IJAREEIE

e-ISSN: 2278-8875
p-ISSN: 2320-3765

International Journal of Advanced Research

in Electrical, Electronics and Instrumentation Engineering

Volume 14, Issue 4, April 2025

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 8.807

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering (IJAREEIE)

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 8.807 | A Monthly Peer Reviewed & Refereed Journal |

|| Volume 14, Issue 4, April 2025 ||

| DOI:10.15662/IJAREEIE.2025.1404013 |

A New Method for Smart Gateway using Digital Payment with Health Monitoring System

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ABSTRACT: In public environments such as zoos, the conventional cash-based ticketing model typically results in wait times and bottlenecks during rush hours, impacting the overall experience of visitors. To mitigate this, we suggest anovel automated ticketing and health check system. The ticketing system allows users to buy tickets online using a React.js-based web application, with Node.js taking care of server-side operations and Razorpay processing secure payments. Transaction history and user information are safely stored in MongoDB, and JSON is used for data exchanges. On a successful transaction, a QR code is created and scanned at the entry point by an ESP32 CAM to enable smooth verification. For health monitoring, the system is equipped with an MQ-3 sensor for detecting alcohol, a DS18B20 sensor for temperature sensing, and a MAX30100 sensor for heart rate and SpO2 monitoring. The information is processed in Blynk and displayed on an LCD to achieve real-time health monitoring. The system improves operational efficiency, minimizes wait times, and provides a smoother and safer entry process.

KEYWORDS: ESP32CAM, MongoDB, ESP8266, Razorpay, MQ-3, MAX30100

I. INTRODUCTION

In recent years, public facilities such as museums, theme parks, and zoos have witnessed a sharp rise in the number of visitors, underscoring the inefficiencies of conventional cash-based ticketing mechanisms. Time-consuming queues and sluggish service at ticket counters at peak times normally result in inconvenience to visitors and a less satisfying overall experience. Furthermore, handling cash raises the prospect of forgery of tickets and operational inconvenience associated with the handling of cash flow. To solve these problems, automated ticketing systems are now a requirement to improve operational efficiency and visitor satisfaction. This paper suggests an integrated online ticketing and health monitoring system that is intended to make the entry process easier and guarantee visitor safety. The ticketing system enables users to create accounts, log in, and buy tickets using an easy-to-use React.js-based website.

Backend operations are managed by Node.js, with Razorpay offering secure payment processing. Once payment is successfully made, a random QR code is produced, which is scanned at the gate by an ESP32 CAM. The gate automatically opens if the QR code is authentic. There is an LCD display for real-time updates on the entry process. Beyond ticketing, the system comes with a health monitoring feature to promote visitor safety. It uses an MQ-3 sensor to sense alcohol content, DS18B20 body temperature sensor for body temperature, and MAX30100 for heart rate and SpO2. Health data is handled using Blynk, and if any health parameter is found over the safety limit, entry is denied. It is a complete solution that increases operational efficiency, ensures the safety of visitors, and offers a convenient and safe entry process.

II. EXISTING METHOD

A number of research studies have discussed the application of QR codes and smart entry systems for secure payment and automated access control. Natarajan (2023) offers a critical examination of QR-based payment systems, outlining their development from rudimentary retail payments to sophisticated mobile platforms. The research points to the issues of scalability, security, and internet connectivity in both urban and rural environments. Graham (2023) talks about the application of integrated payment solutions in smart city infrastructure, where secure payment gateways integrated with access control systems increase operational efficiency and optimize resource management. Ant Group and ISO (2023) launched ISO 5201, an international standard for securing QR-based financial transactions. This standard is centered on minimizing fraud, safeguarding sensitive information, and maintaining transaction integrity in domestic and international applications.

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Lorenzi et al. (2022) examine how the use of QR codes can expand digital government service accessibility. The research emphasizes the way QR technology enhances citizen accessibility to key services like tax and license renewals, especially in developing countries. "How QR Codes Improve the Security of Mobile Device-Based Payment and Authentication Transactions" describes the role of QR codes in enhancing security in payment and authentication processes with mobile devices to increase users' confidence in online transactions. "Advanced Intelligent Entryway Systems" describes how QR codes and sensor technologies can be combined to create seamless contactless entry for high-traffic zones such as metro stations, while enhancing security.

Jog et al. created an automatic alcohol detection system based on MQ-3 and MQ-135 sensors to quantify Blood Alcohol Content (BAC). The system can hinder drunk people from performing dangerous activities by limiting access or sending warnings, promoting safety in public and private areas. The research also solves sensor calibration and real-time data processing issues to enhance accuracy and reliability. Masihuddin et al. (2017) give an extensive overview of e-payment systems, including the components, structure, and challenges of adopting them. The research points out issues of security, points of contention in user acceptance, and the necessity of a strong framework to facilitate trust-based and system-oriented reliability.

Additionally, "Design and Implementation of a Secure QR Payment Based on Visual Cryptography" proposes a new method for safekeeping QR-based payment through visual cryptography. The research presents a mobile app incorporating a payment gateway server to secure transaction information and verify validity. Visual cryptography improves privacy and security, responding to weaknesses in standard QR-based payment solutions. These studies collectively highlight the need for security, efficiency of operation, and user confidence in creating useful QR-based payment and access control systems.

III. PROPOSED METHODOLOGY

In order to properly address the issues presented by conventional ticketing systems in public places, we suggest the use of an automated ticketing and health monitoring system that greatly simplifies the buying and entry process. The process starts with the visitor visiting a friendly website developed using React.js, where they can sign up for an account and log in to start the ticket buying process. Once they have entered their personal information and chosen the preferred tickets, the visitor is redirected to a secure payment gateway linked with Razorpay. This solution is an immediate solution to the problems of traffic at ticket counters because visitors can make their purchases from the comfort of their homes, thus avoiding long queues and facilitating families to gain access to the venue in a jiffy.

After successful payment, a QR code is created and saved in a MongoDB database as an electronic entry pass. This eliminates the use of physical tickets, which tends to result in ticket loss and issues during exit checks. The QR code can be easily scanned at the entry point by an ESP32 CAM, speeding up the verification process. This not only facilitates entry but also solves the accounting problems related to handling cash manually, making all the transactions safe, clear, and traceable. The simplified process of entry minimizes the requirement of large manpower to manage crowds because visitors move into the venue in a more streamlined manner. An LCD screen is utilized to display the status of the entry process, such as QR code verification and gate open/close status, with real-time updates to both staff and visitors.

Besides the automated ticketing system, an overall health monitoring system is incorporated to further ensure visitor safety. The system consists of a health monitoring module comprising an MQ-3 alcohol sensor, DS18B20 temperature sensor, and MAX30100 heart rate and SpO2 sensor. The MQ-3 sensor quantifies Blood Alcohol Content (BAC) and denies entry when the measured BAC is found to be greater than the safe limit. The DS18B20 sensor checks for body temperature, and based on the threshold value set for the temperature reading, entry is denied to curb the spread of disease. The MAX30100 sensor checks heart rate and oxygen levels to confirm that guests pass minimum standards of health to gain access. The sensor readouts are parsed with Blynk and also shown on the LCD for instantaneous monitoring.

By reducing the use of cash transactions and computerizing health screening, our system reduces the workload for staff to attend to, enabling them to concentrate on providing high-quality customer service rather than dealing with ticket sales and health screening manually. In addition, advanced data analysis will be utilized to interpret visitor flows and health trends, and allow management to make effective decisions to enhance services and operational procedures. In summary, the automated ticketing and health monitoring system enhances the overall user experience by providing a seamless purchasing process, efficient entry, and improved health safety protocols. Thiscomprehensive solution

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ultimately contributes to a safer, more organized, and enjoyable experience for all visitors to public spaces.

BLOCK DIAGRAM

A minimum of The suggested system combines an automated ticketing system with real-time health tracking to facilitate the entry of visitors and make their entry safer. The process starts with the user visiting a React.js-based website and creating an account with it before logging in. After the provision of personal information and the selection of the tickets needed, the user is forwarded to a secure payment system integrated with Razorpay. After successful payment, a one-time QR code is created and saved in a MongoDB database in the form of a digital entry pass.At the entry point, the visitor scans the QR code with the help of an ESP32 CAM. The scanned information is forwarded to the NodeMCU ESP8266 for verification. Meanwhile, health parameters are measured through onboard sensors.

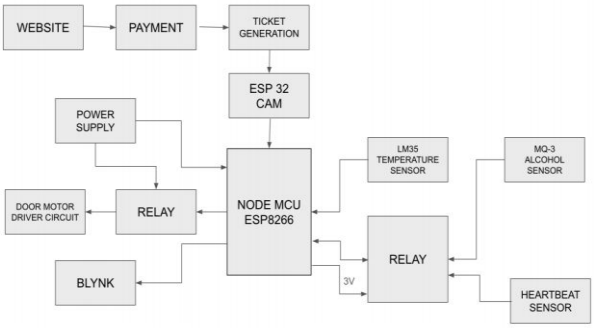

Fig 4.1 Block Diagram for "A Method for Smart Gateway Using Digital Payment with Health Monitoring System"

The LM35 thermometer is used to measure body temperature, the MQ-3 gas sensor is used to detect BAC, and the heartbeat sensor is used to detect heart rate. If temperature, BAC, and heart rate are safe and the QR code is fine, the NodeMCU drives a relay which switches on the door motor driver circuit to open the gate.When any health parameter is above the limit or when there is an invalid QR code, the gate doesn't open, and a message is triggered using Blynk to alert the staff. Both visitors and staff can monitor in real time on an LCD display the status of the entry process, i.e., QR code verification and open/close status of the gate. This streamlined process eliminates delays, reduces employees' workload, provides secure payments, and makes visitors safer through the integration of ticketing and health checks as a single cohesive system.

IV. RESULTS AND DISCUSSION

The hardware deployment of this paper involves crucial components to design an efficient and simplified automated entry system for public spaces. The hub of the system is the NodeMCU ESP, which acts as the main microcontroller, making communication between the different hardware modules and executing commands received from the ESP32 CAM. The system is driven by a Switched-Mode Power Supply (SMPS), which supplies AC power to a stable DC output appropriate for the electronics. For the NodeMCU to operate consistently, an IC7805 Voltage Regulator provides a constant 5V output to safeguard the system from voltage variations.

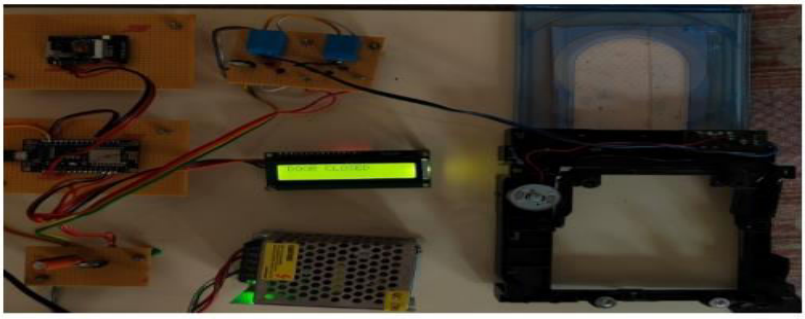

Fig 5.1 Hardware implementation of "A Method for Smart Gateway Using Digital Payment with Health Monitoring System"

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The figure 5.2 explains about the system further features a health monitoring function to improve visitor safety and health standard compliance. The health monitoring system has an LM35 body temperature sensor, an MQ-3 alcohol sensor for detecting Blood Alcohol Content (BAC), and a heartbeat sensor for heart rate monitoring. The system measures these health parameters simultaneously when a visitor scans their QR code at the entrance. When the temperature, BAC, or heart rate recorded is higher than the set safe thresholds, access is refused, and an alarm is triggered through Blynk. This system of integrated health monitoring guarantees that only those persons who satisfy health and safety criteria are allowed access, thus enhancing overall safety and operational effectiveness in public areas. Figure 5.3 shows the output status displayed following a successful verification process. After scanning the visitor's QR code and comparing it with stored information, the system verifies the health parameters, such as body temperature, Blood Alcohol Content (BAC), and heart rate. If the QR code is legitimate and all the health readings are within the acceptable limit, the system will power the relay to open the gate. The validity of the QR code and health monitoring outcome status is indicated on the LCD display. A status of "Verified" appears, showing that the visitor has passed all entry protocols. In case any parameter goes beyond the acceptable limit or there is aninvalid QR code, the gate will not open, and the display indicates an "Access Denied" message. Figure 5.3 gives an obvious graphical output of the system's response following validation

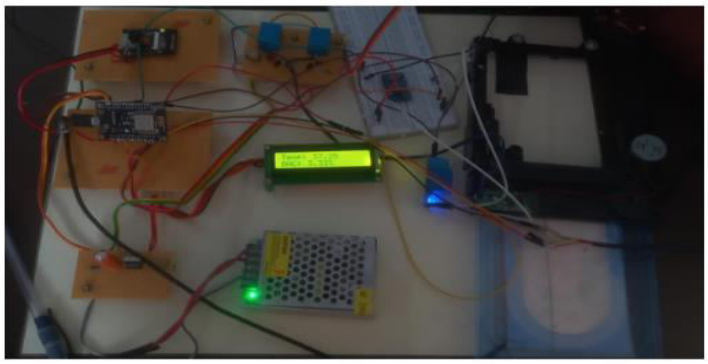

Fig 5.2 Alcohol and health monitor output

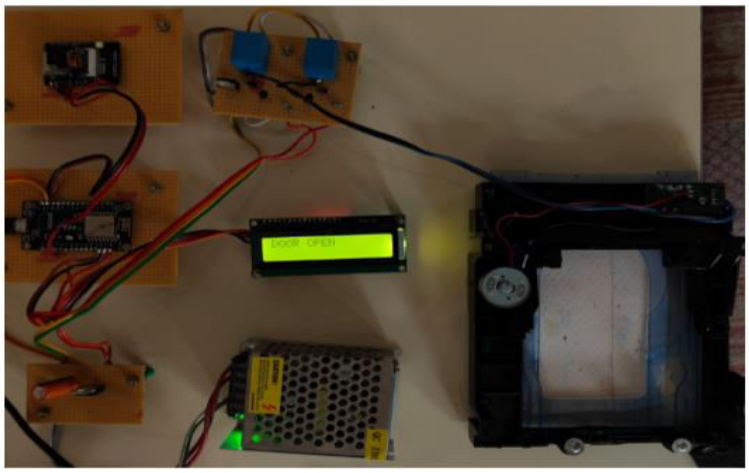

Fig 5.3 Door opens after validation

V. CONCLUSION

In summary, this method is a revolutionary solution to the problems of antiquated ticketing systems in public places such as zoos, parks, and museums. With visitor turnout increasing as a result of population densities going up and an ever-growing need for recreational activities, long waiting lines at ticket booths can result in substantial waiting times and irritation. The system solves these problems by providing an online portal where users can buy entry tickets in

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advance, thus reducing waiting time during peak hours. Thenew automated entry system uses a special QR code that is generated on successful payment via the Razorpay gateway, which ensures safe and easy transactions. This integration of digital payments removes the requirement for physical cash, reducing the chances of accounting mistakes and making financial processes easier.Furthermore, the utilization of the NodeMCU ESP and ESP32 CAM for QR code scanning and verification adds security to the system in that only valid ticket holders will be granted access. With the use of an LCD Display at the entrance, visitors are given instant feedback on whether they are allowed in or not, promoting a seamless and user-friendly experience. The system also has a Relay Module for controlling the entry gate so that fast and automated entry is achieved once a legitimate QR code is confirmed. Not only does this speed up the entry process but also reduces the burden on staff since fewer employees are required to handle ticket sales and crowd management.

Additionally, the inclusion of a health monitoring system adds an extra layer of visitor safety and security. The system comprises an LM35 body temperature sensor, an MQ-3 alcohol sensor to sense Blood Alcohol Content (BAC), and a heartbeat sensor for detecting heart rate. When any of these health parameters cross the threshold limit, the gate does not open, and an alert is triggered through Blynk. This health monitoring facility ensures that access is only allowed to those fulfilling health and safety requirements, enhancing public safety as well as deterring possible health-related problems.In all, our method improves operational effectiveness and customer satisfaction through the facilitation of a smooth and pleasant experience for visitors. By integrating technology with efficient design, we have created a smart gateway solution that solves typical problems in public spaces, opening the door to a more contemporary and streamlined method of ticketing, door entry, and health compliance.

VI. FUTURE SCOPE

The work "A Method for Smart Gateway Using Digital Payment with Health Monitoring System" provides a strong base for future development in enhancing visitor safety and experience. A major development is extending the health monitoring system by incorporating other sensors and sophisticated health evaluation features. At present, the system comes equipped with the LM35 body temperature sensor, the MQ-3 alcohol sensor to measure Blood Alcohol Content (BAC), and a heart rate monitoring sensor for heartbeats. Upcoming models of the system might add an SpO2 sensor to track the level of blood oxygen and a respiratory rate sensor to offer more detailed health scanning.To enhance the accuracy and responsiveness of the alcohol detection system, more sensitive breathalyzer technology or other gas sensors for detecting different types of intoxicants could be used.

This improvement would quietly assess people and bar access to individuals who have a higher than preset BAC, thus minimizing public nuisance and promoting a safer experience for everyone. Additionally, the health monitoring system could be integrated with machine learning algorithms to analyze patterns in visitor health data over time, enabling predictive health assessments and early detection of potential health issues.Subsequent versions of the system may also include the gathering and analysis of health information to provide useful insights to venue management. This would enable the tracking of health trends and better resource planning, so that venues are well prepared to manage different health situations. Additionally, real-time health alerts may be incorporated into the Blynk platform, so that staff can respond quickly to any health-related issues.With the inclusion of these new health monitoring capabilities, the smart gateway system will not only simplify the entry process but also establish itself as an all-around health and safety solution. This pre-emptive measure towards visitor health and safety will raise public confidence, enhance operational effectiveness, and provide a safe and enjoyable experience for all visitors.

REFERENCES

1. Kant,S., & Ojha,S.P.(2022). An Improved User Interface for Enabling Smart Access Using Low-Cost QR – Based Systems at Various Points. In Soft Computing: Theories and Applications: Proceedings of So CTA 2021(pp.213-225).
2. Joy, M. R., Bairavel , S., & Dhanalakshmi, R. (2021, July). Implementing QR code–based contact tracing framework. In2021 International Conference on System, Computation, Automation and Networking (ICSCAN)(pp.1-6).IEEE.
3. Lorenzi,D.,Shafiq,B.,Vaidya,J.,Nabi,G.,Chun,S.,&Atluri,V.(2022,June).Using QR codes for enhancing the scope of digital government services. In Proceedings of the 13th Annual International Conference on Digital Government Research (pp.21-29).
4. Chow, Y. W., Susilo, W., Yang, G., Au, M. H., & Wang, C. (2016). Authentication and transaction verification using QR codes with a mobile device.

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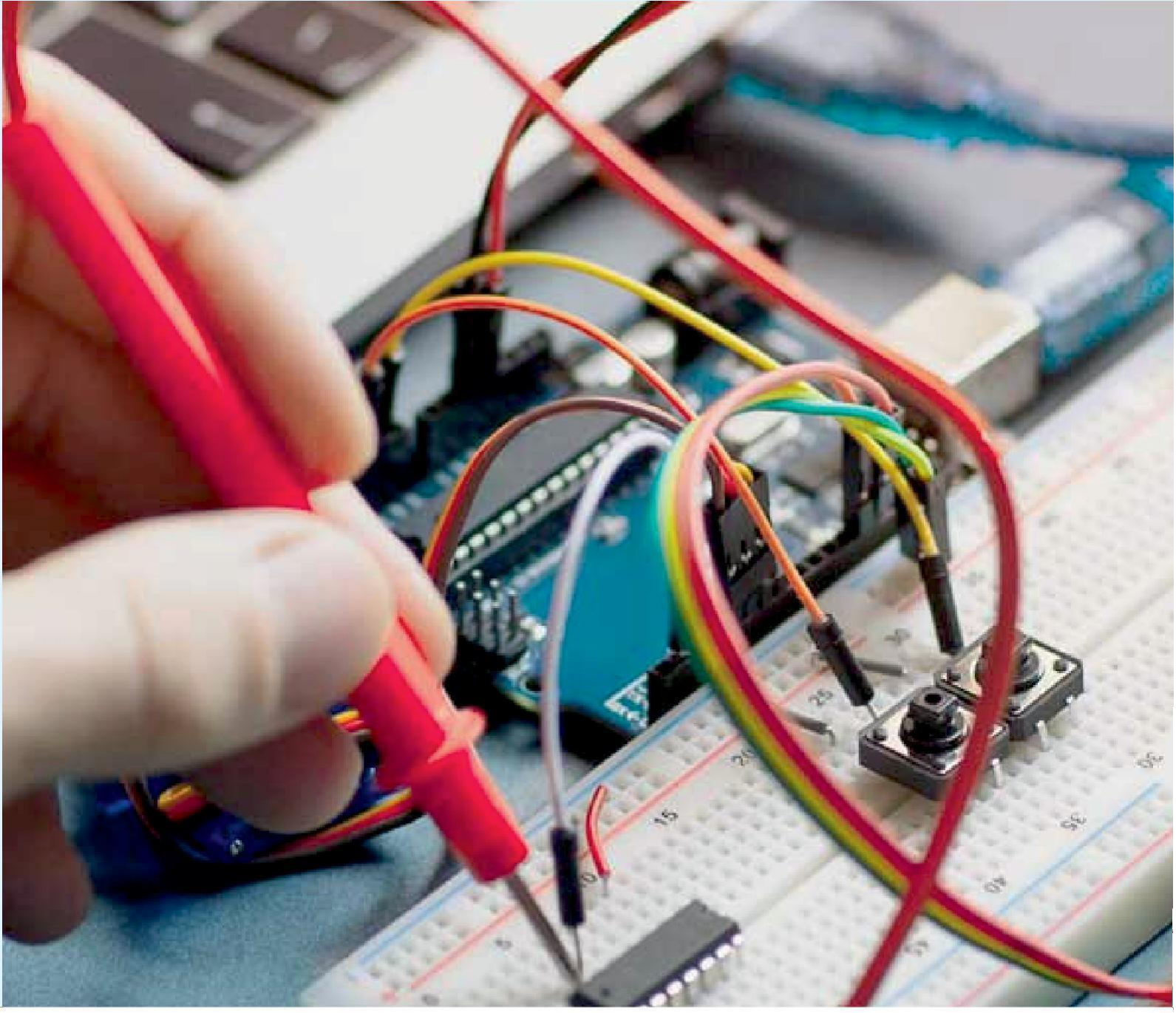
5. Adiono, T., & Daud, A. R. (2021, November). Electricity Smart Meter Payment System Through Payment Gateway and User Interface Design. In202115th International Conference on Telecommunication Systems, Services and Applications (TSSA)(pp.1-4).IEEE.
6. Graham, D. (2023). Integrated Electronic Payment Technologies for Smart Cities. Springer International Publishing.
7. Masihuddin, M.,Khan, B.U.I., Mattoo,M.M.U.I., Olanrewaju,R.F. (2017). Asurveyone-payment systems: elements, adoption, architecture, challenges and security concepts. Indian Journal of Science and Technology,10(20),1-19.
8. Bilgihan, A., Nusair, K., Okumus, F., & Cobanoglu, C. (2015). Applying flow theory to booking experiences: An integrated model in an online service context. Information & Management, 52(6),668-678.
9. Goecke, R.(2020).The evolution of online booking systems. Handbookofe-Tourism,1-25.
10. Jou, R. C., & Day, Y. J. (2021). Application of revised importance-performance analysis to investigate critical service quality of online booking. Sustainability,13(4),2043.
11. Vineetha K R. & Habeeba Sinu (2023). Design and Implementation of a Secure QR Payment Based on Visual Cryptography.
12. Jog, P., Owhal, N., Raut, O., Jadhav, A., Kaple, A., & Patil, H. Automatic Alcohol Detection System.
13. Ant Group & ISO (2023). ISO 5201 Standard on Financial Services for Code-Scanning Payment Security.
14. Lorenzi, D., Shafiq, B., Vaidya, J., & Chun, S. (2022). Using QR Codes for Enhancing Digital Government Services.
15. Digital Payment Systems: Evolution, Opportunities, and Challenges by R. Natarajan, Chapter 4, “QR Code-based Payment Systems,” pp. 98-125.
16. Chuquimarca, L., Roca, D., Torres, W., Amaya, L., Orozco, J., & Sánchez, D. (2020, June). Mobile IoT device for BPM monitoring people with heart problems. In 2020 International Conference on Electrical, Communication, and Computer Engineering (ICECCE) (pp. 1-5). IEEE.
17. Tham, O. Y., Markom, M. A., Bakar, A. A., Tan, E. M. M., &Markom, A. M. (2020, October). IoT health monitoring device of oxygen saturation (SpO2) and heart rate level. In 2020 1st International conference on information technology, advanced mechanical and electrical engineering (ICITAMEE) (pp. 128-133). IEEE.
18. Mobile Payment Systems and Security by S. Kumar & A. Sharma, Chapter 6, “Securing Mobile Payments with QR Codes,” pp. 147-172.
19. Contactless Payments and Digital Wallets by T. Holden, Chapter 2, “Technological Advances in QR Code Payments,” pp. 34-62.
20. Han, Q., Ma, Q., Xu, J., & Liu, M. (2021). Structural health monitoring research under varying temperature condition: A review. Journal of Civil Structural Health Monitoring, 11, 149-173.



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