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RESEARCH ARTICLE

IoT-Based Wrist Band for Women Safety

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Abstract: In the modern world, women now have tremendous success in every field. They can play, learn, and earn as much as men. But what about safety? Do they have the same secure environment that men and boys do? The answer is "NO". Women and girls have been subjected to numerous incidents, including acid throwing, rape, kidnapping, and harassment. It is common to read a lot of news like this in newspapers every day. These incidents make women feel unsafe in this society. Our freedom came a long time ago, but women still lack complete security in this society. All women cannot fight or shout all the time when some danger is happening to them. What can the physically challenged person and Children do? To make women feel safe, we designed "Wrist Band" using IoT for women safety. As the sensors sense information from the body, it will always update the information such as pulse, temperature, and vibration to the well-wishers through the Blynk app.

Keywords: arduino; Google lens; GPS; IoT device; micro camera; sensors; women safety

I. INTRODUCTION

From the early days, women are not getting a secure and safe environment. They can't even go to work, travel on the bus alone even in day times. Nowadays, every parent is getting fear to send their girl kids to school as well as young girls to college. Because of the harassment and violence going around us is very worst. As a parent when they hear this news the fear is getting abnormal, they think their child may also get the same one day. Because of the fear, the parents in the village not making the girl child study after a certain age. Even there are lots of graduate women in cities and villages, their families did not allow them to go outside and work, exposing their talents. The only thing they fear is safety. Why everyone is thinking of women as a weaker community? As per the statistics, average of 88 rape cases has been calculated per day in India. If it is increasing, we can't control it. Every woman has equal freedom as a man. They should come out and should change the world. They should expose their talent to the world. To make every girl child, woman stronger by heart, we have made a device to feel secure and safe all the time. It will help them to check their health condition all the time by that information, and it will send the message to the family when a woman is in danger. This device will help every woman to be safe in any dangerous situation. We have heard lots of cases till now committing rape and murder of a woman or girl. At least, our hope is that this device will prevent harassment, abuse, and violence to every girl child and woman.

II. LITERATURE REVIEW

In reference to [1], the system can send the current location to family members, friends, and the police by pressing a button. As the criminal assaults the victim, the camera module captures the victim's image and alarms to attract the public's attention. In reference to [2], the wearable smart gadget captures an image of the criminal, attaches it to the appropriate email address with information regarding where the victim is located as an attachment. In contrast, self-defense without the internet relies on electric shock gloves, which provide electric shocks that divert the mind of the perpetrator. In reference to [3], note the abnormal senses, the Heartbeat sensor, Tilt sensor, and vibration sensor are connected to Arduino. In addition to sending alerts to nearby police stations, the scanned phone numbers will be sent to the police as well. These are used for raping and teasing girls by perverts, but they also help them if they suffer from any medical problem, like fainting. In reference to [4], the woman must first register her fingerprint in order to activate the device. In the event that the scanner does not detect a fingerprint, a buzzer will sound to alert the citizens. When an emergency occurs, the device will scan the fingerprint and send a text message to notify close family members and the police of the location of the victim. Women can use a shockwave generator to temporarily incapacitate an attacker if they feel the need for self-defense. In reference to [5], the woman has to ON the trigger when danger occurs. As soon as the device is activated, it tracks the location with GPS and sends an emergency message to the registered mobile number and nearby police station. Location is tracked continuously by the IoT module and updated on the website. In reference to [6], the user wears a wristband on each hand. An Arduino Uno and an EMG sensor are integrated into the wristband. A signal is triggered when the user flexes the forearm. Left-Left-Right-Right (LLRR) and Left-Right-Left-Right (LRLR) are patterns of hand movements. A signal will be generated if the pattern matches and the officials will be notified. In reference to [7], with the IoT Sandal, the gadget activates GSM and GPS modules as well as electric shock and buzzing, causing the attacker to lose his veer and allowing others to contact him. The victim can choose to only

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submit her location by pressing the button, and the gadget will contact the attacker. The received messages and the location is monitored using the Google Maps API. In reference to [8], wearable on the wrist, the device resembles a watch. In the event of danger, the victim can press a button on the gadget, which will record the image of the assailant using a Jeer Pi—the device's grounded camera. Through the app that was previously available on the victim's phone, this image has inadvertently forwarded communication and correspondence to a set of pre-stored emergency contacts and the nearby police station. In addition to the taken photograph, this technology would track the victim's location and send it as correspondence or SMS. A shock circuit is also included in this device for self-defense. In reference to [9], Upon turning on the device, the band will start all modules at the same time. If the emergency switch is touched twice in less than 5 seconds, the band will take action. If the switch is not pressed or if it is pressed only once, the band will not take action. In the event that a band stoner is in danger and presses the exigency switch twice in 5 seconds, an exigency SMS will be sent incontinently to the nearest police station, levies, and her relatives. The GSM module will be in charge of updating the position. According to [10], in the event of an emergency, a "Smart band"/microchip embedded in a piece of jewelry can be triggered by pressing a button. Another important feature of this device is the hidden camera sensor [11–16], which detects a concealed camera and warns the person who owns it, making them cautious when changing homes and hostels. The audio and videotape recordings will be stored on a solid-state hard drive and will aid in the investigation of crimes and their perpetrators using any data analytics tool. This device is activated and sends an instant position to the police-set figures via a GSM module [17–25], along with a torture conversation. The device sends both the torture communication with instant position and records the audio of the occurrence when the emergency button is double-clicked. When the same button is held down for a long time, it initiates a call to the police and transmits an audio message.

III. PROPOSED SYSTEM

A. IMPLEMENTATION

Women's safety is a major issue and a widely discussed topic today. The crime rate is on the spike. Women's safety is a big concern and must be addressed here. The main goal of the paper is to improve women's safety and security. We use multiple components for the project like pulse sensor, temperature sensor, vibration sensor, ESP32 cam, and GPS modules. The temperature sensor is used to measure temperature (the temperature becomes high or low). The pulse sensor measures pulse waves. The temperature is being measured in two types which are fahrenheit and celcius. The Blynk app is configured to the well-wisher's device so that the user's information gets updated on their device. The data (Pulse, Temperature) gets updated whenever the concerned person opens the app. The location of the user is also updated using google maps. The Vibration sensors are responsible for measuring the vibration acting on an body (if anytime the victim is getting forced and pulled by a culprit). The vibration sensor has some threshold set up in it. If the vibration rate is abnormal, the well-wishers get a notification on the phone, by clicking that link they can see the live incident happening through the Blynk app, as shown in Fig. 1. The advantage is all the sensors are very small in size and portable to handle in any condition. They are user-friendly and affordable at cost. By comparing to the literature survey taken, the user has no need to press the button when she is in danger. That's the advantage of the device

B. HARDWARE REQUIREMENTS

1) ARDUINO UNO. It is open-source Arduino Uno microcontroller board, as shown in Fig. 2. A Microchip ATmega328P microprocessor is used, resulting in a 74cc microchip. Besides 14 digital I/O pins (6 of which are capable of generating PWM output), the board also provides six analog I/O pins that can be programmed via a type B USB cable with the Arduino IDE (Integrated Development Environment).

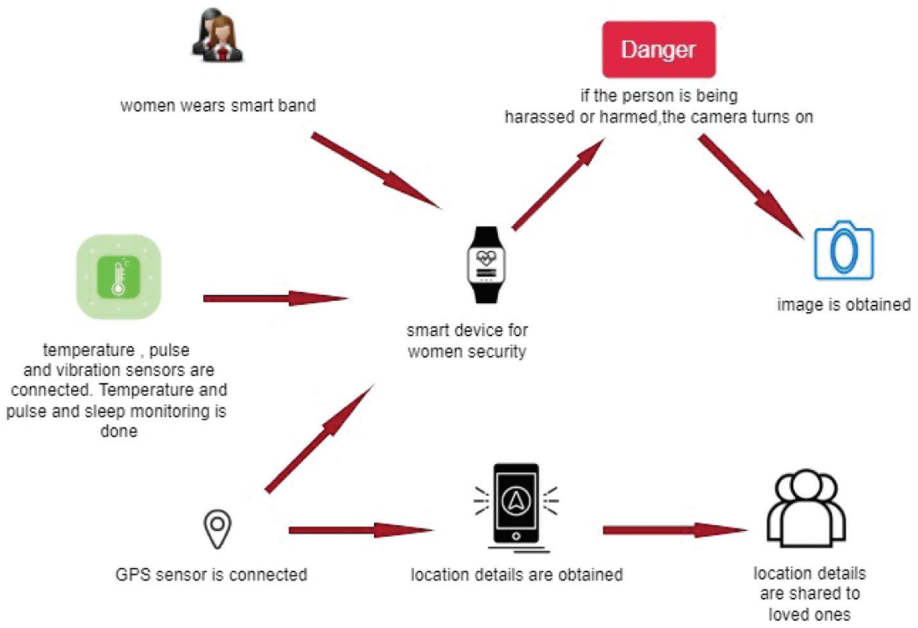

Fig. 1. Architecture of IoT Wrist Band.

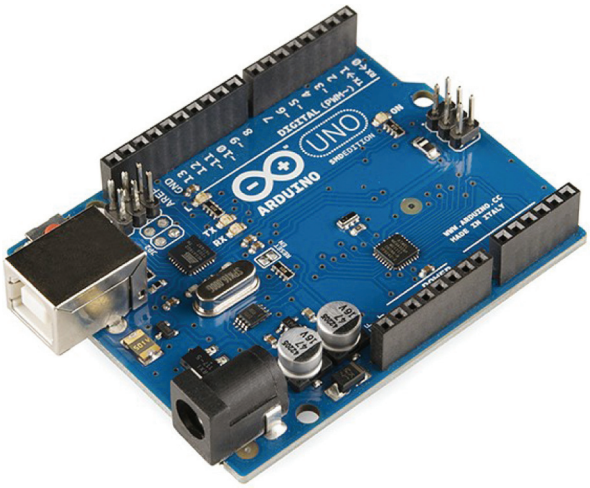

Fig. 2. Arduino UNO.

2) ESP 32. The ESP32 chipset is a one-chip 2.4 GHz wireless and Bluetooth combo chip designed in TSMC's 40 nm ultralow-power manufacturing process. It is shown in Fig. 3 with fewer than 10 external components, the ESP32 is the most comprehensive integration solution for Wi-Fi + Bluetooth applications. In addition to integrating the antenna switch, RF balun, and power amplifier, low noise receives amplifier, filters, and power management modules, ESP32 also integrates a power management system. IoT applications on mobile devices, wearable electronics, and mobile smartphones can all be implemented with ESP32, as shown in Fig. 3.

3) ESP 32 CAM. A video camera and socket for a microSD card are built into the ESP32-CAM, which is a full-featured microcontroller. With this camera, you can create IoT devices that can perform image tracking and recognition. It's inexpensive and easy to use. There are a variety of IoT applications that can be implemented on the ESP32-CAM as shown in Fig. 4.

4) LCD 16 × 2. 16 × 2 LCD is one kind of electronic device used to display messages and information. The term LCD full form is Liquid Crystal display. The display is named 16 × 2 LCD because it has 16 columns and 2 rows. It is able to display (16 × 2 = 32) 32 characters in general, and every person could be made of five × 8 Pixel Dots as shown in Fig. 5.

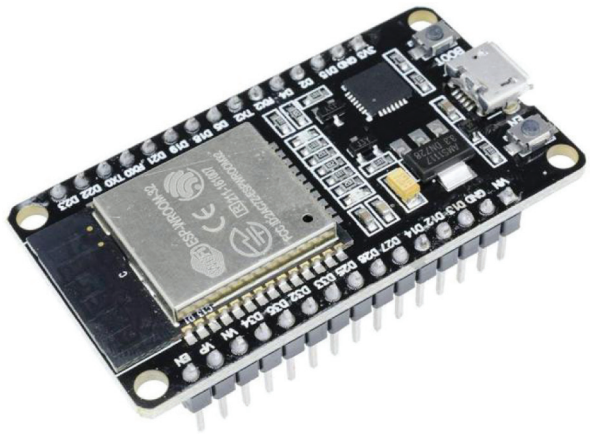

Fig. 3. ESP 32.

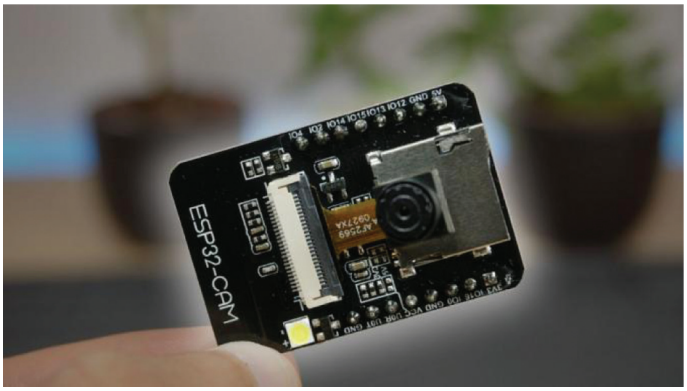

Fig. 4. ESP 32 Cam.

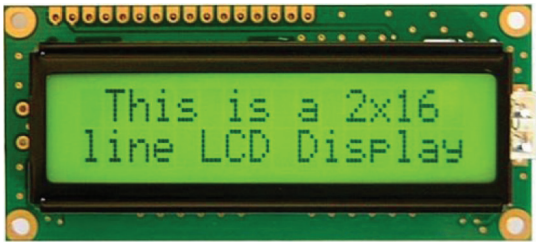

Fig. 5. LCD 16 × 2.

5) FT232RL. Connecting serial devices with RS232 to devices supporting USB is a simple process using the USB-to-RS232 converter cables. An FTDI cable includes an FTDI FT232R chip mounted on the internal electronic circuit, as shown in Fig. 6. Using FTDI chips, you can convert serial to USB data and vice versa. With this cable, you can connect a TTL serial interface to a USB in a simple and cheap way. It is necessary to download a device driver to use this FTDI cable.

C. TEMPERATURE SENSOR

A temperature sensor is a device that measures an object's temperature. This could be the temperature of the air, a liquid, or a solid, as shown in Fig. 7.

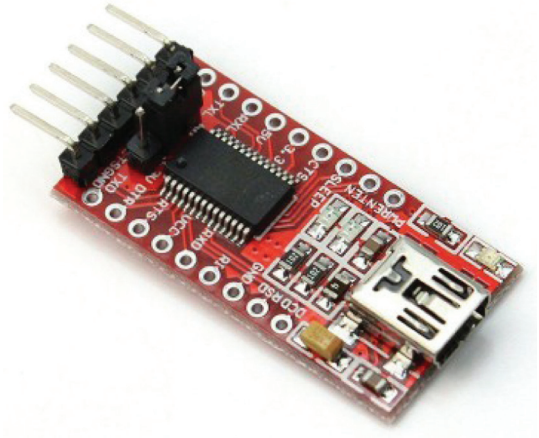

Fig. 6. FTDI FT232R.

Fig. 7. Temperature sensor.

1) VIBRATION SENSOR. In piezoelectric accelerometers, vibrations are detected through their movement. Vibration can be measured at normal speeds or accelerations as well as fluctuations. Piezoelectric effects are utilized to measure changes in acceleration, pressure, temperature, force, otherwise, strain by converting a voltage into an electrical charge. It is shown in Fig. 8.

2) PULSE SENSOR. It is an Arduino heart charge sensor that is well-designed and easy to use. With a few jumper cables, the sensor clamps onto a fingertip or earlobe and connects directly to Arduino. It's also a free monitoring app that displays your pulse in real time. It is shown in Fig. 9.

3) GPS. The global positioning system (GPS) is a comprehensive navigation system based on satellites that use at least 24 satellites. With no subscription fees or setup charges, GPS operates in every weather condition, anywhere within the international, 24 hours a day, 7 days a week. It gets data from satellites in the form of an NMEA string, which includes latitude, longitude, altitude, UTC time, and so on. This text wishes to be parsed in order to get the records we need. It is shown in Fig. 10.

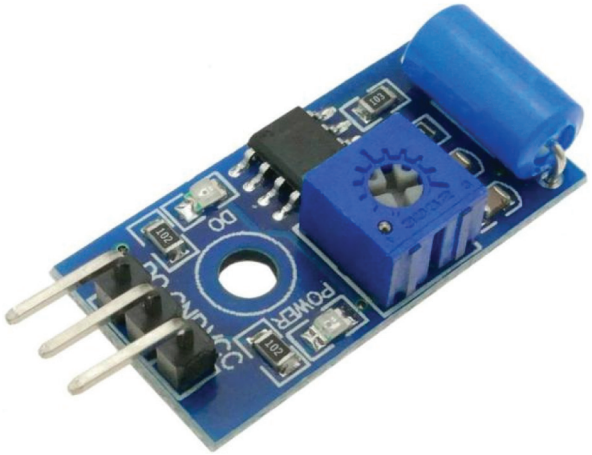

Fig. 8. Vibration sensor.

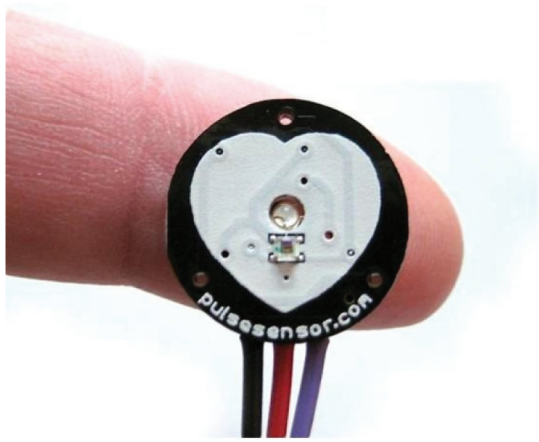

Fig. 9. Pulse sensor.

Fig. 10. GPS module.

D. SOFTWARE REQUIREMENTS

1) ARDUINO IDE. An Arduino IDE (Integrated Development Environment) includes a text editor for writing code, a message space, a text console, buttons for basic capabilities, and a series of menus. Adding packages and communicating with them is done through the Arduino hardware. As part of the Arduino software program (IDE), the console presents textual content, including all error messages and different statistics. It is shown in Fig. 11.

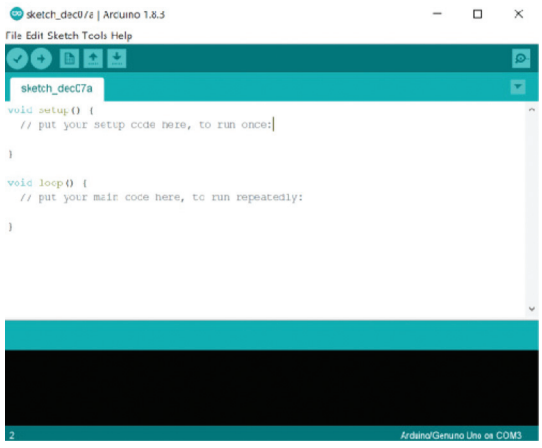

Fig. 11. Arduino IDE.

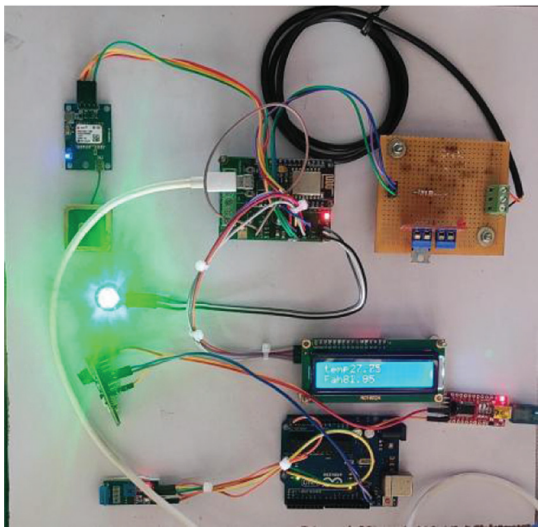

Fig. 12. Blynk IoT app.

Fig. 13. Hardware connections.

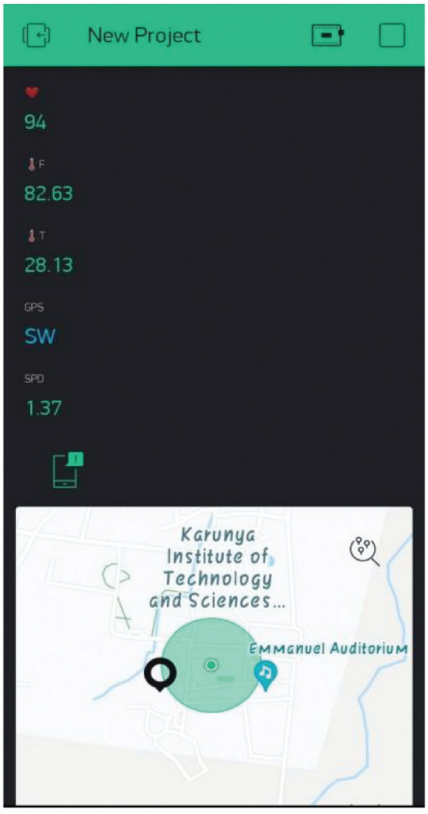

Fig. 14. Output.

IV. BLYNK APP

With Blynk app for iOS and Android, you can create mobile apps that work with the hardware of your choice. It manages all the connection routines, as well as data exchange, between your hardware, Blynk Cloud, and your app project. In the Blynk app as shown in Fig. 12, every time a button is pressed, the message is sent to the Blynk Cloud, where it finds its way to your hardware as shown in Fig. 13. Similarly, everything happens in a blink of an eye in the opposite direction as well.

V. RESULTS AND DISCUSSION

The node MCU is the main component that connects the pulse, temperature, GPS module, and LCD. The vibration sensor, ESP32cam, and FTDI are connected to the Arduino UNO. The temperature will be displayed on the LCD. The other output values will be displayed in the Blynk app, respectively, as shown in Figs. 14, 15.

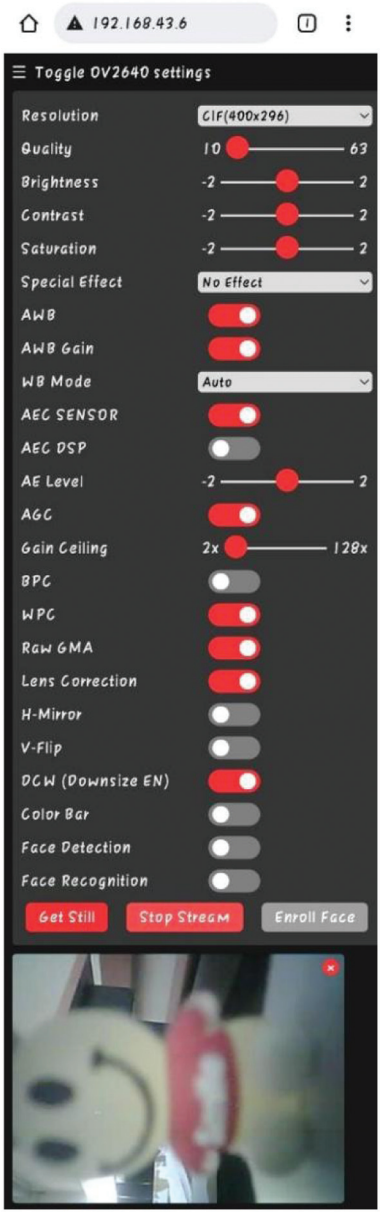

Fig. 15. Blynk app live stream.

The temperature gets displayed in two variants which are FAHRENHEIT and CELSIUS. The heartbeat beat gets displayed by the pulse sensor. The sensor speed is mentioned as SPD. If the speed is equal to zero, the sensor is considered not to work. If the value is above zero, the sensor works fine, and the speed is displayed. The location of the user is captured and displayed using google maps. All this data gets updated in the BLYNK app. If the person is being harassed or harmed, the threshold of the vibration sensor shoots up, and the concerned person will be notified with an ALERT message. Hence, there will be a URL that starts the live stream which captures the audio and the video of the surrounding.

VI. CONCLUSION

This paper IoT-based wrist band for women safety uses an Arduino UNO module to connect the sensors and other components. Node MCU is used to run and compile the code for sensors. When the vibration sensor senses the high vibration, the notification makes the family watch the incident live using esp32 cam. When the temperature and pulse are increased, the GPS tracks the location and sends the message. So in the future, we are trying to implement a new feature which is sending the alert message in their regional language so that even illiterate people can understand the danger and act on it.

References

[1] P. Biradar, P. Kolsure, S. Khodaskar, and K. B. Bhangale, "IoT based smart Bracelet for women security," Int. J. Res. Appl. Sci. Eng. Technol. (IJRASET), vol. 8, no. 11, Feb. 2020. ISSN: 2321-9653.

[2] M. Zikriya, M. G. Parmeshwar, S. R. Math, and S. Tankasali, "Smart gadget for women safety using Iot," (IJERT), vol. 6, no. 13, pp. 1–5, 2018.

[3] A. Jesudoss, Y. Nikhila, and T. Sahithi Reddy, "Smart solution for women safety using IOT," Int. J. Pure Appl. Math., vol. 119, no. 12, pp. 43–49, Dec. 2018, ISSN: 1314-3395.

[4] W. Akram, M. Jain, and C. S. Hemalatha, "Design of a smart safety device for women using IoT," in *Int. Conf. Recent Trends Adv. Comput. (ICRTAC)*, Procedia Computer Science, vol. 165, pp. 656–662, 2019, ISSN: 1877-0509.

[5] B. Sathyasri, U. J. Vidhya, G. V. K. Jothi Sree, T. Pratheeba, and K. Ragapriya, "Design and implementation of women safety system based on IoT technology," Int. Res. J. Eng. Technol. (IRJET), vol. 08, no. 06, pp. 177–181, June 2021, ISSN: 2395-0056.

[6] A. Karmakar, K. Ganguly, and P. S. Banerjee, "SafeBand: IoT-based smart security band with instant SOS messaging," Jan. 2022. DOI: 10.1007/978-981-16-5207-3.

[7] M. S. H. Talpur et al., "Smart sandal with IoT for women's safety and empowerment," Int. J. Adv. Trends Comput. Sci. Eng., vol. 10, no. 2, March – April 2021, ISSN: 2278-3091.

[8] K. Mala, R. K. Pavithra, S. Swetha, N. Yashika, and S. Varsha, "A Raspberry pi based smart wrist band for women safety using IoT," Eur. J. Mol. Clin. Med., vol. 7, no. 4, pp. 2460–2465, 2020. ISSN: 2515-8260.

[9] A. Z. M. T. Kabir, A. M. Mizan, and T. Tasneem, "Safety solution for women using smart band and CWS app," *17th Int. Conf. Electrical Eng./Electron., Comput. Telecomm. Inf. Technol. (ECTI-CON)*, August 2020. DOI: 10.1109/ECTI-CON49241.2020.9158134.

[10] R. Shrivastava and A. Tiwary, "A total smart security solution for women and children using IOT," J. Multidiscip. Eng. Sci. Technol. (JMEST), vol. 6, no. 9, pp. 58–66, Sept. 2019. ISSN: 2458-9403.

[11] K. H. Kishore, E. T. Ravuri, P. K. Sankarasetty, V. K. Mogilicharla, and E. Raghveera, "An application on women safety using embedded systems and IoT," Turk. J. Comput. Math. Educ., vol. 12, no. 3, pp. 65–73, April 2021.

[12] R. Kr. Das, "Women safety device (IoT Based)," Int. J. Pure Appl. Math., vol. 9, no. 5, pp. 1–9, May 2020.

[13] P. T. Janani, U. Aiswarya, A. Mahalakshmi, and S. Nivetha, "Protection for women using IoT smart device," Int. J. Anal. Exp. Modal Anal., vol. 7, no 5, pp. 55–62, May 2020. ISSN: 0886-9367.

[14] A. Siddika, M. D. Hussain, M. D. Hossain, M. D. Farhaduzzaman, "Analysis, design and development of Arduino based women safety device using IoT," Int. J. Adv. Res. Technol., vol. 7, no. 9, pp. 1–8, Sept. 2018. ISSN: 2278-7763.

[15] D. G. Monisha, M. Monisha, G. Pavithra, and R. Subhashini, "Women safety device and application-FEMME," Indian J. Sci. Technol., vol. 9, pp. 1–6, March 2016. ISSN: 0974-5645.

[16] B. Umadevi, P. Eswaran, and N. Manoharan, "Womens security solution using: IoT," Int. J. Pure Appl. Math., vol. 119, no. 10, pp. 1871–1874, 2018, ISSN: 1311-8080.

[17] M. S. N. Prasad, K. Yasavi, K. H. Ramu, G. S. Teja, and P. Nikitha, "Wearable device for women safety using IoT," J. Compos. Theory, vol. 14, no. 6, June 2021. ISSN: 0731-6755.

[18] D. Sunitha and U. Chandana, "Design and implementation of women safety system based on IoT technologies," J. Eng. Sci., vol. 10, no. 9, pp. 177–181, Sept. 2019. ISSN: 0377-9254.

[19] K. Sai Sonika Reddy, K. Keerthi, M. Senthil Kumaran, "Smart security device for women safety using IoT," Mukt Shabd J., vol. 9, no. 5, pp. 152–161, May 2020. ISSN: 2347-3150.

[20] R. S. Sune and M. H. Nerkar, "IoT based women tracking and security with auto defender system," Int. J. Innovat. Res. Comput. Commun. Eng., vol. 6, no. 1, pp. 63–68, Jan. 2018. ISSN: 2320-9801.

[21] K H. Kishore, E. T. Ravuri, P. K. Sankarasetty, V. K. Mogilicharla, and E. Raghveera, "An application on women safety using embedded systems and IoT," Turk. J. Comput. Math. Educ., vol. 12, no. 5, pp. 65–73, April 2021.

[22] N. Penchalaiah, M. Susmitha, C. V. K. Reddy, D. V. P. K. Rao, and D. Sreelekha, "An IoT based smart wearable device for women safety," Int. Res. J. Adv. Sci. Hub, vol. 03, no. 05S, pp. 89–94, May 2021. ISSN: 2582-4376.

[23] S. RahmathNisha, C. Shyamala, D. Sheela, M. Abirami, M. Harshiniand, and R. Keerthana, "Women and children safety system with IOT," Turk. J. Comput. Math. Educ., vol. 12, no. 7, pp. 1137–1440, April 2021.

[24] P. S. Kumar and K. S. Babu, "A mechanism for women safety with help of IoT and smart devices," Turk. J. Comput. Math. Educ., vol. 12, no 13, pp. 3028–3036, June 2021.

[25] S. Naveenkumar, R. Priyadharshan, F. R. Adarsh, V. Senthilkumar, and P. Sivamani, "Women safety device and alert system," Int. J. Rese. Eng., Sci. Manag., vol. 4, no. 6, June 2021. ISSN: 2581-5792.