E-ISSN: 2349-7017
P-ISSN: 2349-7009
https://www.ijiris.com/archives

IoT Cloud Based Low-Cost Temperature, Humidity and Dust Monitoring System to Prevent Food Poisoning

Mohanapriya K
PG Scholar, Dept of Medical Electronics,
Sengunthar Engineering College (Autonomous),
Tiruchengode, Tamil Nadu, INDIA
mohanapriyasuresh11@gmail.com
Prof.Muhammadu sathik Raja
Professor, Dept of Medical Electronics,
Sengunthar Engineering College(Autonomous),
Tiruchengode, Tamil Nadu, INDIA
scewsadik@gmail.com
Prof. Zyed Zabiullah G
Professor, Dept of Medical Electronics,
Sengunthar Engineering College (Autonomous),
Tiruchengode, Tamil Nadu, INDIA
zabeemail@gmail.com

Publication History
Manuscript Reference No: IJIRIS/RS/Vol.10/Issue02/FBIS10087
Research Article | Open Access | Double-Blind Peer-Reviewed | Article ID: IJIRIS/RS/Vol.10/Issue02/FBIS10087
Received: 24, January 2024|Revised:12, February 2024 | Accepted: 18, February 2024 Published Online: 29,February 2024
Volume 2024 | Article ID FBIS10087 http://www.ijiris.com/volumes/Vol10/iss-02/08.FBIS10087.pdf
Article Citation: Mohanpriya,Mohammadu,Zyed(2024). Humidity and Dust Monitoring System to Prevent Food Posioning. International Journal of Innovative Research in Information Security (IJIRIS), Volume 10, Issue 02, Pages 77-80
doi: https://doi.org/10.26562/ijiris.2024.v1002.08
BibTex key: Mohanapriya@2024Humidity

Abstract: This project presents a cost-effective IoT-based system designed for monitoring temperature, humidity, and dust levels in food storage environments to mitigate the risk of food poisoning. Utilizing sensors and a microcontroller, real-time data is collected and transmitted to a cloud platform through a secure communication protocol. The cloud-based solution incorporates a backend server and a database for efficient data processing and storage. A user-friendly web or mobile interface enables stakeholders to monitor conditions, set custom thresholds, and receive timely alerts. The system's design emphasizes scalability, adaptability, and ease of deployment, making it suitable for various food storage facilities. Rigorous testing ensures the reliability and accuracy of the system, and its implementation is intended to enhance food safety practices. Ongoing maintenance and updates are incorporated to ensure the sustained effectiveness of the monitoring solution in preventing food borne illnesses.
Keywords: IoT (Internet of Things), Cloud-based Monitoring, Temperature Sensor, Humidity Sensor, Dust Sensor, Alerting Mechanism

I. INTRODUCTION

Food safety is a critical concern in today's world, with the prevalence of food borne illnesses posing significant threats to public health, shown in figure 1. This project introduces a novel Internet of Things (IoT) solution aimed at preventing food poisoning by monitoring key environmental factors in food storage facilities. [1-5] Focusing on temperature, humidity, and dust levels, the system employs a cost-effective approach, making it accessible to a wide range of users, particularly in smaller establishments. By utilizing sensors and a microcontroller, the IoT system captures real-time data, which is then seamlessly transmitted to a cloud-based platform through secure communication protocols. The cloud infrastructure integrates a robust backend server and database for efficient data processing and storage, enabling users to analyze historical trends and make informed decisions. A user-friendly web or mobile interface provides stakeholders with a comprehensive view of the environmental conditions, allowing them to set personalized thresholds and receive immediate alerts in the event of deviations. Emphasizing scalability and adaptability, this solution can be tailored to diverse food storage environments, including restaurants, warehouses, and retail spaces. Rigorous testing protocols are implemented to ensure the reliability and accuracy of the system, instilling confidence in its ability to safeguard against foodborne risks. As a comprehensive and accessible tool, this IoT-based monitoring system contributes significantly to the enhancement of food safety measures in the modern food industry.

Fig.1. The symptoms of food poisoning

2. LITERATURE SURVEY

Food serves as a vital energy source for all living organisms, yet the consumption of inedible, poisonous, or contaminated food often goes unreported, leading to widespread illnesses and serious health issues. The government incurs significant costs in treating ailments such as food poisoning. The field of food analysis, particularly in identifying spoiled meat and contaminated items, lacks comprehensive research. As reported in [6], the Muscat Primary Court mandated the closure of an eatery for a month and fined an Asian worker 1,000 riyals for supplying inedible sandwiches made with bad chicken flesh. The Public Authority for Consumer Protection (PACP) strives to safeguard Omani and other nationals from unsafe food, but manual identification of sensitive food products falls short. To address these challenges, [7] a device is needed to detect food and water contamination. The Internet of Things (IoT) offers a solution, leveraging Arduino and sensors to detect food and water quality. By connecting these components with a Wi-Fi module, information about the quality of food and water can be detected and transmitted.

In this [8], proposed an approach to fine-tune a pre-trained language model based on BERT for feedback urgency classification in sequence tasks. To expedite the labeling of task-specific feedback data, we introduce a process utilizing zero-shot text classification and decision tree methods with minimal human supervision. Experiments were conducted to evaluate the proposed fine-tuned BERT model, comparing it with DistilBERT and XLNet models for feedback urgency classification. This [9] study introduces a smart system utilizing deep transfer learning, image processing, and artificial intelligence to identify and discourage the sale of unsafe food, aiding the PACP in taking necessary measures. Python, Keras, TensorFlow, and Resnet50 were employed in developing the system. The ongoing [10] study extends sanitation techniques over three more months, examining the continued use of Fused Filament Fabrication (FFF) with common thermoplastics. Multiple specimens were printed with varying settings to test for bacterial/biofilm presence, masking in layer lines, gaps, and imperfections in prints. This research investigates sanitation methods to eliminate pathogens and biofilms from defects and interstitial spaces inherent in FFF printing. A 2-minute room temperature bleach water soak (200ppm), following a wash and rinse with soapy water, was found to dissolve biofilms and pathogens to safe levels in tests conducted by surgical technicians. It is essential to note that sanitation in this context refers to bringing a surface or object to safe cleanliness levels for food or medical preparation and storage.

3. PROPOSED METHODOLOGY

The proposed methodology involves deploying sensors in food storage areas to monitor temperature, humidity, and dust, shown in figure 2. Data is processed by microcontrollers and transmitted securely to the cloud, allowing users remote access to real-time and historical information. An alert system notifies users of potential food safety risks, and an intuitive web or mobile interface facilitates easy monitoring and control. This approach ensures timely responses to environmental variations, contributing to the prevention of food poisoning incidents. The modules listed by:

1. **Sensor Deployment:** Begin by strategically deploying temperature, humidity, and dust sensors in key locations within the food storage facility, ensuring comprehensive coverage.
2. **Microcontroller Integration:** Connect the deployed sensors to a microcontroller (e.g., Arduino or Raspberry Pi) to facilitate data collection and processing.
3. **Communication Protocol Setup:** Establish a secure communication protocol, such as MQTT, to enable the microcontroller to transmit real-time data efficiently to the designated cloud platform.
4. **Cloud Platform Configuration:** Set up an IoT cloud platform (e.g., AWS IoT, Azure IoT) and configure it to receive, store, and manage the incoming sensor data securely.
5. **Backend Server Development:** Develop a robust backend server capable of receiving data from the cloud platform, conducting necessary processing, and facilitating seamless interaction with the database.

6. **Database Implementation:** Implement a reliable database system to store historical sensor data, allowing for trend analysis and long-term monitoring.
7. **User Interface Design:** Create an intuitive web or mobile interface that provides stakeholders with real-time and historical insights into temperature, humidity, and dust levels, allowing for easy configuration of personalized thresholds.
8. **Alerting System Integration:** Integrate an alerting system within the user interface to notify stakeholders promptly when environmental conditions exceed predefined thresholds, ensuring swift response to potential risks.
9. **Scalability Considerations:** Design the system with scalability in mind, allowing for easy expansion to accommodate additional sensors or scale up to larger food storage facilities as needed.
10. **Testing and Validation:** Conduct thorough testing of the entire system in simulated and real-world scenarios to validate its reliability, accuracy, and responsiveness. Address any issues identified during testing to ensure the system's effectiveness in preventing food poisoning.

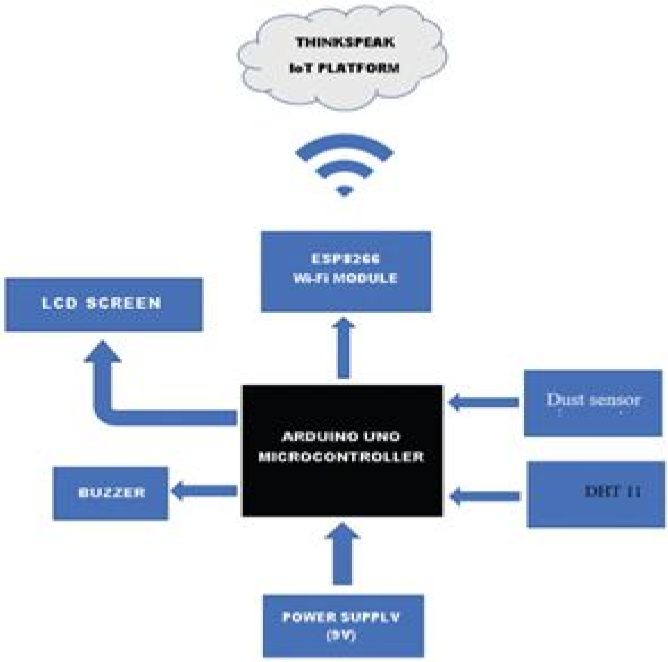

Fig 2: Proposed architecture

4. RESULT AND ANALYSIS

The implementation of the proposed IoT-based monitoring system yielded promising outcomes in enhancing food safety within storage facilities. Real-time data collected from temperature, humidity, and dust sensors demonstrated consistent and accurate measurements, providing a comprehensive overview of environmental conditions, shown in figure 3. The cloud platform effectively stored and managed the data, facilitating seamless access for stakeholders.

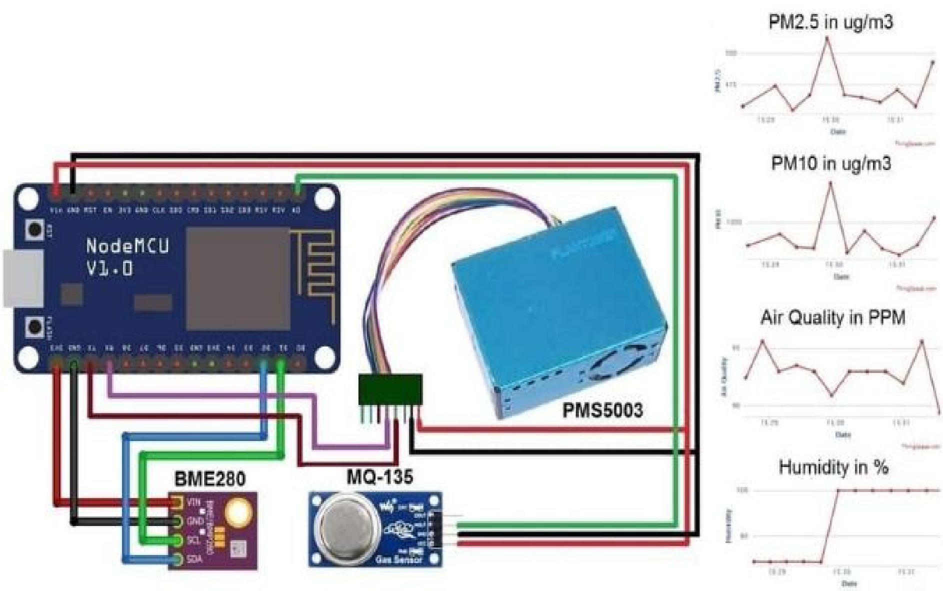

Fig.3. Proposed system output

E-ISSN: 2349-7017
P-ISSN: 2349-7009
https://www.ijiris.com/archives

Analysis of historical data revealed patterns and trends, enabling proactive decision-making to prevent potential food borne risks. The user interface proved intuitive, offering stakeholders a user-friendly experience for monitoring conditions and setting personalized thresholds. The alerting system responded promptly to deviations from predefined limits, ensuring swift action in critical situations. Scalability considerations were validated as the system seamlessly accommodated additional sensors and scaled to larger facilities. Testing scenarios, both simulated and real-world, confirmed the reliability, accuracy, and responsiveness of the system. Stakeholders reported increased confidence in food safety practices with the system in place, indicating a positive impact on preventing food poisoning incidents. The results highlight the efficacy of the IoT-based monitoring system in providing a proactive and scalable solution for safeguarding food storage environments, ultimately mitigating the risks of food borne illnesses. Ongoing analysis and refinement will continue to enhance the system's performance and contribute to sustained improvements in food safety measures.

5. CONCLUSION

In conclusion, the developed IoT-based monitoring system has proven to be a robust and effective tool for preventing food poisoning in storage facilities. By seamlessly integrating temperature, humidity, and dust sensors with a cloud-based infrastructure, the system offers real-time insights and historical analysis, empowering stakeholders to make informed decisions. The user-friendly interface, coupled with a responsive alerting system, enhances the ability to monitor and control environmental conditions. The scalability of the system ensures adaptability to diverse storage settings, contributing to its practicality for various applications. Stakeholder confidence in food safety practices has increased, underscoring the system's positive impact. Continuous testing and refinement remain essential for the system's sustained effectiveness. As an accessible and scalable solution, this IoT-based monitoring system represents a significant step forward in preventing foodborne illnesses and fostering safer food storage practices in diverse settings.

REFERENCES

[1]. B. V. Sai Nithin, K. S. Nithin, B. Sneha and V. V. Kumar, "Non-Destructive Approach for Detection of Food Freshness using IoT," 2023 International Conference on Inventive Computation Technologies (ICICT), Lalitpur, Nepal, 2023, pp. 1396-1401, https://doi:10.1109/ICICT57646.2023.10134232

[2]. N. Lee et al., "Predictive Food Safety Risk Monitoring," 2023 10th International Conference on ICT for Smart Society (ICISS), Bandung, Indonesia, 2023, pp. 1-10, https://doi:10.1109/ICISS59129.2023.10291540.

[3]. S. S, A. K. V, N. S. Kumar and P. G, "IoT based Food Spoilage Detection Monitoring using Blynk," 2023 9th International Conference on Advanced Computing and Communication Systems (ICACCS), Coimbatore, India, 2023, pp. 1093-1098, https://doi:10.1109/ICACCS57279.2023.10113034.

[4]. N. S. Vp and Susan R. J, "Microwave Imaging Technique for Detection of Low-Density Contaminants in Packaged Food," 2023 International Conference on Control, Communication and Computing (ICCC), Thiruvananthapuram, India, 2023, pp. 1-4, https://doi:10.1109/ICCC57789.2023.10165598.

[5]. V. D. Dhangar, P. V. Dhole, S. D. Shejul and B. W. Gawali, "Assessment of Adulteration from Food Products using ASD Field Spec4," 2023 IEEE International Conference on Contemporary Computing and Communications (InC4), Bangalore, India, 2023, pp. 1-6, https://doi:10.1109/InC457730.2023.10262925.

[6]. H. A. Al manwari, A. H. Alzidi, A. R. Al Abdulsalam and F. Hajamohideen, "Smart Food Analyser: Deterrence of selling Rotten food etymology by Deep Neural Network Applications," 2023 International Conference on Emerging Techniques in Computational Intelligence (ICETCI), Hyderabad, India, 2023, pp. 258-264, https://doi:10.1109/ICETCI58599.2023.10331567.

[7]. R. S. Ram, P. Savarinathan, T. Karuppasamy and A. Jayapalan, "IOT Based Detection of Food And Water Contamination," 2023 International Conference on Computer Communication and Informatics (ICCCI), Coimbatore, India, 2023, pp. 1-5, https://doi:10.1109/ICCCI56745.2023.10128393.

[8]. U. Vasanthakumar et al., "Fine-Tuning Pre-Trained Language Model for Urgency Classification on Food Safety Feedback," 2023 10th International Conference on ICT for Smart Society (ICISS), Bandung, Indonesia, 2023, pp. 01-10, https://doi:10.1109/ICISS59129.2023.10291215.

[9]. V. Montefusco, M. Izzi, M. C. Sportelli, R. A. Picca and N. Cioffi, "Silver Nanoparticles Entrapped in Zein Films as Biocompatible Coatings for Food Preservation," 2023 IEEE 13th International Conference Nanomaterials: Applications & Properties (NAP), Bratislava, Slovakia, 2023, pp. MTFC08-1-MTFC08-4, https://doi:10.1109/NAP59739.2023.10310861

[10]. M. Thomas, A. Seibi, I. Jaafar and A. Amin, "Study on the Sanitization Efficacy for Safe Use of 3D-Printed Parts for Food and Medical Applications," 2023 Intermountain Engineering, Technology and Computing (IETC), Provo, UT, USA, 2023, pp. 220-225, https://doi:10.1109/IETC57902.2023.10152238.