Child Safety Monitoring System Based on IoT

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Abstract - Nowadays human trafficking is threatening society more often around the world. Our main idea of this paper is to consider the safety parameters of children. This system is built with the Internet of Things. IoT has become a fast-growing technology, therefore we could even operate anything wireless via the internet. Due to the abuses, the emotional and mental stability of the children gets affected which in turn ruins their careers and future. The use high defined modules and costlier microcontrollers are used widely. This prototype will alert the parents regarding their child's inabilities during their hard times. In our nation, children are the most precious resources as they are imminent of the country. The parents always look forward to having their children in a safeguarded place where they can make their time without any complication. Unluckily children are threatened. The violation has been growing increasingly. The security of graduate school-going youngsters is a noteworthy constituent motivated to proceed along with the assistance of innovative advancement. During children's transit to and from school, there are many miserable cases observed in the media. In our nation, due to the absence of preventative considerations children seem to be nowhere to be found and later end up in the trouble. In this paper the main objective is to design a child safety system through smartphones that provide the possibility to trace a child's location as well as during emergency children can alert parents by saying child in an emergency via message. This paper explains the use of ESP 32 microcontroller, Global Positioning System module, Global system for mobile communication module, Heart Sensor, and Temperature Sensor.

*Key Words***:** ESP 32, IR Pulse Sensor, ESP8266, Accelerometer Sensor, Child Monitoring, journals

1. INTRODUCTION

Nowadays human trafficking is threatening society more often around the world. Our main idea of this paper is to consider the safety parameters of children. This system is built with the Internet of Things. Since the early 2000s IoT has become a fast-growing technology, therefore we could even operate anything wireless via the internet. The overall percentage of child abuse filed nowadays in the world is about 80%, out of which 74% are girl children and the rest are boys. This paper deals with the safety prototype built to monitor children's health and to intimate their guardians about the discomforts of the children. Crime and kidnappings have skyrocketed around the world in recent days. This poses a great threat to children and society. Parents must supervise their children every time, which is impossible. The paper is helping develop prototypes that help monitor a child's health, such as body temperature and heart rate. It helps you to check your location, access your video stream, and see your kids anytime. Child tracking devices have a reduced size and weight and can be carried out in a variety of ways. With built-in loops, you can attach them to shoelaces, belt loops, shirt tags, buttonholes, and more. To locate the child, an Internet of Things (IoT)-enabled tracking device uses a combination of Bluetooth and a Global Positioning System (GPS). Parents can use a smartphone app to set geofences around specific locations. You will receive a check-in notification when your child departs or arrives. Another popular option is wrist wearables. This allows parents to keep in touch with their children. As a result, the child becomes more independent. IoT-enabled bands have Subscriber Identification Module (SIM) cards embedded in the devices that provide connectivity. Bands are pre-programmed by parents with important phone numbers. Malpractice against children and women is increasing exponentially every day. They are under the threat of easily being kidnapped. Today women and children are physically harassed in public places, at school, at work or while travelling. According to the latest 2017 annual report of the National Crime Records Bureau (NCRB), there are 56,709 reported cases of rape in India alone. The number of reported rape cases has steadily increased over the past decade. Most cases of physical harassment occur when women are alone or travelling. The Android apps for smartphones are numerous, but many other systems have been developed for people who do not use smartphones or who cannot keep their phones handy at work. These papers focus on the important aspect that missing children can be helped by the people around them and play an important role in the child's safety until they are reunited with their parents. Wearables currently available are focusing more on providing parents with their child's location, activity, etc. via Wireless Fidelity (Wi-Fi) or Bluetooth. However, Wi-Fi and Bluetooth seem to be very unreliable sources for transmitting information. As such, it is intended to use SMS as the mode of communication between parent and child mobile devices, as it has a lower failure probability than Wi-Fi or Bluetooth.

2. PROBLEM STATEMENT

The designed system, which is based on IoT, will help to monitor the surroundings of the user. ESP 32 microcontroller will help to telecast the live relay of information through the application. The connected sensor communicates through the IoT platform. This information is transferred using the ESP8266 Wi-Fi module. Internet of Things best plays to implement the idea of child monitoring over the air. The proposed system will be able to monitor the pulse ratings of the user, temperature and the position of the device placed with the user from a remote place. This model also allows the user the click on the emergency switch to pass the latitude and longitude of the user to the registered mobile number through the Global System for Mobile communication (GSM).

3. EXISTING SYSTEM

The main purpose of the system is to monitor the child's health condition and the locality of the child [1]. The existing system uses Arduino and raspberry pi, which raises the cost. The existing system used web applications interface monitoring. The user will receive an alert call and after entering the login Identification (ID) and password, they can check the live location through GPS, which was updated in the application. When giving boundaries for the school unit, we can also maintain attendance by updating the entry and exit of the child, in and out, of school in the application. We feed specific threshold values for sensors like temperature and pulse which, if the device exceeds those threshold values or if the device gets exposed to abnormal conditions, then those values tend to be updated in the server [1]. The microprocessor is used to control all these actions and the alert was done by checking for a specific user of that device in the database. The main disadvantage of this existing model is that all the interventions in the system are by the microprocessor. Arduino Uno and Raspberry pi are typically bulk and every time the end user enters the web application needs to provide the credentials, which is time-consuming.

4. HARDWARE DESCRIPTION

The designed system, which is based on an ESP8266, Wi-Fi Module is a self-contained Security Operations Center (SOC) with an integrated Transmission Control Protocol (TCP)/ Internet Protocol (IP) protocol stack that can give any microcontroller access to your Wi-Fi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. The proposed system has a GPS module, which is the Global Positioning System a U.S.-owned utility that provides users with positioning, navigation, and timing (PNT) services. The proposed system has a GSM module, which is a device that uses GSM mobile telephone technology to provide a wireless data link to a network. GSM modems are used in mobile telephones and other equipment that communicates with mobile telephone networks. They use SIMs to identify their device to the network. Also, this system involves the ESP32 webcam module, which is a small-size, low-power consumption camera module based on ESP32. The ESP32-CAM can be widely used in intelligent IoT applications. The Infrared (IR) pulse sensor's transmission types measure pulse waves by emitting red or infrared light from the body surface and detecting the change in blood flow during heartbeats as a change in the amount of light transmitted through the body [14]. The X-axis is parallel to the device's screen, aligned with the top and bottom edges, in the left-right direction. The Y axis is parallel with the device's screen, aligned with the left and right edges, in the top-bottom direction. A Light-Emitting Diode (LED) display is a flat panel display that uses an array of light-

emitting diodes as pixels for a video display [15]. Their brightness allows them to be used outdoors where they are visible in the sun for store signs and billboards. This LED display will showcase the sensor readings.

5. PROPOSED SYSTEM

The suggested system is based on the Internet Of things. The main core of the system relays on ESP8266 and ESP32 came module [10]. Whereas, the existing module used highly defined microprocessors. They are simply cost consumptions and bulk in structure. To reduce the size and structure of the prototype, the proposed system uses a Wi-Fi client which binds all the data together and transfers it to the IoT platform [9]. The IoT platform the proposed system used is blynk. The ESP32 webcam module is a combined set of webcam module and a microprocessor. It stores all the data in the ESP32 open server. The developed application will be able to fetch the data of the respected webcam with the help of Internet Protocol. The proposed system is built in with the accelerometer XYZ position sensor, emergency switch and a self-developed application to access the camera, which segregates the proposed model from the existing system. The main component, which involves ESP8266, ESP32, webcam module, IR pulse sensor, DHT11 sensor, XYZ position accelerometer sensor, GPS module with antenna, GSM module, LED screen display module, temperature sensor and emergency switch. The child/user will have the device, which holds all the sensors and microprocessors with them. The end user will have the application to monitor. If the check-in time of the school is 8:45 am, then parents can monitor the latitude and longitude of the child on time and fetch the geographical details using the GPS module [13]. The IR pulse sensor monitors the child's pulse rating. The temperature sensor monitors the temperature of the child. DHT11 sensor holds the environment temperature with them. XYZ accelerometer position sensor will monitor the position of the device and the direction of the device. The GSM module holds the sim slot and delivers the emergency message through the SMS [13]. When the child feels some discomfort, they could make use of the emergency switch to throw the emergency alert through the GSM module. The entirety of the circuit connection information is split into two parts as displayed in Fig. 1.
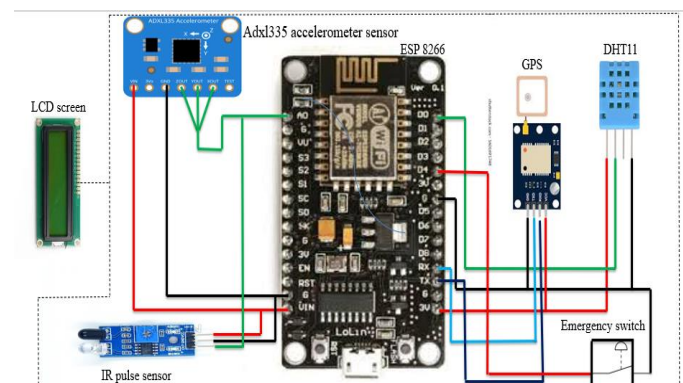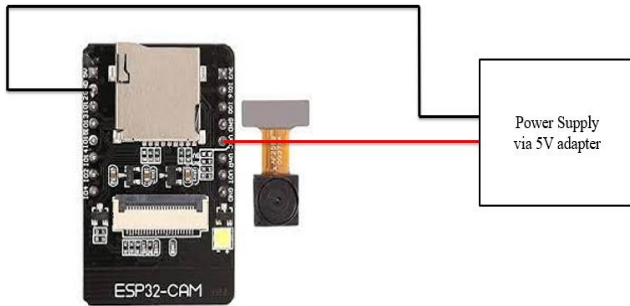
Fig-1: Circuit Diagram

6. DISCUSSION

In this Paper, Child safety is a top priority for parents, and the use of IoT devices can provide an effective way to monitor and protect children. IoT devices such as smart cameras, sensors, and wearables can provide real-time information about children's activities, movements, and behavior, enabling parents to take immediate action in case of potential danger. The use of IoT devices can also help parents monitor their children's health and wellness, providing valuable data on sleep patterns, physical activity levels, and other health-related information. Additionally, IoT devices can improve communication and interaction between parents and children, providing a greater sense of security and connection even when parents are away from home. The timely alerts and notifications provided by IoT devices can also help parents take proactive measures to protect their children, such as alerting them when their child leaves a designated safe zone. Overall, the use of IoT devices for child safety monitoring can enhance the safety and well-being of children, providing parents with peace of mind and valuable insights to make informed decisions about their children's safety and health. By leveraging the power of IoT, child safety monitoring systems can provide parents with peace of mind and help keep their children safe and secure, both at home and when they are out and about.

7. FUTURE SCOPE

The potential for IoT in child safety monitoring is vast, and there are several areas where it could be further developed and integrated. Firstly, the use of wearable devices such as smartwatches, bracelets, and necklaces can be explored for child safety monitoring. These devices can track a child's movements, heart rate, and even temperature, providing valuable information to caregivers in real time. The integration of Artificial Intelligence (AI) and Machine Learning (ML) technologies can enable the system to analyze and learn from data, identifying potential hazards and providing proactive recommendations to caregivers. The use of blockchain technology can provide a secure and tamper-proof way of storing data related to child safety monitoring

8. RESULT

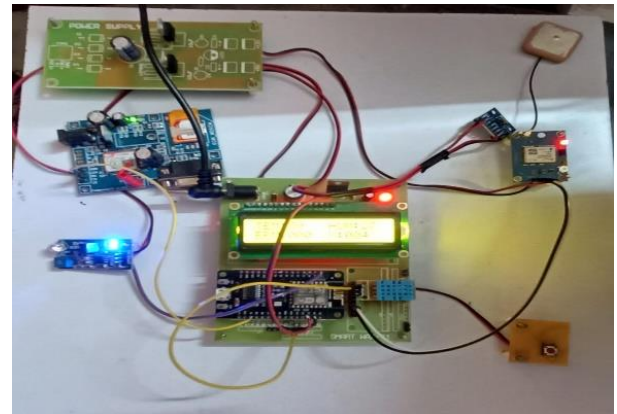Figure 2 illustrates the device setup of the proposed system.

Fig-2: Device Setup Circuit

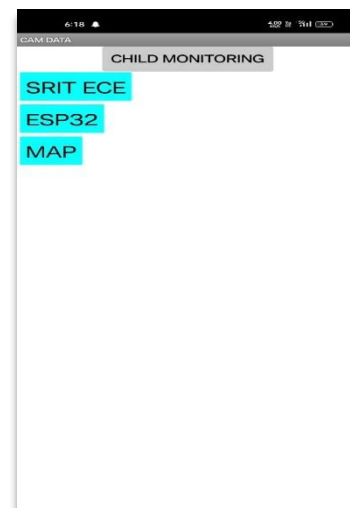Figure 3 showcases the self-developed application to access the ESP32 webcam module.

Fig-3: Screenshot of the Front End of the Application

When the device relates to the IoT platform it exhibits the sensor results in the LED screen. Figure 4 illustrates the sensor details displayed in the LED.
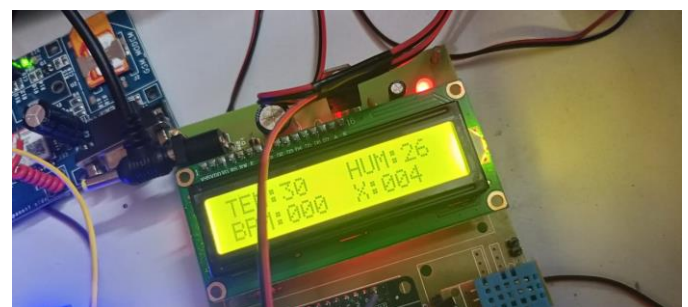

Fig-4: Results of the data in LED Screen

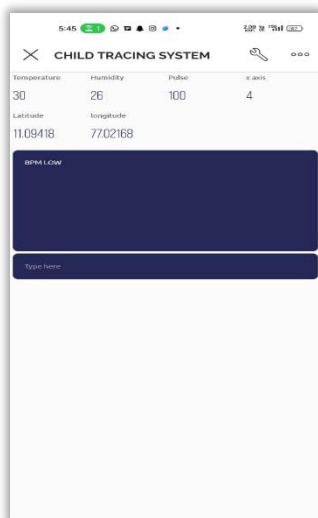Figure 5 illustrates the IoT platform result, which will be used by the child's guardians.

Fig-5: Screenshot of Result from the Blynk

When the child feels discomfort from any external environment, then they can press the emergency button to trigger the latitude and longitude details to their guardian. Figure 6 shows the screenshot of the SMS received from the GSM module.
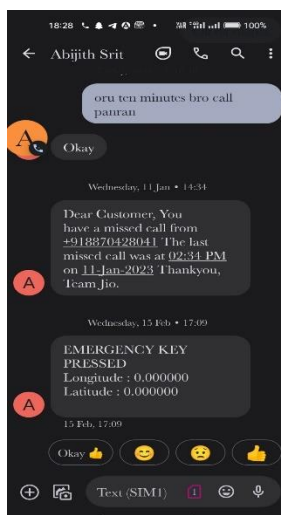

Fig-6: Screenshot of the SMS received

When parents need to observe their child or their surroundings, possibly they could make access the application that is developed. Figure 7 illustrates the result of the application, which displays the screenshot of the live relay from esp32 webcam module.
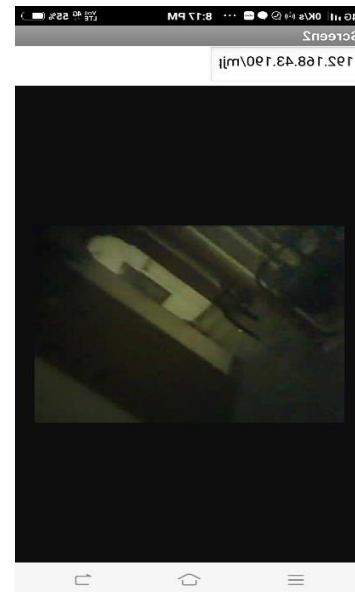

Fig-7: Screenshot of the Live Relay from ESP32

9. CONCLUSIONS

In conclusion, the development of a child safety monitoring system based on IoT has been shown to be a promising solution for enhancing the safety of children in various settings. The system offers several benefits, including real-time monitoring, location tracking, and notification alerts. The integration of IoT technologies such as sensors, cameras, and GPS devices provides a comprehensive solution that can detect potential hazards and alert caregivers in real-time. The system has the potential to be used in a variety of settings, such as schools, daycare centers, and homes, and can be customized to meet the specific needs of different environments. Additionally, the system can provide valuable insights to parents and caregivers about their child's behavior and activity patterns, enabling them to make informed decisions and take proactive measures to ensure their safety. Overall, the development of a child safety monitoring system based on IoT is a significant step towards enhancing child safety in today's rapidly changing world. While there may be some challenges and limitations to the system, such as privacy concerns and technical complexities, these can be overcome with careful planning and implementation. As technology continues to evolve and become more affordable, it is expected that the system will become more widespread, making it an essential tool for ensuring the safety and well-being of children everywhere.

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