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Enhancing Child Safety through Wearable IoT Devices: Real-Time Monitoring and Reporting of Distress Levels using Machine Learning.

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ABSTRACT

Child safety and well-being remain paramount concerns in today's world. To address the pressing issues of child abuse and missing child cases, we introduce a wearable Internet of Things (IoT) device designed to provide parents and guardians with real-time tracking and comprehensive monitoring capabilities while addressing privacy concerns. Several of such monitoring devices have been commercialised internationally utilising location beacons. The drawback is that the devices in use are predominantly location-based. GPS locators do not have a mechanism to provide context whether the device is still worn by the child and other significant aspects of monitoring like distress levels. Further, there are no such devices available and fabricated locally in spite of the looming challenges. The proposed wearable IoT device is equipped with sensors to monitor essential physiological parameters, including heart rate, audio and location. The overall goal in this approach is to provide a general state of the child's well-being without transmitting sensitive information unless the system so deems. The wearable IoT device incorporates sensors to monitor key physiological factors such as heart rate, audio, and location, allowing for an assessment of the child's well-being and surroundings. Heart rate monitoring serves to detect distress, ensuring the device's constant connectivity for emergency response. Audio analysis provides insights into the child's activities and overall condition, while geofencing using location data enables the establishment of safe zones. If the child strays from these predetermined safe areas, the device promptly notifies the caregiver, enhancing child safety and providing peace of mind. The work involves designing and fabricating the wearable device. Similarly, Machine learning algorithms will be trained for different levels of distress detection from the sensors. Development of applications (App) will also ensue to convey the information to guardians/parents. All data, including general state information and distress context, is securely transmitted to a cloud server for easy access and historical analysis while maintaining privacy through edge processing. In conclusion, this wearable IoT device offers a holistic solution to child safety concerns, enabling parents and

guardians to track their child's real-time location, monitor vital signs, and receive selective contextual alerts when distress is verified, all while safeguarding privacy. Its use of SMS and app communication, geofencing, and advanced privacy measures make it a valuable tool for enhancing child safety in today's world.

Keywords: Child safety, wearable devices, Machine Learning, Distress, Internet of Things (IOT).