Fully Automated Smart kitchen

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Abstract

People's lives are becoming increasingly convenient thanks to the Internet of Things' fast growth of artificial intelligence. Customers prefer intelligent frying machines because of its benefits in saving time and time. But despite having low automation, poor quality, and difficult operations, the majority of fry machines on the market today have not received much publicity. Consequently, this study proposes a highly intelligent, fully automated, and practical culinary robot. It is based on information technology for the Internet of things and enhances every part of the construction, circuit, software, and user experience. It has the ability to automatically measure food ingredients, create intelligent recipes, apply intelligent seasoning precisely, cook automatically, and do other tasks. The user experience is good, and the cooking process is fully automated, precise, and intelligent.

Keywords: *Artificial Intelligence, Moley Machine, Internet-Of-Things*

1. Introduction

There is no doubt that technology had touched every aspect of our lives. In almost everything we do, there is a touch of technology that we can see even in cooking. We have truly gone a long way from the hunter-gatherer life that our ancestors have lived before to the modernized kitchen that we use now. We say, modernized because if before, cooks have used pots, pans, stoves and other manual tools to cook delicious food that we enjoy so much, today, there are various equipment’s that cooks can use in order to create a perfect food that is consistent from one serving to another. Because of the different equipment’s available today, cooking delicious foods is much easier and effective that anyone can multi-task without difficulty. For example, with a blender, a cook can easily leave small pieces of potato for it to be mashed while cooking the gravy that will accompany the dish. Another example is a restaurant using a dish washer that can clean the plates and utensils that have been used so that the workers can focus on pleasing the customers by doing other tasks. These small things can really help in cooking food efficiently. Developing smart home technologies by incorporating technologies like IoT to automate repetitive tasks that are necessary for getting through the day, such as cooking, and cleaning can save a lot of time that can then be invested in many other non-repetitive important activities. Such technologies and automations will also provide an independent inclusive workspace for people with disabilities and the elderly. Several studies indicate that the longevity and the quality of human life has significantly increased over the years resulting in the increase in population of the elderly. The food industry has been slow to adopt robotics in their operation. Experts agree that food industry robots are changing at a rapid pace. Companies that are refusing to look at the possibilities of robot implementation might risk falling behind if new technology is not deployed. With over 7.5 billion of the world’s population, the food demand continues to rise.

2. Literature Survey

2.1 SPYCE KITCHEN (2018)

In the summer of 2018, a fast-casual restaurant called Spyce opened in Boston's Downtown Crossing. This eatery was powered by a robotic kitchen, as a graduate student, Michael Farid realized that he was no longer on a college meal plan. The MIT alum was too busy to cook, but he couldn't eat out every single night. This would be tough on both his budget and his health. So, along with three undergraduate friends from the institute's water polo team, he worked to create a robot that could cook up rice bowls on demand. The result of this endeavor was Spyce, a restaurant serving delicious salad bowl meals inspired by cuisine from around the world. Korean, Roma, Lebanese, Thai, and Indian-inspired bowls are available, and retail for around 560 to 640 Indian rupees. Spyce has attracted $24.8 million in joint funding from Maveron and Collaborative Fund for the project. The concept also drew the attention of Michelin-starred chef Daniel Boulud, who has not only invested in the business but also joined the team as an advisor, assisting with the creation of the restaurant's beautiful dishes. You won't find a single flesh-and-blood human in the Spyce kitchen, with the entire department being manned by the latest in automation technology. The robots are responsible for every part of the kitchen operation at Spyce - from prep and cooking to plating food and even cleaning up.

2.1.1WORKING:

1.Carbon Steel Plancha:
Spyce cook's proteins and vegetables at a temperature of 450°F in a double-sided seasoned carbon steel plancha to produce the optimum Maillard reaction – to create an amazing sear on the ingredient's entire surface, developing a deeper, more flavorful crust, caramelizing juices and natural sugars.

2.Superheated Steamer:
Spyce steams pasta, noodles and grains at 300°F steam, about 100°F hotter than normal steam. This bounds the natural moisture in the ingredient without expelling its water, producing perfectly al-dente pasta and noodles, and fluffier, more delicious grains.

3.Measurement, Precision, Timing:
Spyce – The infinite robotic kitchen system delivers ultra-precise measurements of every dressing and sauce according to your personal taste. So vegetables and toppings are cooked and portioned consistently, and the process is thoughtfully designed to bring ingredients in at the perfect second for delicately layered bursts of flavor.

2.2 MOLEY ROBOTIC KITHCEN (2015)

This Moley robotic kitchen prototype can already cook breath-taking meals, by itself as it's library of recipes and tips from chefs allow you to leave the cooking to the robot or choose to cook for yourself when you're in the mood. As a result, Moley makes it easy to eat healthy and creatively. User Interface of Moley Robotics is a sophisticated, large GUI touchscreen is another point of difference for the Moley kitchen. With the help of the GUI, you can instruct the robot to create a particular recipe, define the ingredients, set the temperature for refrigerators, record the new recipes, operate appliances, open drawers and find utensils and ingredients without ever having to touch them. All the information about your kitchen and its settings are displayed on the GUI screen. The GUI screen allows you to operate a complex system with simple operations. Now, the dream is not only to introduce the fully-automated Moley robotic kitchen into the marketplace but also to bring the cost down to a point where it is affordable for the middle class. On the question of affordability, partly this is because, as the consumer robot market matures and competition expands, the price of the robotic parts will drop. Moley robotic can be used in either its automatic or traditional kitchen setting.

2.2.1 ROBOTIC HAND

A Robotic hand is one of the main components of the kitchen is the five-finger robotic hand. Even compared to similar products on the market, it is a ground-breaking product. The robot can accurately grasp things and ingredients in the hand because of sensors at the ends of its arms, which allow it to perceive pressure coming from various angles.

The anthropomorphic hand was designed in partnership with Moley's exclusive hand partner, the world-renowned German robotics company SCHUNK. It can utilise pre-contained materials and handle appliances much like a human hand. It can therefore utilise kitchenware and utensils, control touchscreen gadgets, and clean up the counters after itself. It can also learn how to operate new pieces of equipment because to its adaptive operating system.

2.2.2 MIXING ROBOT

A trend toward mixer robots arose as a result of realizing that too much time is wasted in the kitchen mixing or integrating products. The Mixing Robot included basic movements such as directing the product or an object, moving it on the table, pouring into the equipment, moving the spatula on the table, scraping and mixing. In this context, it uses both end effector location and conformity control techniques.

The robot performs its gripping functions by holding the mixing bowl in place. The end effector on the mixing bowl moved the other end effector with an attached spatula via the position control. Finally, the effector activated the Cartesian exciters, bringing the mixing arm into contact with the product. The main goal of the mixing robot is to achieve standard values by presenting solutions against the risk of time loss and excessive mixing. The mixing robot is an automatic intelligent unit that can independently prepare, flavor and serve a complex dish in a hygienic environment

2.2.3 MOLEY APP

By using the Moley Robotics application, you can manage a menu programmed with more than 2,000 recipes. Robotic tools can do the same if you make a recipe while wearing application-specific gloves. With these robots, which will replace almost everything you use in the kitchen, you can order food from far places.

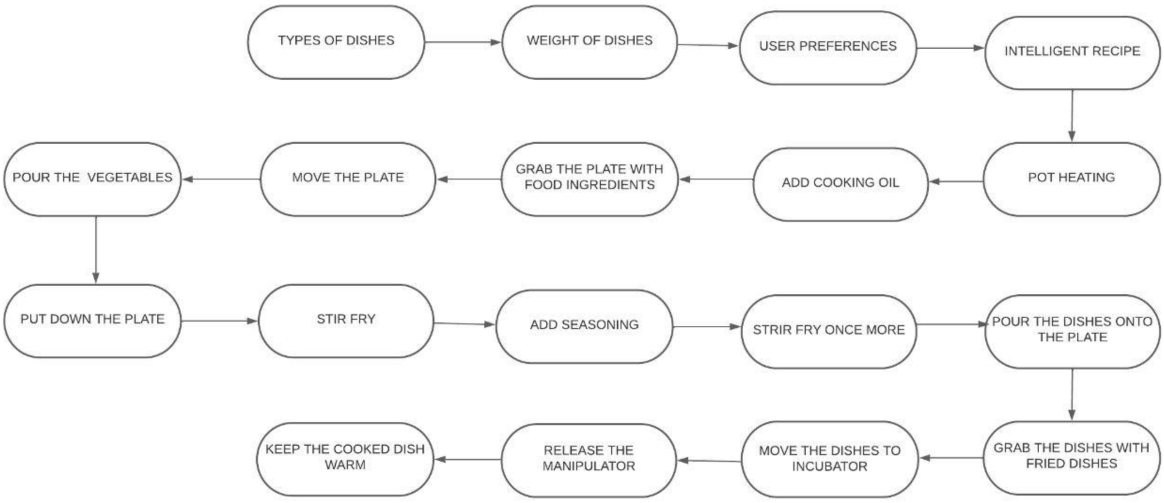
3. Materials and Methods

3.1 PROPOSED ALGORITHM

The need of a new machine altogether was very important because all the existing algorithms were not fully automatic like example in the SPYCE model you still needed people to add the ingredients into the machine so it couldn’t be a item storage cooker. In case of the MOLEY robotic kitchen it was too rigid and couldn’t understand the feelings of nutrition and pleasure which are important parts of human psychology. In particular, the automatic cooking machine currently available on the market can fry food and adjust temperature automatically, but it still requires manual labour to add spice and move cooking ingredients. The procedure is also laborious, and the level of intelligence is not very high. For instance, choosing the right recipe software, power source, and heating duration when preparing food has a significant impact on people's experiences. Therefore, we must create a culinary robot that is more autonomous, intelligent, and practical.

3.2 OVERALL DESIGN

The design of the structure includes a drum-style cooking pot, a stirrer, an incubator, a cooking table, a seasoning rack, and a central console. The circuit is created with the temperature sensor, pressure sensor, touch screen, and voice module. Software advancements have increased the automation, accuracy, and intelligence of the entire cooking process while also increasing user satisfaction. Examples include intelligent electromechanical control technology based on multi-sensor information fusion technology of the internet of things, intelligent heating technology, step-by-step intelligent seasoning addition, intelligent recipe programme, and voice interaction mode. The primary method of operation for the cooking robot is to write routines that divide standard recipes into various modules and then convert those routines into computed instructions for the mechanical arm, heating, seasoning addition, and connection of various actions by the timer to complete a dish.



3.3 STRUCTURE DESIGN

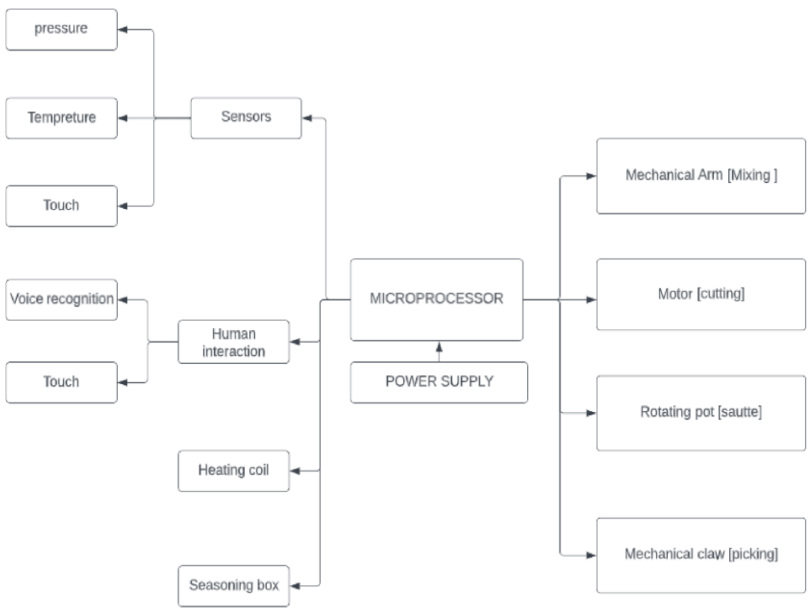
The hydraulic arms are used for carrying and pouring dishes into pots, closing or opening pot covers. This also has a temperature sensor put in the middle of the stove's heating area to gauge the pot's temperature. On the meal preparation table, there are pressure sensors at the bottom of every bowl that are used to weigh the dishes. You can add the ingredients in the spice and seasoning rack to the pot both in quantity and order.

The robot's component sections move in roughly the following order: The electromagnetic heating coil begins to heat up, the pot begins to rotate at a specific angle, and the spice and seasoning rack pours oil into the pot once the individual uses voice or touch to select the program to run. The carry arms move the plate containing the ingredients, spin the plate at an angle, and then dump the vegetables on the plate into the pot. At this point, the spatula arms are lowered, and the motor pushes the mixing blade to revolve in order to distribute the ingredients out evenly. The spice and seasoning rack add the proper seasoning at the proper moment, in the proper amount, and with the proper weight and kind. Next, the spatula arm and spatula move once again to stir-fry the food.

3.4 HARDWARE DESIGN

The single chip microprocessor, pressure sensor, temperature sensor, voice recognition module, touch screen, power supply, DC motor, steering engines, electromagnetic heating coil, and a number of solenoid valves make up the majority of the hardware of the fully autonomous intelligent cooking robot. The core controller, a single-chip microcontroller, controls all other hardware and software operations. The weight of the meal to be cooked is determined by the pressure sensor, which also determines how much seasoning should be added to the dish. The temperature sensor continuously measures the temperature in the pot and transmits the information to a single chip microcontroller, which gradually regulates the heating system to maintain the desired temperature. The single-chip microprocessor controls each motor to accomplish the proper working location and speed, respectively, based on the active programme. The single chip microcontroller controls the solenoid valve to add the right kind and number of spices to the pot depending on the type of veggies. The speech recognition module and touch screen might be utilised as a human-machine interface to enter and output data while concurrently displaying the temperature and pressure on the display screen.

Figure depicts the flowchart for the hardware system structure.



4. Future Works:

This device can be enhanced in the future with a network application so that it can be operated remotely to complete its task. The same programme can be shared by multiple people and used in various cooking styles. This feature will allow people to eat their favourite foods even when the master chef is not present. Because the input and output components can respond to other control processors, this cooking system can be integrated with other systems such as a Programmable Logic Controller (PLC), a Programmable Automation Controller (PAC), an Industrial PC (IPC), and a Raspberry Pi [107] based on the consumer's needs.

There are numerous advantages to fully automating food preparation and processing operations, but the challenges are numerous, and new technologies must be integrated together to make progress. We investigated many research articles and commercial systems related to the robotic handling of food products in this review. We first summarised the fundamental challenges faced by the food industry in introducing robotic systems, and then elaborated on advancements in various aspects, such as the robotic end-effector, food recognition, and fundamental information of food categorization, property, and database, all of which are crucial for developing robotic systems. Finally, we propose potential future directions for addressing these challenges and eventually assisting the food industry's automation process.We have finally created a breast cancer classification using a neural network.

Neural Network models are much more straightforward to use when compared to Machine Learning models. This model could be very useful and it could let people know about the tumour (with accurate reading) they have been affected with and further diagnose and cure it. The model we have used gives accurate results when compared to most models, thereby classifying and predicting the type of cancer the person is suffering from.

5. Conclusion:

The completely autonomous intelligent cooking robot's fundamental tenet is to divide the cooking programme into several standardised modules, turn each action into a programme instruction, and connect these modules. To replicate the entire human cooking process and accomplish automated cooking, electrical technology and mechanical design were used.
This study designs the control system for the fully autonomous, intelligent cooking robot. First, the device's integrated design is examined to determine the mechanical system and control system architecture. The major body, software, and hardware designs of the fully autonomous, intelligent culinary robot are then progressively completed. The related features of the fully automatic intelligent cooking robot device are now accomplished, and the system design of the entire device is finished. In comparison to the previous frying machine, the completely automatic intelligent cooking robot that is built in this article is more intelligent and automatic. People may fully automate the frying process by pressing only one button, which will do things like pour the raw ingredients into the pot, add the seasoning by weight and in the proper sequence, stir-fry, pour the dish out of the pot, and keep the cooked meal warm, among other things. Additionally, it could be able to prepare several foods sequentially, which would significantly enhance the user experience.

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