INNOVATIVE METHODOLOGY FOR APPLICATION FOR INDUSTRY 4.0 IN TOURISM SECTOR

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Abstract

In the age of the new computer world, the topic related to individual tourist trips is quite relevant. However, the question arises with the language barrier when considering tourist sites, getting timely information about the site using intelligible (native) language. This methodology examines the possibility of applying the modern achievements of technology in the tourism industry. The essence is to use an individual self-propelled robot that moves along a given route chosen by the tourist. The verification methodology is based on two fundamentally different recognition methods embedded in a robot developed by us. The robot's movement can also be controlled in automatic or manual mode. By applying Industry 4.0, it stops at every object and senses it using sensors. The robot, in turn, introduces the tourist to the features of the object in a language understandable to him. The present development aims to demonstrate the offering of an innovative tourism service which bypasses the linguistic peculiarities of the different languages, obtains better tourist services and achieves greater satisfaction with the tourist.

Key words: *tourism, industry 4.0, robot, tourists, innovation*

INTRODUCTION

The use of robots is not a new idea. There are developments in different spheres without human intervention, but they don't can take on the complex real world with all modern technology. Therefore, these machines have not been very successful. The current understanding is to create intelligent machines that are capable of making independent decisions and operating in the natural environment without taking over the human control functions. At the same time, these machines must be capable of operating for a long time without supervision [1].

On the other hand, there are no working hours and days off for the robots. At the same time, they may perform functions in inclement weather.

Robots are small, smart, interconnected, lightweight machines that aim to release the person from basic everyday pursuits.

One advantage of modern robots is their ability to be built using cheap, lightweight and intelligent components. Due to their spread in consumer electronics such as mobile phones, gaming consoles and mobile computers (laptops, tablets, etc.), high quality cameras and embedded processors can be built into many platforms at a very low cost. In most cases, they are made of new materials and modern composites, using modern and technological production processes that are much cheaper than the basic production processes for the production and manufacture of its details and for the production and implementation of robotic platforms [6].

The symbiotic use of new and differently based platforms will synchronize the work of robots to further enable the distribution of tasks across this multitude of platforms and thus provide an opportunity to increase the tourist service offered. The most robotic fleets can also take advantage of a wealth of data from various sources to calibrate tasks and minimize environmental impacts [9, 6].

The wide range of technologies embedded in these robots enables the rapid transition of the fourth industrial revolution to enter the tourism sector through robotics. Some technologies will need to be developed specifically for this sector, while other technologies have already been developed for other activities and can be adapted to the tourism domain, such as autonomous vehicles, artificial intelligence and machine vision [9, 3, 6].

In recent years, there has been a greater uptake of artificial intelligence-based technologies in tourism globally. Tourism innovations should and would be useful if they are aimed at improving the competitiveness of Bulgarian tourism companies on the domestic and global markets [5].

This can be achieved by improving the organization of the production and sale of tourist goods and services.

Recent advances in telecommunications, networking, databases, data processing and electronic marketing provide many new opportunities for tourism-business. These are significantly impacting traditional tourism business models. The long-term growth of any economy is determined by its ability to renew itself, ie. to turn knowledge into an economic result. "Upgrade or Die" - with this article title in the magazine. "Economist" Peter Drucker gives the shortest definition of the importance of the "renewal" problem for contemporary economic development [2].

This is evidenced by the fact that in developed countries, half of GDP growth is a result of innovation and this share increases as the intensity of new knowledge creation and use in the economy increases. In the tourism sector, a large number of operations are carried out by people, the employment of human resources is over 75%. Significant progress has already been made in implementing AI solutions in the tourism industry. This trend will not only continue, but will intensify in the coming years. The ability of artificial intelligence-based technologies to improve customer service while saving human resources makes AI extremely relevant to the tourism sector. This is a prerequisite for the implementation of this type of solutions at an even faster pace in 2020 [8].

The purpose of this development is to demonstrate the application of Industry 4.0. in the tourism sector, and in particular in the amusement parks, by offering an innovative tourism service that circumvents the linguistic features of different languages.

MATERIALS AND METHODS

To illustrate the areas of activity related to the fourth industrial revolution in the tourism sector, an attempt was made to create the tree structure shown in Fig. 1.
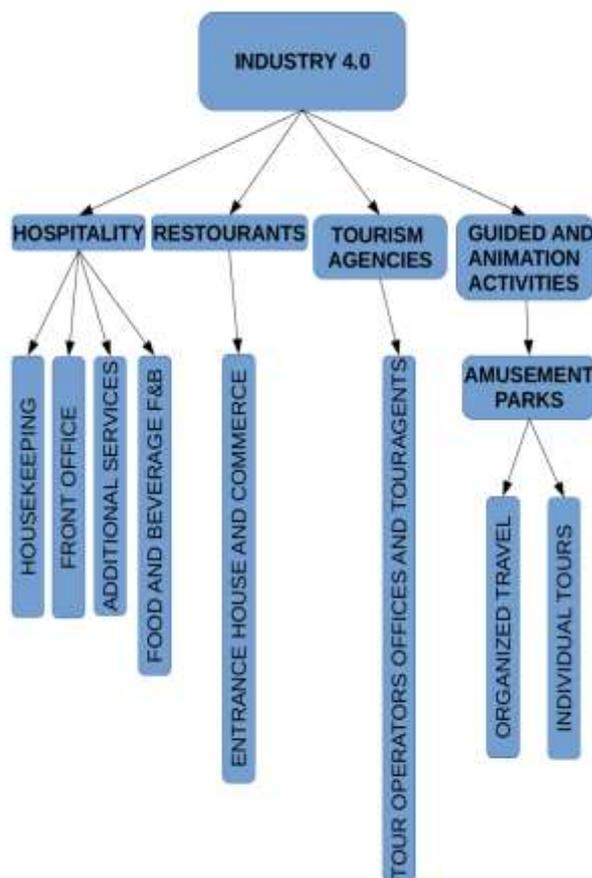

Fig. 1. Industry 4.0 in the tourism sector
Source: Author's development.

Fig. 1 shows the areas of activity of the robots in the tourism sector. In Bulgaria, the application of Industry 4.0 is poorly developed and implemented. all the above mentioned tourism sectors.

Specifically for the purpose of our development, we will look more closely at the implementation of Industry 4.0. in the amusement parks.

As mentioned in Amusement parks it is possible to do organized trips and individual tours.

Fig. 2 shows the interrelations between the different elements of the methodology for using robots in Amusement parks. The purpose of this development is precisely amusement parks (AP). They have a significant number of

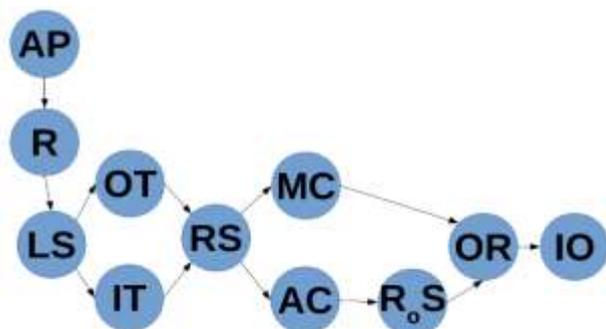attractions and sights to go around. In many cases, they work part-time.

Fig. 2. Relationship between the different elements of the methodology for using Industry 4.0 in the tourism sector:
Legend: AP-amusement park; R-robot; LS-language selection; OT-organized travel; IT-individual tour; RS-regime selection; MC-manual control; AC-automatic control; RoS-route selection; OR-object recognition; IO-information of object
Source: Author's development.

This requires shift guides and more staff to be employed. In the absence of a skilled guide or employment, using Industry 4.0 is quite attractive.

RESULTS AND DISCUSSIONS

Artificial intelligence will improve customer service and save resources in the tourism business. The general technological scheme of hotel services includes activities and operations in: Front office (Front office); Hotel household; Units for additional activities and services; Food & Beverage Sector.
In the near future, hotels will impress their guests with modern IT developments. According to the forecasts of specialists in the hotel sector (Professor of Information Technology at the École Hôtelière de Lausanne in Switzerland and Richard Lewis of Best Western Hotels GB), hotels will soon surprise their guests with directional sound, virtual reality, 3D printing technology, a wireless Internet that works with LEDs and other innovations [8].
In Bulgaria, innovations in the hospitality industry related to Industry 4.0. (robotics and automation software products), modern AI developments, high-tech developments that facilitate and replace human-made work operations and lead to consistent quality of

service have not been implemented. The human factor is still large. The quality of service in the hotel complexes would be greatly improved if a new, innovative model were introduced [4].
Food and entertainment establishments combine production and commercial activity. For each of these activities, appropriate premises should be provided include activities and operations closely related to their intended use.
- Commercial premises to the front of the establishment;
- Production premises close to commercial and direct connections;
- Warehouses are the most frequently chosen northern part;
- Administrative-residential premises one floor below or above.
For the purposes of our development, we will focus on Commercial Premises. They include all the rooms where visitors are welcomed, accommodated and served. This includes the entrance hall and commercial halls (dining, banquets, etc.).
In the face of increased competition in the restaurant business, stylish interiors and quality and delicious food are no longer sufficient to retain regular visitors and attract new customers, which requires owners and managers of restaurant establishments to bring in new technologies without increasing technology. the complexity of managing them. The introduction of Industry 4.0 in the restaurant business will enable effective communication and synchronization in the restaurant service and will give greater added value and a better quality restaurant product.
Only the activities, directly or indirectly related to the provision of basic and additional tourist services, may be performed at the sites for the implementation of tour operator and tourist agency activity. The office of the travel agent must have a showcase and signboards and information boards, and near the entrance information on the company of the travel agent and on the place and the name and surname of the person in charge of the site as well as working hours should be placed. In the office a commercial area with separate workplaces and a place for reception of clients should be

formed. The travel agent's office must be open full-time, at least five days a week. If the tour operator also carries out travel agency activity, the premises in which he operates must meet the above requirements. The requirements for the staff are specified in the Regulation on the requirements for the staff of tour operators and travel agents [7].

They are introduced in this regulation and relate to education, language qualification and internship of the staff. Implementation of Industry 4.0. it will facilitate a large part of the work operations in the sector and lead to their uniformity and better quality. Trends show that consumers are increasingly preferring self-service solutions and avoiding intermediaries. The introduction of technologies that eliminate the need for the client to interact with a consultant or tour operator to complete the booking or purchase of a tourism product will save time and provide convenience that will be useful to both consumers and tourism companies. Further improvements in this direction will reduce problems with self-service systems to ensure reliability and security.

Like any additional tourist service, amusement parks have a great added value for the tourism sector and for those who offer it. This methodology makes it possible to apply the modern achievements of the technique in the excursion and animation activities.

Specifically, we will look at the amusement parks in the case of individual and organized tours. The essence is to use an individual self-propelled robot that moves along a given route chosen by the tourist. The verification methodology is based on two fundamentally different recognition methods embedded in a robot developed by us. The robot's movement can also be controlled in automatic or manual mode.

By applying Industry 4.0, it stops at every object and senses it using sensors. The robot, in turn, introduces the tourist to the features of the object in a language understandable to him. This innovative tourist service allows you to bypass the linguistic features of different languages, to obtain better tourist services and to achieve a more complete satisfaction of the tourist.

As mentioned in the first section of the methodology (illustrated in Figure 2) are Amusement parks (AP).

The second unit is the use of robots (R). They are subject to a number of requirements for different fields of use, but in this case, in particular, the robots must meet a few more specific ones:

-Adequate clearance - necessary for the robot to overcome obstacles in its path. Such can be stairs, slopes of ascent and descent, stones, soil, etc.;

-Great autonomy of travel - the requirement must be tailored to the length of the routes. The need arises from the requirement for the robot to circumnavigate these landmarks and return to the entry position;

-Ability to quickly restore the energy source;

-Ability to use RES energy;

-Use quiet mode of movement;

-Possibility for automatic and manual mode of movement;

-Database connection;

-QR reader;

-Ability to work in different languages;

-Convenient user interface.

Once the robot has been selected as a way of touring the attraction, it is necessary to be able to choose the language of communication (LS). This is done using a suitable user interface in a web-based platform. The platform gives you the choice of mode of travel.

One is the group tour (OT). It is suitable for organized visits to the attraction. Usually these are tourists, students, businesses or organizations. They move in a group, usually with a leader who is responsible for the persons in the group and serves as a contact. He must have a minimum of knowledge of computer science in order for communication to take place properly. If the group is large it is possible to split it by interests to satisfy the requirements and wishes of all visitors. It is also possible to divide by number, limiting the maximum number of tourists in one group for the sake of group unity.

One group needs one robot, otherwise it starts with individual tours (IT). They require a robot for each tourist to follow, after programming for certain visits.

The next element in the methodology is mode selection (RS). It selects the way the robot moves in the attraction. There is a choice between automatic mode and manual mode. Specifying the choice of guidance mode aims to specify the length of visit to the park.

By choosing the manual mode of travel (MC), tourists are given a joystick to control or choose the sequence of visits to the attractions. By choosing a joystick control, they have the ability to direct the robot's movement themselves and stop at specific attractions for maximum satisfaction. With it, the robot stops where the tourist takes him, while choosing the attractions to be visited by tourists determine in advance the sequence of visits to the individual attractions. This mode does not require a pre-selection of the attractions to visit.

With automatic guided tour (AC), tourists do not have this option. The specially developed software here instructs the robot on its movements. Communication is required between the robot and the navigation system through a GSM operator or satellite system.

The Road Selection (RoS) element specifies the sequence of visits to the selected attractions. After choosing the attractions to visit, specialized software develops several routes for the robot to travel. Allows you to choose which of the routes the robot moves. This allows the tourists to have a controlling effect on the machines, and it enables them to make a logical decision depending on certain criteria. After specifying the previous elements, a visit to the attractions begins.

Stopping in front of the attraction, the robot must recognize it (OR). This is done with the help of a QR reader, the standard equipment for the robot. To be able to properly approach the code plate, the robot is equipped with an additional 3 VGA cameras on Cognex on both sides. They serve to determine the position through specialized software that takes into account the distance and position of the code. The QR reader may be integrated into the aperture chamber. The cameras also allow the number of tourists in the group to be monitored through the specialized software attached to it. By reading the code, the robot receives information about the attraction in front of it and connects to a database to retrieve information about the particular attraction. The last step in this methodology is to output object information (IO). Through the appropriate user interface, the robot informs tourists about the object in front of them.

Audio-visual display of the information on a special screen on the robot is possible. There is also an option for holographic display of object information in 3D.

When visiting two attractions with sufficient proximity, headphones are used or information is displayed on the screen of tourists' smartphones by a special application that communicates with the robot via the bluetooth interface.

When using specialized software on the smartphone, it is possible to control the camera of the robot to take pictures or selfies.

CONCLUSIONS

Based on the research we can summarize and synthesize the following conclusions:

The artificial intelligence-based technologies are conduct to improve customer service while saving human resources. This making Industry 4.0. extremely suitable for the tourism sector.

An attempt has been made to create a tree structure aiming to outline the areas of activities related to the fourth industrial revolution in the tourism sector.

A brief feature of industry 4.0 activity areas has been made. and the various sectors of the tourism industry (hotels, restaurants, tour operators and travel agencies, guides and animation).

An innovative methodology has been developed for using robots in excursion and animation activities, specifically at Amusement parks, for organized tourist groups and individual tourists.

The essence of methodology are consist to use an individual self-propelled robot that moves along a given route chosen by the tourist.

The requirements for the use of the robot in the tourism sector are specified.

Methodology for application of Industry 4.0 developed. in the tourism sector, it is an innovative tourism service that circumvents the linguistic features of different languages,

aiming at achieving better tourist services and more complete tourist satisfaction.

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