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Smart System for Food Quality Detection and Transportation Using IoT

Payal Patel[1], Arti Pagar[2], Madhuri Aher[3], Prasad Mutkule[4]
[1, 2, 3, 4]*Department of Information Technology, Sanjivani College of Engineering, Kopargaon-423 603*

Abstract: ***Food inventory network process involves crops assortment, handling of food, transporting and conveyance to the entire dealer on the lookout. Reaped food sources disintegrate from the second they are collected due to assaults from chemicals, oxidation, and microorganisms. These incorporate microscopic organisms, form, yeast, dampness, temperature, and substance response. The deterioration of new food has expanded over the long haul because of the multistage slow food inventory network process. The ID, detectability, and constant following of products in supply chains have forever been a test. The approach of the Internet of Things and distributed computing has brought another way to deal with the food store network process for better participation among store network accomplices. The inventory network the executives (SCM) benefit extraordinarily through mechanization dependent on key advancements of IoT.***
Keywords: IoT, Food Supply, Tracking, Food Safety, Distributed Computing

I. INTRODUCTION

A Smart Food Container/Smart Container containing various sensors is intended to catch constant setting of food newness location. This framework proposed novel methodology towards proficient food transportation through an IOT empowered dynamic and constant match-production framework which tends to the qualities and weaknesses recognized in framework [11]. Transportation will screen and live following will be finished utilizing GPS module , Also we are giving the condition reasonable to move based of climate boundary. “Intelligent packaging materials” is the term used to represent class of packaging materials that can monitor the condition of either the packaged food or the food environment inside the package which includes temperature, pH, etc., and provides this information to the user [14]. Term describe packaging with enhanced functionality through technology. Intelligent Packaging: Contains sensors to determine the condition (e.g., freshness or temperature) of the product. Primarily used in food and beverage applications. Storing and transporting food is a special challenge. This is due, among other things, to the perishability of fresh food products and the special requirements for ambient temperatures.

There are a number of legal regulations and hygiene rules that must be observed during storage and also during transport. Ultimately, the aim is to ensure food safety for consumers. In the warehouses, suitable environmental conditions - especially with regard to temperatures - must be established for different product categories. In addition, there are requirements for humidity, CO2 content (for ripening warehouses), air circulation, and much more. In addition, precautions and defence measures against pest infestation must be taken

II. LITERATURE SURVEY

Weimin Xioa et al. [1] proposed for help consumers enjoy healthy food, technology investigation for food freshness sensing are conducted. In this study meat is selected as the detection target based on a consumer survey. Near infrared spectroscopy, pH, CO 2 , TVOC, and auto fluorescence are investigated. The results showed that CO 2 and TVOC could be a used for meat freshness sensing in a closed space such as box. Near infrared spectroscopy and auto-fluorescence have the potential for meat freshness sensing? PH alone cannot be applied to predict meat freshness directly due to the large food sample varieties.

Suwimol Sittichat et al. [2] have developed a portable electronic nose (E-nose) based on eight metal oxide gas sensors for classification and prediction of meat freshness. In this study, the E-nose was applied to predict chicken freshness during different storage days. Principal component analysis (PCA) and artificial neural network (ANN) were used to analyze the experiment data. The PCA method can classify the chicken freshness related to storage days. The ANN result shows good agreement with the PCA result. The correct rate in classification of ANN is 97.92 percent. From PCA and ANN results, it indicates that the E-nose can well classify and predict the freshness of chicken and owns many advantages over other methods including easy operation, rapid detection, high accuracy, and safety for meat.

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Mahdi Guermazi et al. [3] proposed Reliable information about food state and freshness throughout production processes and until consumption is very important for product quality, consumer safety and export of goods. Regulations worldwide protect consumers and encourage the production of safe, nutritious and affordable aliments. Several measurement methods for food quality assessment can be used in the laboratory e.g., chemical analysis, mechanical methods, optical methods, x-ray measurements and nuclear magnetic resonance. Even if they are precise, these methods remain useless for real-time application.

C. Platias; Z. Kandylakis [4] proposed To help consumers enjoy healthy food, technology investigation for food freshness sensing are conducted. In this study meat is selected as the detection target based on a consumer survey. Near infrared spectroscopy, pH, CO 2 , TVOC, and auto fluorescence are investigated. The results showed that CO 2 and TVOC could be a used for meat freshness sensing in a closed space such as box. Near infrared spectroscopy and auto-fluorescence have the potential for meat freshness sensing. pH alone cannot be applied to predict meat freshness directly due to the large food sample varieties.

G-J E. Nychas and K. Karantzalos, et al. [5] proposed Multispectral and hyperspectral imaging systems have proven capabilities in estimating critical food quality parameters for a number of food processing and inspection tasks. In this paper, we have developed a processing pipeline for multispectral and hyperspectral snapshot video sensors, towards detecting certain critical quality parameters like freshness, spoilage levels and storage temperatures. In particular, a set of pre-processing modules are detecting clear meat or salad observations and then a classification algorithm is responsible for detecting and labelling accordingly each pixel or sample. The experimental results and performed quantitative validation indicate the quite promising potentials of the developed approach.

D. Mayr et al. [6] In today's world, food spoilage is a crucial problem as consuming spoiled food is harmful for consumers. Our project aims at detecting spoiled food using appropriate sensors and monitoring gases released by the particular food item. A micro controller that senses this, issues an alert using internet of things, so that appropriate action can be taken. This has widescale application in food industries where food detection is done manually. We plan on implementing machine learning to this model so we can estimate how likely a food is going to get spoiled and in what duration, if brought from a particular vendor. This will increase competition among retailers to sell more healthy and fresh food and create a safe world for all consumers alike.

III.METHODOLOGY

The single problem can be solved by different solutions. This considers the performance parameters for each approach. Thus considers the efficiency issues.

1) Problem Solving Methods are concerned with efficient realization of functionality. This is an important characteristics of Problem Solving Methods and should be deal with it explicitly.

2) Problem Solving Methods achieve this efficiency by making assumptions about resources provided by their context (such as domain knowledge) and by assumptions about the precise definition of the task. It is important to make these assumptions explicit as it give the reason about Problem Solving Methods.

3) The process of constructing Problem Solving Methods is assumption-based. During this process assumptions are added that facilitate efficient ope rationalization of the desired functionality

4) This study proposes a reliable, auditable and trackable framework that ensures transaction integrity, immutability and transparency in the entire course of ship-ments of perishable products. The system provides a coherent digital representation of valuable assets to stackeholders , from raw material suppliers to end-users or consumers

IV.SYSTEM ARCHITECTURE

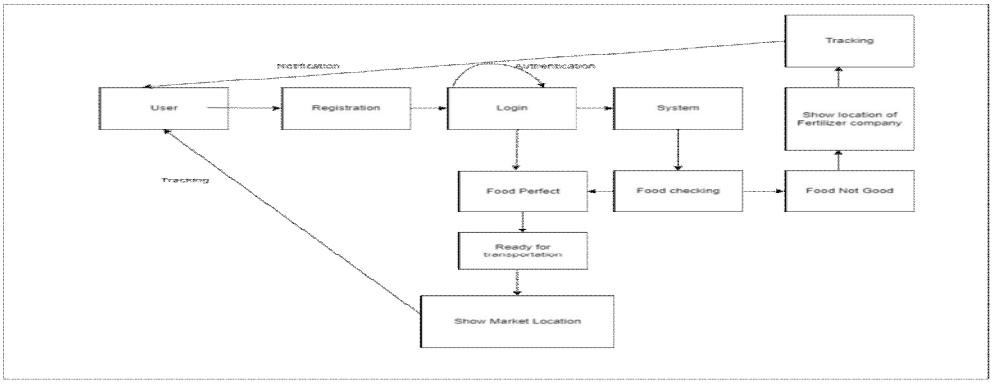


Fig. 1 System Architecture

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A System Architecture consist of multiple modules. The user will log in into the system by registering their details. As soon as registration is completed, the system will store their details in DB. Then the system will select the food which is observe in the container and the system will predict the food perfect or not based on freshness of food and also recommend notifications to the user. System having advantages like innovative, centralized database, easy to use and effective cost.

V. EXPERIMENTAL SETUP

Android Studio is the official[7] integrated development environment (IDE) for Google's Android operating system, built on JetBrains' IntelliJ IDEA software and designed specifically for Android development.[8] It is available for download on Windows, macOS and Linux based operating systems or as a subscription-based service in 2020.[9][10] It is a replacement for the Eclipse Android Development Tools (E-ADT) as the primary IDE for native Android application development. Android Studio was announced on May 16, 2013, at the Google I/O conference. It was in early access preview stage starting from version 0.1 in May 2013, then entered beta stage starting from version 0.8 which was released in June 2014.[11][17] The first stable build was released in December 2014, starting from version 1.0

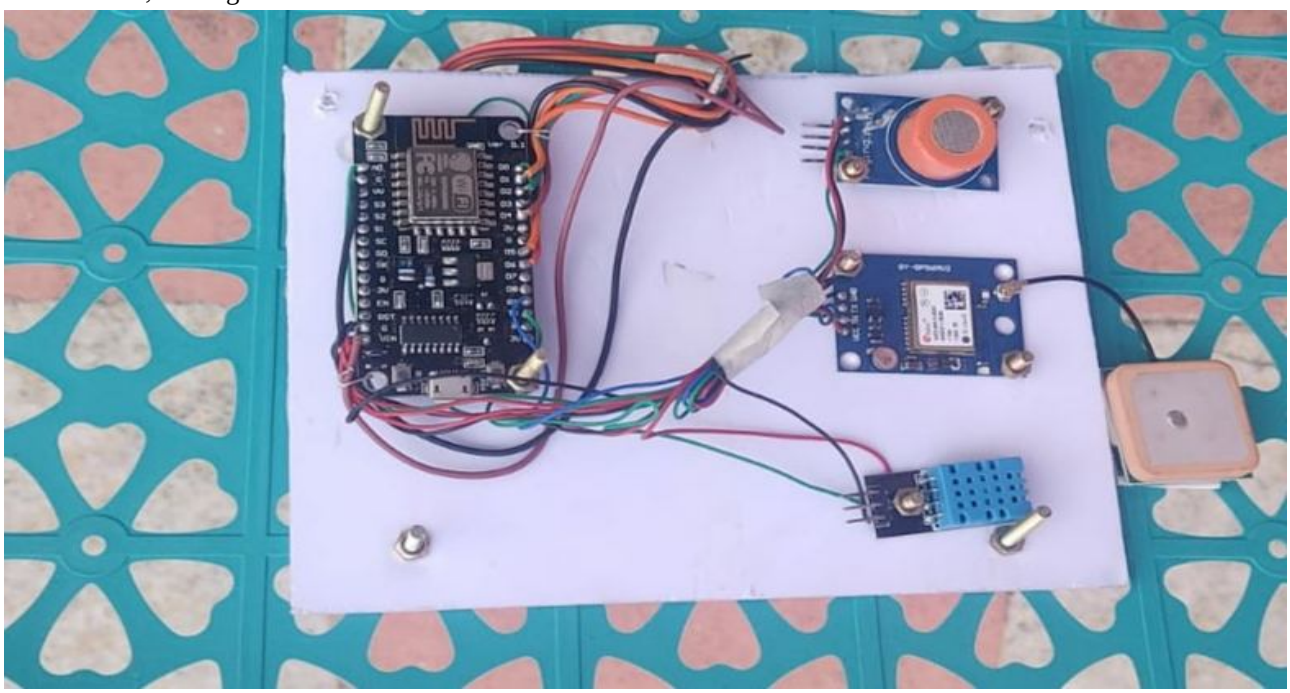


Fig. 2 Experimental Setup

Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards ('shields') or breadboards (for prototyping) and other circuits. The boards feature serial communications interfaces, including Universal Serial Bus (USB) on some models, which are also used for loading programs. The microcontrollers can be programmed using the C and C++ programming languages, using a standard API which is also known as the Arduino language, inspired by the Processing language and used with a modified version of the Processing IDE. In addition to using traditional compiler toolchains, the Arduino project provides an integrated development environment (IDE) and a command line tool developed in Go.

Firebase evolved from Envolve, a prior start-up founded by James Tamplin and Andrew Lee in 2011. Envolve provided developers an API that enables the integration of online chat functionality into their websites. After releasing the chat service, Tamplin and Lee found that it was being used to pass application data that were not chat messages. Developers were using Envolve to sync application data such as game state in real time across their users. Tamplin and Lee decided to separate the chat system and the real-time architecture that powered it.[2] They founded Firebase as a separate company in 2011 and it launched to the public in April 2012.[3] Firebase's first product was the Firebase Realtime Database, an API that synchronizes application data across iOS, Android, and Web devices, and stores it on Firebase's cloud. The product assists software developers in building real-time, collaborative applications.

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VI. COMPARATIVE ANALYSIS

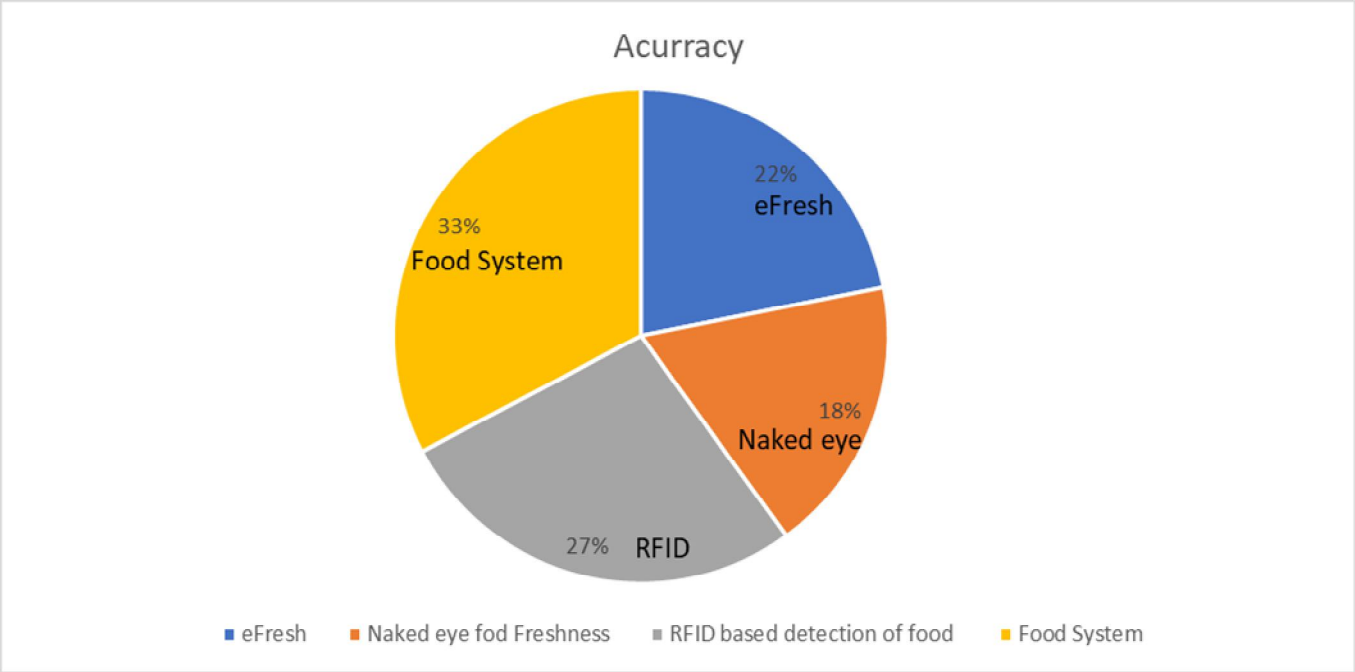


Fig. 3 Analysis based on accuracy

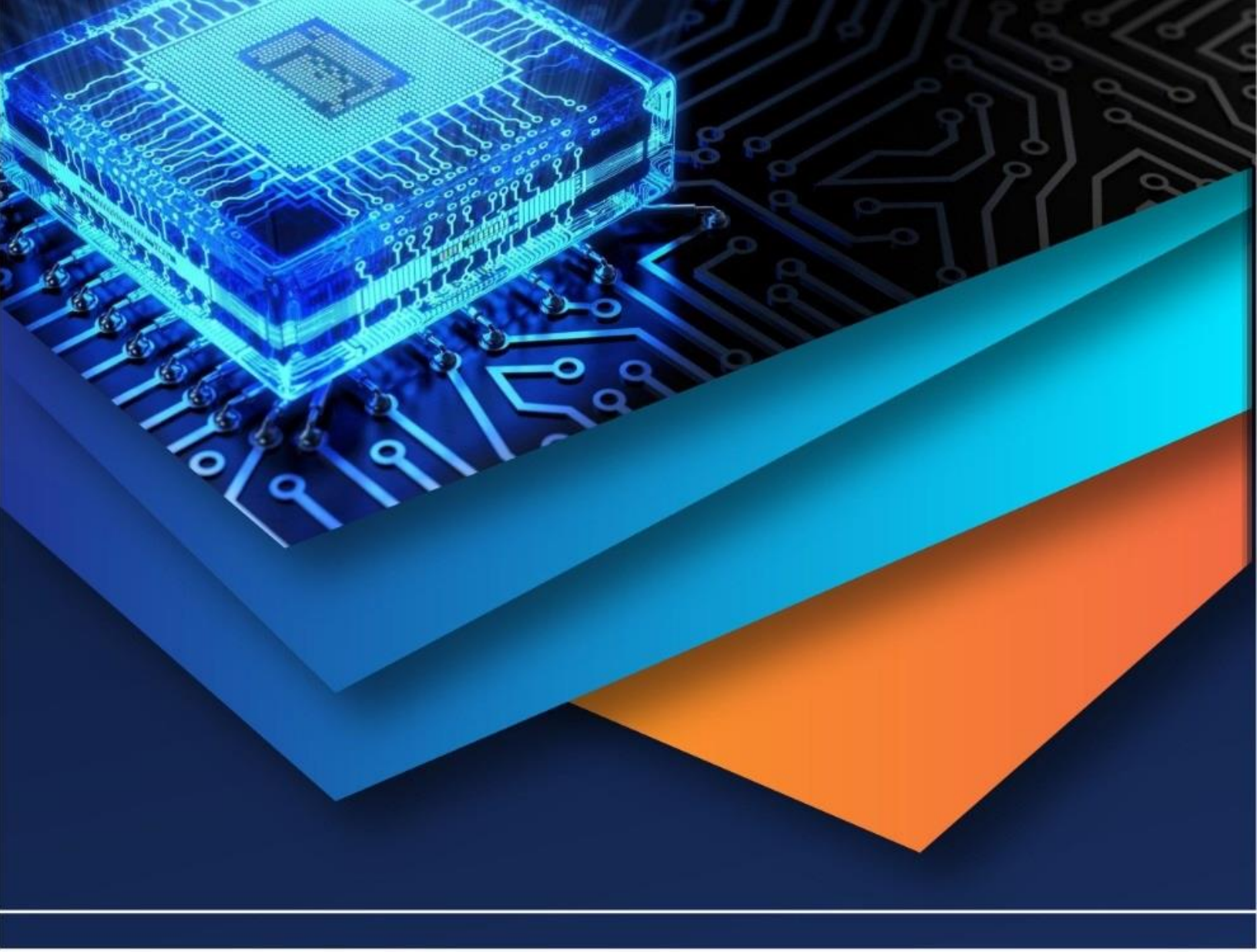
VII. CONCLUSIONS

This study proposed a reliable, auditable, and trackable framework that ensured transaction integrity, immutability, and transparency in the entire time of transaction of perishable products. The proposed system bestowed secure monitoring and reporting based on IoT. It provided a digital representation of individual transactions. The framework created a digital ledger that contained information about quality, transaction information, stakeholders information, and other relevant information. The individual shipment items adopted a unique digital identification tag equipped with navigation and communications sensors to track and trace the items during the life span of the entire delivery. Hence this system overcoming the drawback of existing system and providing a smart system that will not only monitor and control food wastage but also supply it to needed people. IOT technology helps us to develop a quality product in minimum cost.

REFERENCES

[1] Weimin Xiao; Weishun Bao; Yafang Jin; Lucia Lu; George Luo; Yuqiang Wu, ”Investigation of food freshness sensing technology for consumer use” IEEE 2020 Advanced Progress in Electromagnetic Research Symposium (PIERS), 2016
[2] Mahdi Guermazi; Ahmed Fendri; Olfa Kanoun; Nabil Derbe, ”Potential of impedance spectroscopy for real-time assessing of food quality", IEEE Instrumentation Measurement Magazine, 2018
[3] Weimin Xiao; Weishun Bao; Yafang Jin; Lucia Lu; George Luo; Yuqiang Wu, "Investigation
[4] of food freshness sensing technology for consumer use" IEEE 2020 Advanced Progress in Electromagnetic Research Symposium (PIERS), 2016.
[5] C. Chen, X. Tang, and Y. Li, ‘‘The application research of application decision model based on Internet of Things in enterprise supply chain management,’’ J. Intell. Fuzzy Syst., vol. 37, no. 5, pp. 5809–5817, Nov. 2019,
[6] H. Nilsen, M. Esaiassen, K. Heia and F. Sigernes, "Visible/near-infrared spectroscopy: A new tool for the evaluation of fish freshness", Journal of Food Science, vol. 67, no. 5, pp. 1821-1826, 2002.
[7] Q. Chen, J. Cai, X. Wan and J. Zhao, "Application of linear/non-linear classification algorithms in discrimination of pork storage time using Fourier transform near infrared (FT-NIR) spectroscopy", LWT - Food Science and Technology, vol. 44, no. 10, pp. 2053-2058, 2011.
[8] R. Grau, A. J. Sánchez, J. Girón, E. Iborra, A. Fuentes and J. M. Barat, "Nondestructive assessment of freshness in packaged sliced chicken breasts using SW-NIR spectroscopy", Food Research International, vol. 44, no. 1, pp. 331-337, 2011.
[9] D. Mayr et al., "Rapid detection of meat spoilage by measuring volatile organic compounds by using proton transfer reaction mass spectrometry", Applied and Environmental Microbiology, vol. 69, no. 8, pp. 4697-4705, 2003.
[10] J. Tománková et al., "Volatile organic compounds as biomarkers of the freshness of poultry meat packaged in a modified atmosphere", Czech J. Food Sci., vol. 30, pp. 395-403, 2012.

[11] A. Thommandru, P. Mutkule, A. Bandi and K. Tongkachok, "Towards Applicability of Artificial Intelligence in Healthcare, Banking and Education Sector", ECS Transactions, vol. 107, no. 1, pp. 16665-16671, 2022. Available: 10.1149/10701.16665ecst.
[12] C. Rukchon et al., "Development of a food spoilage indicator for monitoring freshness of skinless chicken breast", Talanta, vol. 130, pp. 547-554, 2014.
[13] P. Puligundla, J. Jung and S. Ko, "Carbon dioxide sensors for intelligent food packaging applications", Food Control, vol. 25, no. 1, pp. 328-333, 2012.
[14] Mutkule Prasad R., "Interactive Clothing based on IoT using QR code and Mobile Application", International Journal of Scientific Research in Network Security and Communication, Vol.6, Issue.6, pp.1-4, 2018
[15] MUHAMMAD NASIR MUMTAZ BHUTTA AND MUNEER AHMAD, (Member, IEEE) " Identification, Traceability and Real-Time Tracking of Agricultural Food Supply During Transportation Using Internet of Things"Received April 3, 2021, accepted April 25, 2021, date of publication April 28, 2021, date of current version May 6, 2021
[16] S. E. Chang and Y. Chen, "When blockchain meets supply chain: A systematic literature review on current development and potential applications," IEEE Access, vol. 8, pp. 62478–62494, 2020, doi: 10.1109/ACCESS.2020.2983601.
[17] P. Mutkule, "One Stop Solution for Farmer Consumer Interaction", in National Conference on Advances in Computing (NCAC 2015), D Y Patil School Of Engineering Lohegaon, Pune, 2015, pp. 16-19.
[18] F. M. Bencic, P. Skocir, and I. P. Zarko, "DL-tags: DLT and smart tags for decentralized, privacy-preserving, and verifiable supply chain management," IEEE Access, vol. 7, pp. 46198–46209, 2019, doi: 10.1109/ACCESS.2019.2909170.
[19] Y. P. Tsang, K. L. Choy, C. H. Wu, G. T. S. Ho, and H. Y. Lam, "Blockchaindriven IoT for food traceability with an integrated consensus mechanism," IEEE Access, vol. 7, pp. 129000–129017, 2019, doi: 10.1109/ACCESS.2019.2940227.
[20] Mahdi Guermazi; Ahmed Fendri; Olfa Kanoun; Nabil Derbe, "Potential of impedance spectroscopy for real-time assessing of food quality", IEEE Instrumentation Measurement Magazine, 2018
[21] Weimin Xiao; Weishun Bao; Yafang Jin; Lucia Lu; George Luo; Yuqiang Wu, "Investigation of food freshness sensing technology for consumer use" IEEE 2020 Advanced Progress in Electromagnetic Research Symposium (PIERS), 2016
[22] C. Chen, X. Tang, and Y. Li, "The application research of application decision model based on Internet of Things in enterprise supply chain management," J. Intell. Fuzzy Syst., vol. 37, no. 5, pp. 5809–5817, Nov. 2019, doi: 10.3233/JIFS179162 31
[23] Kriengkri Timsorn; Chatchawal Wongchoosuk; Pakaket Wattuya; Sansoen Promdaen; Suwimol Sittichat, "Discrimination of chicken freshness using electronic nose combined with PCA and ANN", 11th International Conference on Electrical Engineering/Electronics, Computer, Telecommunications and Information Technology (ECTICON), 2014
[24] T. De Vass, H. Shee, and S. J. Miah, "The effect of 'Internet of Things' on supply chain integration and performance: An organisational capability perspective," Australas. J. Inf. Syst., vol. 22, pp. 1–29, Jun. 2018, doi: 10.3127/ajis.v22i0.1734
[25] C. Platias; Z. Kandylakis; E.Z. Panagou; G-J E. Nychas; K. Karantzalos, "Snapshot Multispectral and Hyperspectral Data Processing for Estimating Food Quality Parameters", 9th Workshop on Hyperspectral Image and Signal Processing: Evolution in Remote Sensing (WHISPERS), 2018.



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