iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 10 **Issue:** I **Month of publication:** January 2022

DOI: https://doi.org/10.22214/ijraset.2022.40127

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue I Jan 2022- Available at www.ijraset.com

Smart Microwave Oven

Yash Gupta[1], Utkarsh Garg[2], Hemant Kumar Khushwah[3], Vaibhav Jadon[4], Mr. Dinesh Prasad[5]
[1, 2, 3, 4]*Department of Electrical Engineering, Galgotias College of Engineering and Technology, Greater Noida, India*
[5]*Assistant Professor, Galgotias College of Engineering and Technology, Greater Noida, India*

Abstract: ***In this study paper, I'd want to present a straightforward answer to the challenges that users of microwaves encounter in today's world. And, since its inception, this equipment has performed wonders in the realm of food, making cooking so simple and quick for consumers, particularly beginners. And it is updated on a daily basis to make it more efficient and smart, so I hope that by taking this simple step, I can make the gadget safer and wiser. Cooking is essential for any human being to exist in our planet since no food can be consumed uncooked. As a result, cooking is now regarded an art since any adjustments and crafting may be done to make it seem beautiful. That it attracts the individual who needs to eat. However, it may become a laborious task for a variety of reasons, the most common of which are time-consuming processes.***
Keywords: Microwave, LCD LED, Relay, Sensors, In-out Tray.

I. INTRODUCTION

Microwave ovens have been around for more than 50 years. Tappan invented the first microwave oven in 1955, but it wasn't until the 1970s and 1980s that they became widely used in homes. Microwave ovens are now frequently used as a multipurpose cooking equipment without fire for warming, baking, boiling, steaming, and other purposes since the first home microwave oven was produced for household use in 1965. By 2015, the global market for microwave ovens is expected to reach 72.5 million units. Microwave energy for materials processing is emerging as a novel and innovative technology with a number of advantages over traditional processing, including reduced processing cycle time, which saves energy and money, finer microstructures, which improve mechanical properties, and environmental friendliness Microwave radiation can be used in a wide range of applications, including communication, chemical reactions, rubber vulcanization , drying, food processing, and medical fields are just a few examples.

When used to cook food, a microwave oven can save a significant amount of electrical energy, up to 63 percent.

In the last 50 years, the microwave has achieved unexpected success. In terms of microwave power applications, the author gave some forecasts for the next 50 years. The development of new magnetrons, solid-state sources, and a broadening of the area of microwave power applications are among his major forecasts, according to reports. An outline of microwave processing's possibilities has been recognised and published. The heating behaviour of materials in electric and magnetic fields at microwave frequencies has been investigated for industrial applications. Nowadays, a microwave oven is regarded as an important home device. Its concept is based on heating food with microwaves, which are radio waves with a frequency range of roughly 2500 MHz. Microwaves with high power are emitted inside metallic chambers where food with a certain level of polarity, notably in the case of water, which is a very polar molecule, are treated as dipoles, constantly attracting and repelling opposite poles. The temperature values in the microwave oven are directly related with the recipes, so there is no need to set the temperature manually. The temperature control of an electric oven is usually done with discrete components like solenoids, thermostats, and thermal fuses. Because these components are sometimes operationally unstable, an embedded control can be used to replace them. Users of commercially available residential electrical microwave can decide the time or temperature according to the instructions and guidelines provided by the manufacturer In some circumstances, the recipes are pre-programmed, so the temperature or time do not need to be changed by the user. There is no microwave oven on the market that can recommend ingredients for a recipe. We will replace the tray of the microwave by the automatic button operated in-out trolley.

II. EASE OF USE

A. Sensors Selection Analytical Study and Tests

In order to be included as a contextual data collecting component in an effective real-world smart oven system, sensors must meet specific functional requirements. Sensors must be simple to install and integrate (e.g., on a sensor node) in order to be useful. In order to develop an efficient smart oven, sensors must have a quick response time to improve the overall system's performance. The cost of the sensors must be considered before they can be used in a real-world setting. Furthermore, resistance to the cooking environment (temperature variations, humidity, and smoke from the cooking process) is a significant consideration when choosing sensors. Following that, we go over the specifics of our investigation into these sensors.

B. Different From Ordinary Microwave

The suggested microwave proposes the target temperature based on the food and our needs, so the user does not have to remember it each time the same food is warmed. The algorithm learns the types of meals that are consumed in that home over time and grows more intelligent in its recommendations. Inside the metallic chambers where the food is placed to be cooked, microwaves with extremely high strength are blasted.

III. COMPONENTS AND BUILDING OF MICROWAVE

A. Components and Building of Microwave Sensors Selection Analytical Study and Tests

In order to be included as a contextual data collecting component in an effective real-world smart oven system, sensors must meet specific functional requirements. Sensors must be simple to install and integrate (e.g., on a sensor node) in order to be useful. In order to develop an efficient smart oven, sensors must have a quick response time to improve the overall system's performance. The cost of the sensors must be considered before they can be used in a real-world setting. Furthermore, resistance to the cooking environment (temperature variations, humidity, and smoke from the cooking process) is a significant consideration when choosing sensors. Following that, we go over the specifics of our investigation into these sensors

B. Design And Fabrication Of A Smart Microwave Oven

This project's main purpose is to develop a smart microwave oven that can sense food temperature and change cooking time accordingly. This is accomplished through a series of modifications and advancements that would be made to a traditional microwave oven, including the inclusion of sensors.

C. Application Potential for Developments in Microwave Oven Systems

Microwave ovens frequently enable customers to adjust the time and temperature as per the customer specification.

Instead of setting the temperature manually, temperature values are directly related with the recipe in this study to make the microwave oven more user pleasant.

D. Development of Microcontroller Based Smart Electric Oven System

They created a Microcontroller-based Smart Oven System in this research article.

The primary goal of this Review paper is to:

1) Developing an electric oven with a microprocessor that can regulate heating, duration, and recipe.
2) Writing a microcontroller programme in theC programming language.
3) Development of a high-precision oven controller.

IV. CONSTRUCTION OF MICROWAVE

The Smart Microwave makes use of the following components, which are listed below:

1) *Microwave Chamber:* Food is kept in this chamber of the microwave for baking/cooking.
2) *High Tension Transformer:* This device is required to provide enough electric current.
3) *Magnetron:* A magnetron is an electron tube that may be used to amplify or generate microwaves, with the flow of electrons controlled by an external magnetic field.
4) *Air Blower:* This device transfers heat away from the microwave so that it does not overheat.
5) *Cavity Lamp:* This light illuminates the microwave cavity, allowing food to be seen from the outside.
6) *Microwave Leakage Wire Mesh*: Prevents heat from escaping the microwave, allowing for the greatest results.

a) *In/Out Tray:* It is used to slide the food content out or in by pushing the ON-OFF button and sliding to avoid burning.
b) *Timer:* When the time for cooking/baking food has passed, the timer will automatically stop and the food will be cooked.
c) *Camera:* The camera will assist the timer in determining the correct time based on prior experience.
d) *Arduino MEGA:* Arduino MEGA is an open source hardware and software platform for programming. It is equipped with a chip. A programmer is generally stored in the chip's data.
e) *Internet of Things (IoT):* IoT stands for Internet of Things. It's all about taking the internet's power beyond computers and cellphones.
f) *Temperature Sensor:* The temperature of food stored in the microwave chamber will be measured by this sensor.

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue I Jan 2022- Available at www.ijraset.com

V. WORKING OF SMART MICROWAVE

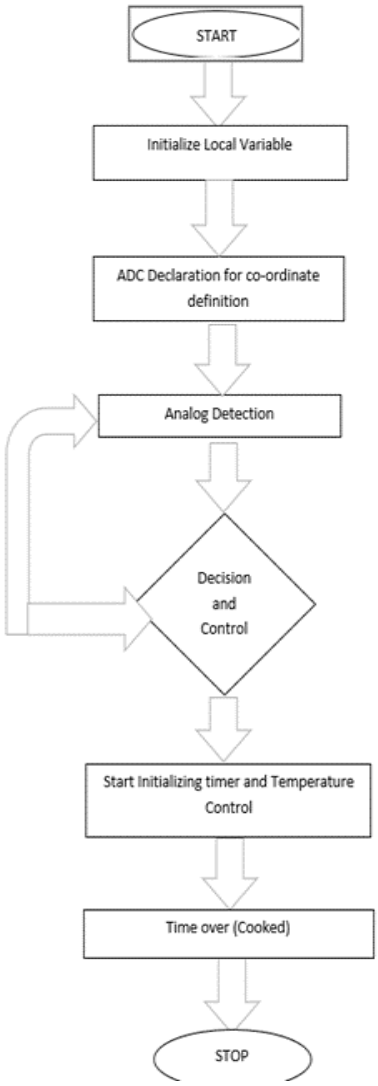
As discussed in the construction, the idea is such that I have replaced the tray of the microwave by the automatic button operated in/out trolley and we put a timer and temperature sensor in microwave which automatically detect the temperature of a food that have been kept in Microwave Chamber and close the timer of Microwave.

So, we have divided our Working into 2 Parts:

1) In – Out Trolly will work similarly to a DVD player's CD reader. It pops out when the button is pressed, then it pops back in when the CD is loaded. The in-out trolley in a microwave will only come out when the button is pressed and the microwave door is open, and the tray of baked food can be held on this trolley until the button is pressed, causing the trolley laden with the tray to travel in. After the food has been cooked and the door has been opened, the button/switch is pressed, and the trolley emerges, allowing one to effortlessly hold the tray full of food while avoiding getting burned on the microwave chamber's hot walls. Smart Microwaves are also easy to clean since tray can be removed or installed fast.

2) Second Function of a Smart Microwave is that we have installed a Temperature sensor and Timer in Microwave. Temperature sensor measures the temperature of a food and accordantly set the time in timer. And when the timer reaches the value then automatically timer will stop and our food is cooked.

VI. FLOW CHART



VII. FUTURE SCOPE

The following recommendations and future scopes can be proposed for future work:

1) Mobile application can be developed to control the microwave oven instead of using Keypad and LCD.
2) Develop new ways for remote control of the microwave.
3) Further research on Temperature Sensors.
4) Involve new technologies such as Wi-fi and Bluetooth to operate Microwave Oven.
5) Develop various connectivity techniques between microwave ovens and smart devices.

VIII. CONCLUSION

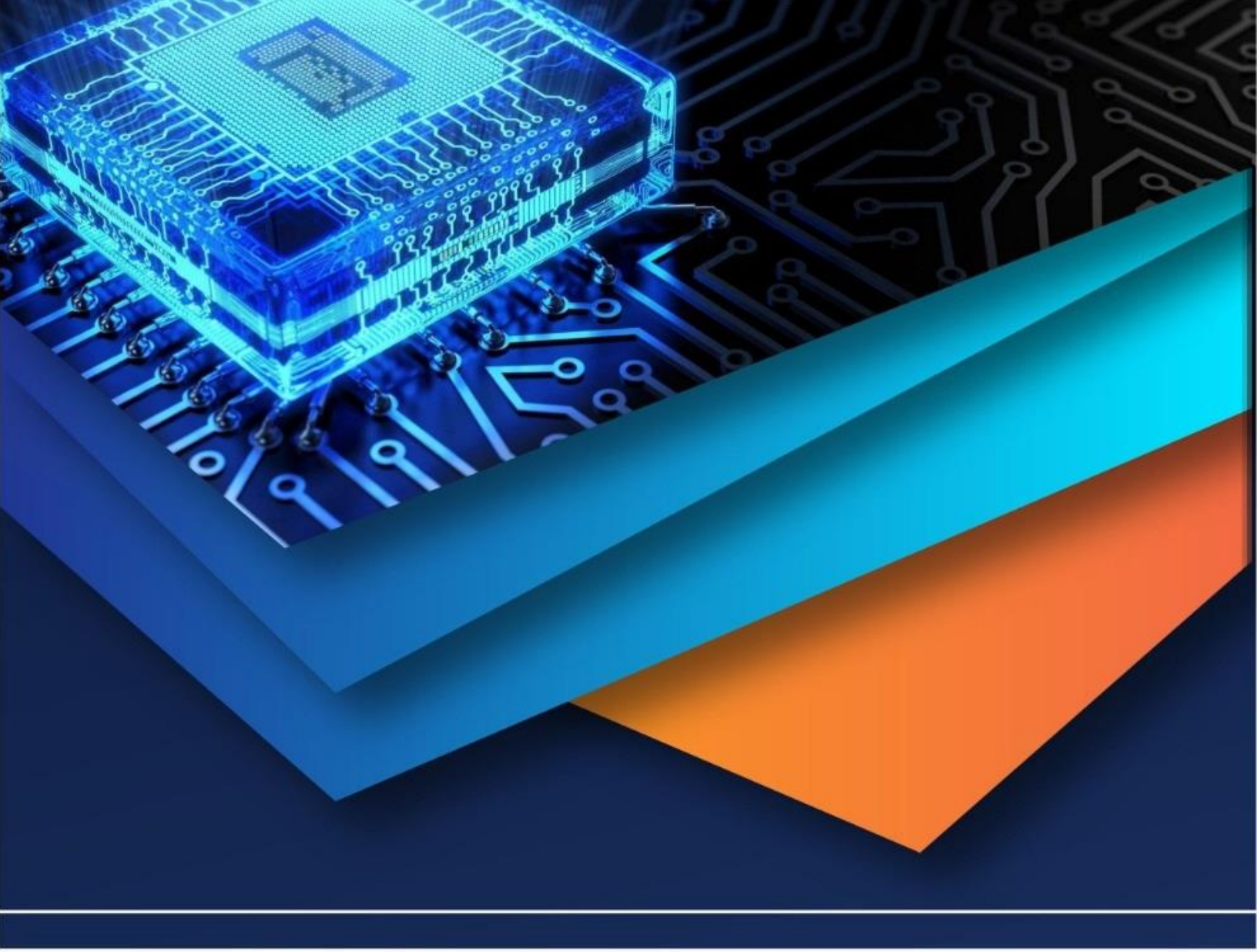
In this project, a closed-loop microwave oven with a – anti IR temperature sensor is explained in this project. The proposed methodology has the potential to learn and improve its recommendations over time. The suggested microwave-oven features a hardware prototype that has been created and tested for accuracy.

IX. ACKNOWLEDGMENT

I'd want to convey my thanks to my professors for their advice and assistance. We were able to learn about a variety of topics while working on this project with the help of our professors. They educate us about the many types of technology that are used in this project, as well as the broad concepts of the Internet of Things, and they also provide us with knowledge about research papers that will aid us in this project. Throughout the process, their counsel and useful recommendations have been really beneficial.
Also, they help us finalize our project within limited period of time.

REFERENCES

[1] Gaba M. and Dhingra N., (2011), “Microwave Chemistry: General Features and Applications”, Indian Journal of Pharmaceutical Education and Research, Vol. 45, Issue 2, pp. 175- 183
[2] Alka, Bipul Kumar, and Amita Singh. "Space Based Solar Power–A Step to Wireless Energy Transfer. “Space 3.5 (2015).
[3] J. Osepchuk, “Microwave Power Applications”, IEEE Transactions on Microwave Theory and Techniques, Vol. 50, No. 3, pp.975-985, 2002
[4] Y. Chang, C. Steel, and M. Clerici, “Use of Microwave Radiation to Process Cereal-Based Products”, Chapter 23.
[5] Advances in Induction and Microwave Heating of Mineral and Organic Materials, Intech Pub., pp.531-552, 2011
[6] M. Vollmer, “Physics of the Microwave Oven”, Physics Education, Vol. 39, No. 1, pp.74-81, 20014.
[7] C. Tsai, Y. Bai, M. Lin, and R. Jhang, “Reduce the Standby Power Consumption of a Microwave Oven”, IEEE Transactions on Consumer Electronics, Vol. 59, No. 1, pp.54-61, 2013.
[8] Bostani, A., and J. P. Webb. "A model-order reduction method for the passband and stopband characteristics of periodic structures." Microwave Conference (EuMC), 2011 41st European. IEEE, 2011.
[9] Ali Bostani, “Department of Electrical Engineering, American University of Kuwait” 2019. “Design and Fabrication of a Smart Microwave Oven”
[10] Miss Anuradha D. Ingold, Mr Bhushan H. Band. “Development of Microcontroller Based Smart Electric Oven System”. “International Journal of Innovative and Emerging Research in Engineering Volume 3, Special Issue 1, ICSTSD 2016”
[11] Rami Yared 1, and Bessam Abdulrazak 2: 14 November 2016 Sensor-based Smart Oven system to enhance cooking safety
[12] Tareq khan Smart Microwave Oven with Image Classification and Temperature Recommendation Algorithm, Aug 8, 2018 “International Journal of Electrical and Computer Engineering (IJECE) Vol. 8, No. 6, December 2018, pp. 4239~4252”
[13] Ryan Nolan, James Chorma , Alexander Tsangarakis , “Smart Toaster Oven For The Future”



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY