologies, this system addresses the critical need for effective communication and accurate distribution of relief materials. With further development and implementation, this system has the potential to become a game-changer in the field of disaster management, ensuring that the needs of vulnerable populations are met swiftly and efficiently, ultimately saving lives and facilitating the recovery process.

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