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IMPLEMENTATION OF ARTIFICIAL INTELLIGENCE IN RESTAURANTS

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The topicality. In recent years, there has been a need to study the artificial intelligence use for the operation of restaurants, as in Ukraine (and in most countries) there is no such experience. The use of artificial intelligence systems customer-to-customer and item-to-item will ensure the quality of food delivery sites, which will allow you to analyze the order of the guest and identify the patterns of his preferences thus, automatically ask him to choose a certain set, dish and successful additions to the order, which will increase the average check, or choose new establishments that will help them enter the market of restaurant services. **Purpose and methods.** The purpose of the study is to analyze the current state, determine the prospects for the application of existing robotic technologies in the technological process of restaurants and develop a robotization scheme of the technological process of restaurants such as salad bar. Methods are in the course of research the methods of logical generalization concerning development of the robotization scheme of technological process which were carried out by means of the computer ArchiCaD program were applied. **Results.** The problem of introduction and the artificial intelligence use are studied by scientists and researchers in various fields of science. Considering their scientific works, it can be noted that artificial intelligence is already actively used for the manufacture of culinary products in foreign restaurants. There are known examples of the use of barista robots, pizza robots, salad maker robots, burger maker robots, etc. The study developed the robotization scheme of the technological process of salad bar, consisting of three stages. The first stage is the service of visitors in the shopping area, where the selection of the order, payment through the terminal and the subsequent automatic receipt of culinary products and beverages. The second stage is the preparation of semi-finished products in the procurement area. This process is controlled by a chef-operator, who controls the required number of semi-finished products and cleans and cuts vegetables, fruits, meat and fish products using machines for cleaning and slicing culinary products. The program provides for the analysis of the balance and the required number of semi-finished products and the choice of components for the preparation of salads with artificial intelligence. The third stage is the automatic preparation of salad in the pre-cooking production area. The artificial intelligence placed in the system analyzes the guest's order and activates the containers with the necessary ingredients, mixes them and unloads them into a container covered with a plastic lid, and the robot stamping element leaves the order number on the lid. The proposed scheme provides for compliance with sanitary and hygienic standards for institutions of this type. With the developed system of production activities, the required number of employees will be 5 people: cleaner in the trade area, dishwasher, tray packer, cook-operator of the pre-cooking area and system administrator of artificial intelligence. **Conclusions**

and discussions. The authors analyze the current state, identify prospects for the application of existing robotic technologies in the technological process of restaurants and developed a robotization scheme of the technological process on the example of a salad bar. The developed scheme consists of three stages: service of visitors, preparation of semi-finished products and automatic preparation of finished goods. It is assumed that the implementation of the developed system will speed up the process of customer service, reduce the area of production facilities and, accordingly, increase the restaurant turnover.

Keywords: production, culinary products, robot, technology, equipment, artificial intelligence.

The topicality of the problem

The problem formulation. Quarantine measures due to the spread of coronavirus infection have forced humanity to adapt to new rules of conduct that prevent active social contacts between people. In order to ensure social distancing, the process of their robotization is relevant in the restaurant industry, which will ensure the absence of staff contact with guests and at the same time speed up the process of customer service and production of culinary products.

New information technologies are already known that function independently of human intervention through the use and artificial intelligence development. In one of his works, Yu. Sydorchuk (2017) emphasizes that the technologies development, total informatization and computerization transform the social, economic, political and spiritual spheres of modern society. According to her opinion, the neuro technology development, genetic engineering, nanotechnology, biotechnology, the widespread use of the Internet affects not only society but also change people, transforming their natural capabilities.

Most scientists focus on the study of the nature of the human intelligence development, but there is no consensus on its definition and understanding. With the advent of computers in the 1950s, the ever-advancing artificial intelligence began its development.

Therefore, there is a need to study the use of artificial intelligence for the operation of restaurants, as in Ukraine (and in most countries) there is no such experience. A striking example of the use of artificial intelligence in the restaurant business are robot waiters, robot cooks, the possibility of using such artificial intelligence systems as customer-to-customer and item-to-item. The use of these systems will ensure the quality of food delivery sites, which will analyze the guest's order and identify patterns of his preferences, and thus automatically offer the customer to choose a set, dish and successful additions to the order, increase the average check or choose new establishments, which will help them enter the market of restaurant services.

The state of the problem study. Analyzing the artificial intelligence concept, we can conclude that there are many definitions of intelligence. Thus, A. Oliynyk (2019) argues that intelligence is the ability to solve problems in unprogrammed (creative) way. Koizumi (2019) suggests that intelligence is the ability to function properly, think rationally, and act effectively in relation to the environment. According to Samuel (2000), intelligence is an innate quality, in contrast to the abilities acquired during training.

In one of their works, McAfee and Brynjolfsson (2017) emphasize that the emergence and artificial intelligence development is inevitable. Looking around, we see many interactive and intelligent systems, such as a system that is a personal assistant that

uses natural speech processing to make recommendations or answer questions. Even today, driving a car is possible without a person; the car can move independently on the streets, stop at traffic lights or park. The idea of artificial intelligence is mentioned in the article of the famous English scientist A. Turing (1950) “Computers and the mind”, which was published in 1950. The main question that was mentioned in the article at the time was: Can computers think like humans? According to the famous American futurist and inventor Hamilton (2017), the merger between computers and humans is so fast and deep that it is a turning point in history.

The popular book by E. Brinolfsson and E. McAfee (2016) “The Second Age of Machines” presents the following classification of artificial intelligence: 1) systems that think similarly to humans (e.g., cognitive architecture and neural networks); 2) a human-like system (e.g., Turing test through natural processing language, knowledge representation, automated reasoning, and learning); 3) a system that thinks rationally (for example, logical solution algorithms, conclusions and optimization); 4) a system that operates rationally (for example, an intelligent software agent, the creation of robots that achieve goals through perception, planning, reflection, study, communication, decision-making and action).

Machine teaching researcher Smith attributes to artificial intelligence the study of four types based on the methods they use: “symbolists”, “connectionists”, “evolutionists”, “Bayesians” (Smith & Shum, 2018).

Considering the scientific works of domestic and foreign scientists and researchers, we can conclude that there is no single definition of artificial intelligence, as it is a very young field of research. Scientists define this concept in broad and narrow meanings. After learning about the artificial intelligence concept, we can conclude that artificial intelligence is a characteristic that determines the intellectual capabilities of computers in their decision-making.

A significant number of scientific papers in the United States are devoted to the study of artificial intelligence, which confirms a deep understanding of the need for its use. It is well known that the US government annually prepares various reports on the implementation and active use of new information technologies, including artificial intelligence, in order to improve and facilitate people work. From the content of these reports it can be concluded that the United States is one of the leading countries at the state level to think about the global development of artificial intelligence.

In October 2016, the United States presented at the governmental level the document “Preparing for the Future with Artificial Intelligence”, which states that artificial intelligence technology opens up new demand and new opportunities for progress in critical areas such as health, education, energy and the environment. This document consists of recommendations for future action for federal authorities and other participants. It has several definitions of “artificial intelligence”. McAfee and Brynjolfsson (2017) define it as a computerized system that behaves and mostly thinks as instructed. Others define the “artificial intelligence” concept as a system that can rationally solve a set of problems or adapt actions to achieve goals regardless of the real circumstances.

Unresolved issues. Currently, there are two approaches to artificial intelligence, which are conventionally called algorithmic and with the help of self-learning (JavaTpoint, n.d.). In the first, all the rules by which intelligence operates are prescribed manually, and in the second is the created algorithm learns independently on a certain amount of data and allocates its own rules independently. Algorithmic path, which has its positive aspects,

such as predictability and the ability to act within the programmed limits, as noted by D. Lubko, S. Sharov (2019), failed. At the same time, artificial intelligence, built on a self-learning algorithm, allows you to act differently in similar situations, taking into account the results of previously performed actions. This confirms that the problem of artificial intelligence has not been fully studied (Tokareva, 2018). It should be borne in mind that the use and transition of restaurants to activities with full or partial use of robotic technologies is an unexplored problem and task of restaurant business professionals.

Purpose and research methods

The purpose of the article is to analyze the current state and determine the prospects for the application of existing robotic technologies in the technological process of restaurants and the development of a robotization scheme of the technological process of restaurants such as salad bar.

The methodological basis of the study is the theoretical and methodological aspects of a comprehensive approach to problem setting, analysis of research results using new theoretical developments, modern computer modeling methods.

Research methods are in the course of research the methods of logical generalization concerning development of the robotization scheme of technological process which were carried out by means of the computer ArchiCaD program were applied.

The object of the study is the technological process of the restaurant.

The subject of the study is restaurants such as salad bar.

The information base of the research was the scientific works of domestic and foreign scientists and scientists on the researched problem: monographs, scientific articles, materials of international congresses and symposiums, scientific and practical conferences, regulatory and technical documentation, patents, copyright certificates, statistical data.

Research results

Scientists have been paying attention to the study of artificial intelligence since the second half of the twentieth century: in 1950, Alan Turing (Turing, 1950) explored the problem of mental nature, i.e. how to implement a meaningful problem of modeling the machine of natural human thinking.

Today, theorists and practitioners of many fields of scientific activity, including the culture of hospitality and restaurant business, have begun to understand the use of artificial intelligence, robotics, information and cognitive technologies. The conceptual framework for the creation of artificial intelligence was based on the automation of production processes that replace man during the performance of monotonous, routine work, which reduces time, financial, human and other resources and thus increase productivity.

In this regard, different opinions are expressed, for example, P. Morkhat (2018) proposes to consider artificial intelligence from the following reviews: as a “cybernetic (computer-software) tool for expanding and strengthening human intellectual potential”; as a tool for human replacement (under its control) in the performance of any function that has the ability to anthropomorphic mental and cognitive processes (learning and self-learning, reflection, reasoning and self-regulation), emphasizing the ability of artificial intelligence to operate more effectively than primitive automation.

V. Razumov and V. Sizikov (2019) emphasize that artificial intelligence can be considered not as a reproduction of natural intelligence, but as a “tool for imitating various scenarios”. In their scientific work, the authors express their own modern concept of artificial intelligence as control and communication in complex technical systems (in terms of information processes), which provide the possibility of their automation.

Today, the possibilities of using artificial intelligence to solve cognitive problems are widely explored: for example, text interpretation, language recognition, identification of persons and objects, the use of robotic systems that have the ability to make decisions (Demkin & Lukov, 2018; Sokolov et al., 2018), and robotization in the restaurant business on the example of robot waiters and robot chefs, who are already demonstrating the first unique “digital” services.

Artificial intelligence is firmly entrenched in reality, as well as in the interaction and interdependence with other phenomena generated by informatization, expanding the functionality of the Internet, information and telecommunications technologies, reviving its uniqueness and relevance.

Already today, in many countries, people are using technological innovations that point to the approaching era of artificial intelligence: unmanned aerial vehicles; voice services from modern electronics manufacturers; technological content of the so-called “smart home”, etc. One of the leaders in the study of the practical application of artificial intelligence was the American company Apple, which created a prototype of artificial intelligence – a smartphone. Siri’s voice assistant appeared in the iPhone 4S in the fall of 2011, which revolutionized the IT industry. After a while, Google introduced its “smart” service Google Now.

Unlike Siri, Google’s product strives to be useful not only when the user needs it, but also when he doesn’t even think about it. That is, Google Now works automatically, like the autonomic nervous system. This system tracks the movements and actions of the user and studies his habits. By calculating the time a user regularly returns home from work, Google Now checks the traffic service in advance and paves the best way to navigate before you leave. Microsoft has similar systems: a virtual assistant with a female voice and Cortana’s name is designed for dialogues and can ask questions to the user.

Artificial intelligence “smart home” is a concept that scientists have been studying for decades. Today, several large companies are making significant efforts to bring concrete solutions to market for artificial intelligence systems, including Apple, which introduced a unified wireless protocol for managing home appliances with the iPhone help.

It is necessary to mention the innovations of the Chinese company Xiaomi, which offered to equip their air fresheners with a Bluetooth module, which allowed the user to be reminded of the need to change the filter. Xiaomi later introduced four smart home modules, which include a webcam that can control a TV, air conditioning, music center, smart outlet, which allows you to remotely turn off any household appliance. All these gadgets can be controlled by the user using a smartphone and voice commands.

There are the first developments that allow you to use artificial intelligence to control the functionality of the “smart home”. For example, change the lighting depending on how lively the user listens to music. Unmanned vehicles are another proof that the era of artificial intelligence has begun. Business car owners already use on-board computer features such as motion tracking, adaptive cruise control and a collision warning system that can release gas and brake on its own. In particular, Volvo, Audi, Volkswagen, Range Rover, Acura and other companies equip their cars in this way.

In April 2018, the European Commission presented a strategy for artificial intelligence, which sets the main goals; they are strengthening the technological and industrial capabilities of the EU with its application in various sectors of the economy, ensuring a “proper ethical and legal framework”, as well as preparation for socio-economic change (Cabinet of Ministers of Ukraine, 2018; 2020).

Ukrainian developers are active leaders in the idea of a completely different approach to the artificial intelligence development. For example, the founders of the Digital Life Lab take a slightly different approach to the problem than other researchers. According to their opinion, first you need to learn to feel the car, and only then to think logically. Only in this way can a machine, without being human, find any human qualities. And this can be achieved only by giving the car the opportunity to communicate with people so that it can get to know them better (Antonenko et al., 2019). Ukrainian startup Digital Life Lab is working on the KARA project and developing a model of empathic artificial intelligence. KARA is in the pre-testing stage, and, according to its developers, it will be characterized by recognition of the mood, emotions and the guest’s feelings.

In June 2020, the famous Ukrainian restaurateur Dmytro Borysov announced on his Facebook page the opening of the gastronomic platform Gastrofamily Food Market, where with the help of a bot assistant guests can choose a restaurant and dishes from the menu according to their preferences.

To understand at what stage of use in restaurants is artificial intelligence, it is worth giving a few examples.

The company Chowbotics plans to place Sally robot kiosks in restaurants, cafeterias, hotels, airports and medical institutions. Their work is based on stations where work machines contain about 20 plastic containers with chopped vegetables, and when choosing an order, the robot combines them into salads according to the guest’s order.

In addition, such a station is equipped with a touchscreen for order fulfillment and a terminal for cashless payment. Artificial intelligence calculates the chemical composition and caloric content of food, helps to choose the composition of the salad and portion size according to age, sex, allergies and the guest’s preferences. An option to improve the operation of such equipment is to teach artificial intelligence to determine the balance of semi-finished products, the required amount of raw materials and make the necessary list for purchase, as well as analyze demand and plan sales and recommend improving the composition of finished culinary products.

Kitchen robotics developer Miso Robotics has released the Flippy robot manipulator for turning burgers. Artificial intelligence is able to distinguish a piece of chicken from a bun, and a ready-made burger from a semi-finished product on such indicators as shape, color, temperature.

The American supermarket chain Whole Foods is developing a robot barista Briggio. Flippy has proposed the name “cobot”, which means cooperative robot. That is, if the machine detects the presence of a person in the work area, then used by the developers industrial manipulator Universal Robotics will stop immediately to prevent collisions with people and prevent possible injury.

The American supermarket chain Whole Foods is developing a robot barista Briggio. Such equipment with artificial intelligence will be able to receive orders from the Internet through a personal account on the developer’s website. This way, you can pay and place your order online while on the way to the supermarket. The robot-barista can make hot drinks such as lattes, tea, hot chocolate and cappuccino (McKinsey Global Institute, 2017).

The Momentum Machines project has developed the Momentum Machine, which has a capacity of 400 burgers per hour, is equipped with 350 sensors and 20 computers and is 4 meters long. Such a robot will speed up maintenance and increase the owner's income. Thus, for an hour of work at an average burger price of \$ 6, it is possible to get an income of \$ 2,400, which is three times higher than the average income of a fast food restaurant in the United States (Antonenko et al., 2019).

In San Francisco, the airport has a mobile barista robot, which moves around the airport and offers guests a choice of coffee drinks and the ability to pay by card. So now airport guests do not have to look for a coffee shop – the products are looking for those who want them.

There is a semi-automatic Spycy restaurant in Boston, where robots have replaced chefs. It was created by four graduates of the Massachusetts Institute of Technology and approved by the prestigious chef of the restaurant Daniel Buluda. Spycy is considered to be the first restaurant in the world with robotic cuisine, where complex dinners are prepared ("Artificial Intelligence", 2019).

The bartenders at Bionic Bar on the Royal Caribbean liner not only speed up the preparation of drinks, but also serve as elements of the show (McKinsey Global Institute, 2017). Directly above the works is a panel with more than a hundred bottles of alcoholic beverages. To order, the guest must choose a drink from 30 options in the menu on the tablet or on your smartphone by downloading the mobile application. After that, customers just watch as the works mix and shake the necessary ingredients.

In the American restaurant Zume Pizza, robots are used to make pizza. The sauce is dosed on the dough pieces, the next robot decomposes the ingredients, then on the conveyor they go to the robot, which distributes them evenly on the pizza, and the last robot transfers it to the oven. This station is located in a portable van, so the pizza can be prepared on the way to the customer, which reduces delivery time.

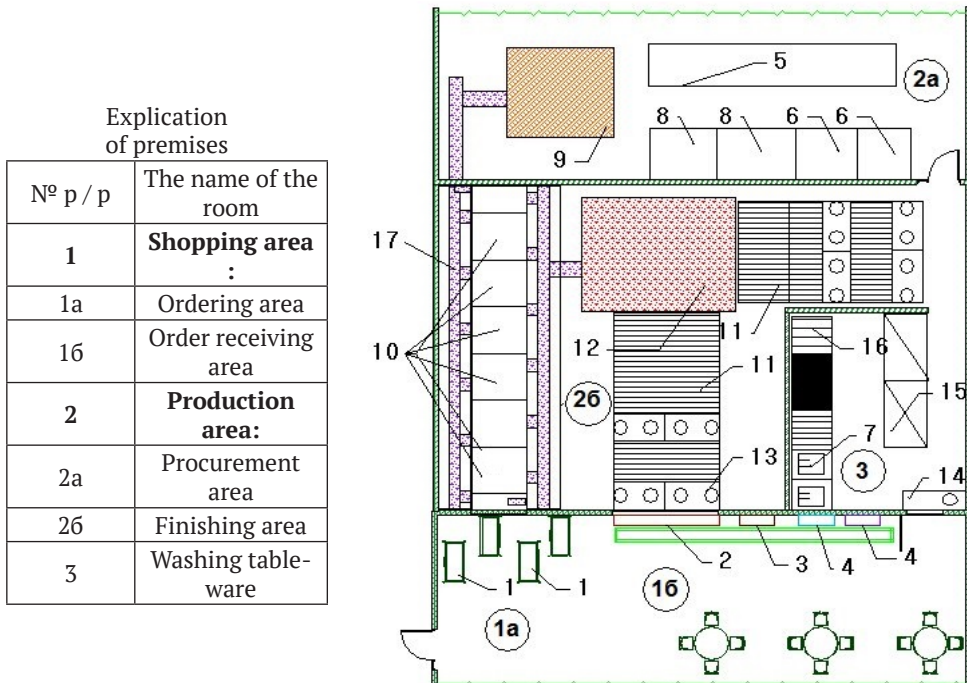
The Chinese restaurant Dalu Robot in Jinan uses 12 robots. They travel around the hall on small bicycles and deliver meat and vegetables, which visitors dip in boiling broth. Each of the robots is equipped with a motion sensor that allows you to send a signal to stop the robot at the right table. In addition, they perform the functions of hostesses, as well as entertain guests by singing and dancing (Association of Ukrainian-Chinese Cooperation, 2017).

The Japanese restaurant FuA-Men automated the preparation of noodles using the robot Fully Automated Ramen. The preparation of noodles takes 1 minute and 40 seconds, which are 80 servings per shift. The quality of ready meals does not differ from traditional ones.

At the Russian company Promobot, the robot helps people with navigation, answers questions, broadcasts promotional materials and remembers everyone with whom he had to communicate.

Based on a preliminary analysis of the use of artificial intelligence in restaurants, the authors have developed a robotization scheme of the technological process of such an institution on the example of a salad bar (Fig. 1).

This scheme consists of three stages. The first stage is to serve visitors in the shopping area. First, they form their own order in the order area on the touchscreen terminal: in the dialog box, choose a salad (this can be a suggested recipe or created by the visitor to choose from the suggested ingredients) and drinks. After confirming the order, it is paid through the payment terminal and receives a check with the order number.



Equipment specification			
Nº p / p	Name of the equipment	Nº п/п	Name of the equipment
1	Order terminal with touchscreen and settlement terminal	9	Distributor robot
		10	Containers-dispensers with products
2	Handout	11	Conveyor
3	Hot drinks machine	12	Mixer robot
4	Cold drink machine	13	Tray with the order
5	Production table	14	Table with a hole for waste
6	Vegetable peeling machine	15	Rack with utensils
7	Wash bath	16	Dishwashers
8	The machine for cutting vegetables	17	Channel for transportation

Fig. 1. Robotization Sceme of Food Processing in Salad Bar

Source: Own Development

The next step for the visitor is receiving an order in the distribution area through the appropriate window. The visitor identifies his order by the number of the check, which is stamped on the lid of the finished salad. The next step of the visitor is to receive the ordered drink in the appropriate machine by entering the check number on the keyboard. After receiving a full order, the visitor takes a free seat at a table in the shopping area. After consumption, the cleaner collects trays and dishes and through a special window passes them to the washing tableware, where the process of washing dishes and sorting it on the rack.

The second stage is the preparation of semi-finished products in the procurement area. This process is controlled by a chef-operator, who prepares the required number of semi-finished products and cleans and cuts vegetables, fruits, meat and fish products using machines for cleaning and slicing culinary products. The sliced semi-finished products are loaded into a sorting robot, which recognizes the semi-finished product by size, shape and color, and uses special channels to transport the semi-finished products to the appropriate container.

The third stage is the automatic preparation of salad in the pre-cooking production area. The artificial intelligence housed in the system analyzes the guest's order and activates the containers with the necessary ingredients, in which the dispenser dispenses the required amount of semi-finished product into a special container that stops under each container, and then sends a mixture of semi-finished products to the mixer. Here is the automatic mixing of products, filling them with dressing and unloading into the dishes, which is covered with a plastic lid, and the stamping element of the robot leaves the order number on the lid. A conveyor is connected to the robot mixer, which connects it with the dishwasher. There, the dishwasher sorts the trays and places the dishes on them, which move along the conveyor to the mixer robot. After loading the finished salad into the dishes and applying the order number, the tray with the order is transported on the conveyor to the distribution room, where it is picked up by the visitor and then sent with it to the vending machines with drinks.

During the operation of the proposed system, the number of semi-finished products in the container decreases over time. The artificial intelligence of the system analyzes the hourly number of visitors and the content of orders of previous days and weeks and calculates the limit of the number of semi-finished products in the container. Thus, when the number of semi-finished products becomes less than this limit, the operator is given a signal that it is urgent to prepare a certain semi-finished product and load it into the container.

With the developed system of production activities, the required number of employees will be 5 people: a cleaner in the shopping area, a dishwasher, a packer of trays, a cook-operator of the pre-cooking area and a system administrator of artificial intelligence.

Forecasting the implementation of the developed system will accelerate the process of customer service, reduce the area of production facilities and, accordingly, increase the turnover of the restaurant.

Therefore, restaurateurs, who are constantly working to optimize the technological process and service, in their institution are interested in using robots, because such an innovation in the restaurant business helps to address issues of production and service and is of interest to visitors.

In addition, over time, the use of artificial intelligence in restaurants will no doubt be perceived naturally. That is why now restaurateurs have the opportunity to be among the first in Ukraine to implement this innovation and the use of artificial intelligence to robotize the technological process in restaurants.

Conclusions and results discussion

Thus, the relevance of the artificial intelligence introduction in the activities of restaurants due to the fact that quarantine measures due to the spread of coronavirus

infection force humanity to ensure social distancing. This process will ensure the absence of staff contact with guests and at the same time speed up the process of customer service and production of culinary products.

Scientific works analysis of domestic and foreign researchers has shown that there is a need to study the use of artificial intelligence for the functioning of restaurants.

The robotization scheme of technological process on an example of salad bar which consists of three stages has been developed: service of visitors, preparation of semi-finished products and automatic preparation of finished goods.

Prospects for further research are to study the possibilities of using artificial intelligence in the restaurant business on the example of robot waiters and robot chefs, the possibility of creating artificial intelligence systems such as customer-to-customer and item-to-item.

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ВПРОВАДЖЕННЯ ШТУЧНОГО ІНТЕЛЕКТУ В ЗАКЛАДАХ РЕСТОРАННОГО ГОСПОДАРСТВА

Актуальність. Протягом останніх років виникла потреба дослідження застосування штучного інтелекту для функціонування закладів ресторанного господарства, оскільки в Україні (та в більшості держав світу) відсутній подібний досвід. Використання систем штучного інтелекту customer-to-customer та item-to-item забезпечить якісне функціонування сайтів доставки їжі, що дасть змогу проаналізувати замовлення гостя та виявити закономірність його вподобань і, таким чином, автоматично запропонувати йому вибрати певний сет, страву та вдалі доповнення до замовлення, що збільшить середній чек, чи обрати нові заклади, що допоможе їх виходу на ринок ресторанних послуг. **Мета і методи.** Метою дослідження є аналіз сучасного стану, визначення перспективи застосування існуючих роботизованих технологій у технологічному процесі закладів ресторанного господарства та розроблення схеми роботизації технологічного процесу закладів ресторанного господарства типу салат-бар. Методи – у процесі дослідження було застосовано методи логічного узагальнення щодо розроблення схеми роботизації технологічного процесу, що проводилися за допомогою комп'ютерної програми ArchiCaD. **Результати.** Проблему впровадження і використання штучного інтелекту вивчають вчені та дослідники у різних галузях науки. Розглядаючи їх наукові праці, можна зауважити, що штучний інтелект вже активно використовується для виготовлення кулінарної продукції у закордонних закладах ресторанного господарства. Відомі приклади застосування роботів-бариста, роботів-піцайол, роботів-салатмейкерів, роботів-бургермейкерів тощо. В дослідженні розроблено схему роботизації технологічного процесу салат-бару, що складається із трьох етапів. Першим етапом є обслуговування відвідувачів у торгівельній зоні, де передбачено вибір замовлення, розрахунок через термінал та наступне автоматичне отримання кулінарної продукції і напоїв. Другим етапом є підготовлення напівфабрикатів у заготівельній зоні. Цим процесом керує кухар-оператор, який контролює необхідну кількість напівфабрикатів і проводить очищення та нарізання овочів, фруктів, м'ясних і рибних продуктів за допомогою машин для очищення та нарізання кулінарної продукції. Програмою передбачено аналіз залишку та необхідної кількості напівфабрикатів і вибір компонентів для приготування салатів штучним інтелектом. Третім етапом є автоматичне приготування салату у доготівельній виробничій зоні. Штучний інтелект, що розміщується у системі, аналізує замовлення гостя і активує контейнери із необхідними інгредієнтами, перемішує їх та вивантажує до посуду, який накривається пластиковою кришкою, а штампувальний елемент робота залишає номер замовлення на кришці. У запропонованій схемі передбачено дотри-

мання санітарно-гігієнічних норм, що висуваються до закладів такого типу. При розробленій системі виробничої діяльності необхідна кількість працівників становитиме 5 осіб: прибиральник у торговельній зоні, мийник столового посуду, пакувальник таць, кухар-оператор доготівельної зони та системний адміністратор штучного інтелекту. **Висновки та обговорення.** Авторами здійснено аналіз сучасного стану, визначено перспективи застосування існуючих роботизованих технологій у технологічному процесі закладів ресторанного господарства та розроблено схему роботизації технологічного процесу на прикладі салат-бару. Розроблена схема складається із трьох етапів: обслуговування відвідувачів, підготовки напівфабрикатів, автоматичне приготування готової продукції. Передбачається, що впровадження розробленої системи призведе до пришвидшення процесу обслуговування гостей, зменшення площі виробничих приміщень та, відповідно, збільшення товарообігу закладу ресторанного господарства.

Ключові слова: виробництво, кулінарна продукція, робот, технологія, устаткування, штучний інтелект.

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ВНЕДРЕНИЕ ИСКУССТВЕННОГО ИНТЕЛЛЕКТА В ЗАВЕДЕНИЯХ РЕСТОРАННОГО ХОЗЯЙСТВА

Актуальность. В последние годы возникла необходимость исследования применения искусственного интеллекта для функционирования учреждений ресторанного хозяйства, поскольку в Украине (и в большинстве стран мира) отсутствует подобный опыт. Использование систем искусственного интеллекта customer-to-customer и item-to-item обеспечит качественное функционирование сайтов по доставке еды, что позволит проанализировать заказ гостя и выявить закономерность его предпочтений и, таким образом, автоматически предложит ему выбрать определенный сет, блюдо или удачные дополнения к заказу, что увеличит средний чек, или выбрать новые заведения, что поможет их выходу на рынок ресторанных услуг. **Цель и методы.** Целью исследования является анализ современного состояния, определение перспективы применения существующих роботизированных технологий в технологическом процессе заведений ресторанного хозяйства и разработка схемы роботизации технологического процесса заведений ресторанного хозяйства типа салат-бар. Методы – в процессе исследования были применены методы логического обобщения при разработке схемы роботизированных производственных помещений, которые проводились с помощью компьютерной программы ArchiCad. **Результаты.** Проблему внедрения и использования искусственного интеллекта изучают ученые и исследователи

в различных областях науки. Рассматривая их научные труды, можно заметить, что искусственный интеллект уже активно используется при изготовлении кулинарной продукции в зарубежных учреждениях ресторанного хозяйства. Известны примеры применения роботов-бариста, роботов-пиццайоло, роботов-салатмейкеров, роботов-бургермейкеров и т. п. В нашем исследовании разработана трехэтапная схема роботизации технологического процесса салат-бара. Первым этапом является обслуживание посетителей в торговой зоне, где предусмотрены выбор заказа, расчет через терминал и последующее автоматическое получение кулинарной продукции и напитков. Вторым этапом является подготовка полуфабрикатов в заготовительной зоне. Этим процессом руководит повар-оператор, который контролирует необходимое количество полуфабрикатов и проводит очистку и нарезку овощей, фруктов, мясных и рыбных продуктов с помощью машин для очистки и нарезки кулинарной продукции. Программой предусмотрен анализ остатка необходимого количества полуфабрикатов и выбор компонентов для приготовления салатов искусственным интеллектом. Третьим этапом является автоматическое приготовление салата в доготовочной производственной зоне. Искусственный интеллект, который размещается в системе, анализирует заказ гостя и активирует контейнеры с необходимыми ингредиентами, перемешивает их и выгружает в сосуд, который накрывается пластиковой крышкой, а штампочный элемент робота оставляет номер заказа на крышке. В предлагаемой схеме предусмотрено соблюдение санитарно-гигиенических норм, предъявляемых к заведениям данного типа. При разработанной системе производственной деятельности необходимое количество работников будет составлять 5 человек: уборщик в торговой зоне, мойщик столовой посуды, упаковщик подносов, повар-оператор доготовочной зоны и системный администратор искусственного интеллекта. **Выводы и обсуждение.** Авторами проанализировано современное состояние, определены перспективы применения существующих роботизированных технологий в технологическом процессе заведений ресторанного хозяйства и разработана схема роботизации технологического процесса на примере салат-бара. Разработанная схема состоит из трех этапов: обслуживание посетителей, подготовка полуфабрикатов, автоматическое приготовление готовой продукции. Предполагается, что внедрение разработанной системы приведет к ускорению процесса обслуживания гостей, уменьшению площади производственных помещений и, соответственно, увеличению товарооборота заведения ресторанного хозяйства.

Ключевые слова: искусственный интеллект, кулинарная продукция, оборудование, производство, робот, технология.