Abstract: Investigating the use of Wearable Technology to Improve the Safety of Humanitarian Workers in Dangerous Situations

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I. Background

THE team from the Queensland University of Technology partnered with Engineers Without Borders Australia on a research project aiming to increase the safety of humanitarian aid workers whilst deployed to dangerous locations.

The United States Bureau for Humanitarian Assistance released a data set in August 2021, confirming a trend of increasing violence against humanitarian workers across the world. According to this data, 2020 saw 475 humanitarian workers fall victim to violence, including 108 deaths and 125 kidnappings [1]. The Conversation (2021) reports that in June 2021, three Médecins Sans Frontières workers were shot and killed in Tigray, Ethiopia, forming the latest horrific statistic [2]. Security issues facing humanitarian workers are also highly complex in nature, and the Harvard Humanitarian Institute describes the many existing conflicts and gaps in security management which ultimately decrease the safety of aid workers [3].

The refugee camps in the Cox's Bazar District of southern Bangladesh were taken as a case study by the team, due to their high density of humanitarian workers in the camps and the significant risk of violence they face.

To ensure a culturally appropriate solution, a human-centred design approach was adopted. Surveys were sent to humanitarian workers with experience in refugee camps, which provided first-hand responses about current safety and security practices, telecommunication systems, physical challenges, etc.

II. Design Solution

The proposed solution explores the development of wearable devices worn by humanitarian workers which wirelessly transmit alert messages to a centralised response team. When humanitarian workers are facing an immediate threat of violence, have been forcibly removed from their working area, etc., a response and rescue team will be instantly informed of their situation and have the individual's live location. Figure 1 represents the various trigger conditions and alerts that have been designed to provide appropriate support based on the situation.

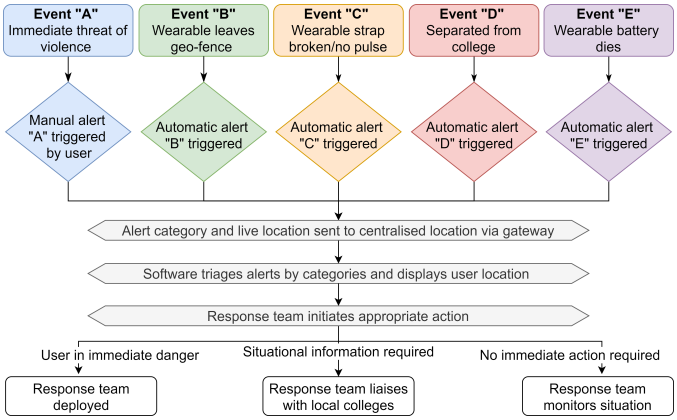

Fig. 1. System Process

Considering most camps globally are located in remote areas with limited access to large-scale communication infrastructure, a proprietary Low Power Wide Area Network (LPWAN) based upon Semtech Long Range (LoRa) technology has been proposed.

The base functionality of the system has been demonstrated through a proof-of-concept focused upon the ability to trigger an emergency alert which periodically transmits geo-location information. For rapid prototyping, the wearable was built upon an Arduino Uno microcontroller with a Dragino LoRa/GPS shield as well as a RAK831 Pilot Gateway used to receive and monitor the data. Figure 2 presents the overall system architecture.

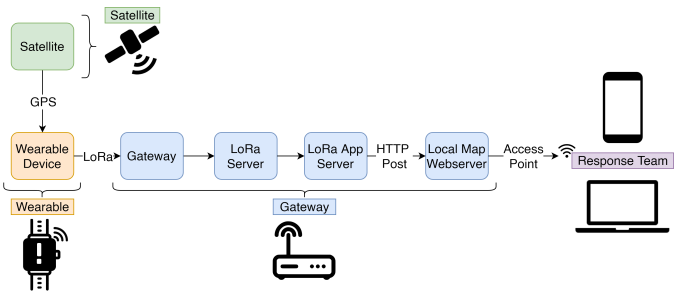

Fig. 2. System Architecture

The gateway was programmed to not only manage the LoRa server, but also integrate the received data with a local webserver to visualise the geo-location of the wearable on a map interface. Being completely decentralised, the network is capable of operating without external connections to the internet as well as being able to operate in remote locations with a simple renewable power system.

III. Further Opportunities

This feasibility investigation found that the proposed solution has potential to increase the safety of humanitarian workers and opens the opportunity for detailed design and implementation. There is also the opportunity for a similar design to be adopted in other locations beyond this case study of Cox's Bazar, Bangladesh.

References

[1] B. for Humanitarian Assistance (BHA) USAID, "Major attacks on aid workers: Summary statistics," https://aidworkersecurity.org/incidents/report, 2021.

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[3] H. H. Institute, "Protecting humanitarian action: Key challenges and lessons from the field," https://bit.ly/2YoYqQz, 2021.