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Use of artificial intelligence in automated transportation management

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Abstract

Artificial Intelligence **(AI)** is one of the most important and rapidly developing areas of modern technological progress, which has had a fundamental impact on the development of modern society.

The development of **AI** over the past decades has significantly changed our perception of technological possibilities and opened new horizons in almost all areas.

Most industries, including logistics, have been transformed by the development of new technologies such as AI. Autonomous vehicles, warehouse automation, predictive analytics and smart roads are all examples of technologies that are now becoming the new norm.

Keywords: Artificial Intelligence (AI), automated transportation, logistics.

1. The importance of artificial intelligence in human life

Most jobs that are being replaced by computers or robots involve jobs that require a high school education. However, now that computer algorithms are becoming increasingly sophisticated, this wave may reach positions requiring higher education as well. In today's modern era full of challenges, the boundaries and barriers between people have been erased thanks to technological advancements. The question is often asked: what has man-made technology changed in our lives? - The most important change is the absence of borders. The introduction of artificial technologies is happening very fast, and this process will accelerate even more.

Artificial Intelligence (AI) is a field of computer science that aims to create an intelligent computer machine/program capable of achieving the level of human intelligence. Determining the level of intelligence depends largely on the task at hand. Artificial intelligence technology acts automatically, guided by its own motivations and emotions, and has the ability to interact with people and the environment. They believe that the definition of the term should consider categories such as: nature, autonomy, purpose, operating environment and human-robot communication. However, to date, there is no universally accepted definition of the term **(Fig. 1):**

Fig. 1. Artificial intelligence is used in almost all spheres of human activity

The world is evolving and artificial intelligence is rapidly entering and has already entered the organization of human life.

2. Artificial Intelligence in Transportation

Today, "smart" traffic lights in megacities can hardly surprise anyone. Many motorists know that cameras constantly analyze the traffic situation and help regulate traffic. But this is only one way of using artificial intelligence (AI) in transportation. There are others. For example, unmanned vehicles, and not only passenger cars, but also, say, harvesters or trucks. In addition, automation helps to control the proper operation of various ground transportation systems [1-3].

Today, with the help of AI, driver fatigue monitoring systems are being tested and are beginning to be implemented. This is especially important for public transportation (buses, trolleybuses, streetcars, metro trains). There are various reasons why a driver can fall asleep at the wheel and cause an accident. But with the new system, this will not happen. - A special camera constantly "looks" at the driver and analyzes his condition. Based on many indicators (for example, movements, blinking frequency, facial expressions), the electronics determines the degree of fatigue of a person. And if the computer notices that the driver has started to fall asleep, it gives a signal to wake him up and bring him to his senses.

Artificial intelligence can be used to develop automated systems to control traffic flows, optimize routes and schedules, and create self-driving cars and drones.

- **Unmanned cars (self-driving cars)** - a system based on AI gently guides a car through the streets in compliance with all traffic rules. During the entire period of testing, such cars have not provoked a single accident.
- **Public transport** – an AI on public transport does not "drive" itself yet - it only assists the driver. The artificial brain constantly analyzes the traffic situation (traffic signals, road signs, traffic, other vehicles and pedestrians), predicts its development, promptly identifies possible dangers and, in case of their occurrence, signals the driver. If the person has not reacted in any way, and the danger is getting closer, the system activates automatic braking of the streetcar.
- **Applied to railroads** - an AI-based railroad dispatcher assistant system has been developed. It is capable of predicting, modeling and optimizing the movement of trains to make their schedules more accurate and reduce the likelihood of accidents. - The smart system analyzes the situation on the railroad in front of the train and, by recognizing other trains, switches, tracks and people, helps to avoid emergencies. Where a person might not notice something, the electronics see everything and signal the driver [4-8].

- **Agriculture** - a system of autonomous control of agricultural machinery (combine harvester, tractor, sprayer) based on artificial intelligence technologies has been in operation for a long time. It allows to entrust the control of the machine to a robot-assistant, and the operator can concentrate on controlling the quality of field cultivation or harvesting. Unlike a car, a combine harvester is a complex set of systems, a whole mobile "factory". In addition to the movement itself, harvesters perform dozens of other harvesting procedures, and it can be difficult for the operator to keep track of everything at once. Now a person will be able to control only the key functions, leaving the most complex of them - motion control - to a robot. - According to experts, a tractor with autopilot can increase tillage productivity by up to 20%, seed savings by up to 40% and yields by up to 10%.
- **Logistics** - being in a highly competitive marketplace, operating efficiently and flexibly allows any company to gain a leading position in its field. Therefore, companies are looking for tools to help them make decisions and optimize their processes to improve operational efficiency, meet customer needs and reduce costs. Now, new technologies and

AI in particular are playing a key role in solving ambitious challenges. According to the authoritative research company Gartner, in 2024, about 50% of logistics companies will invest in AI-enabled technologies **(Fig. 2):**

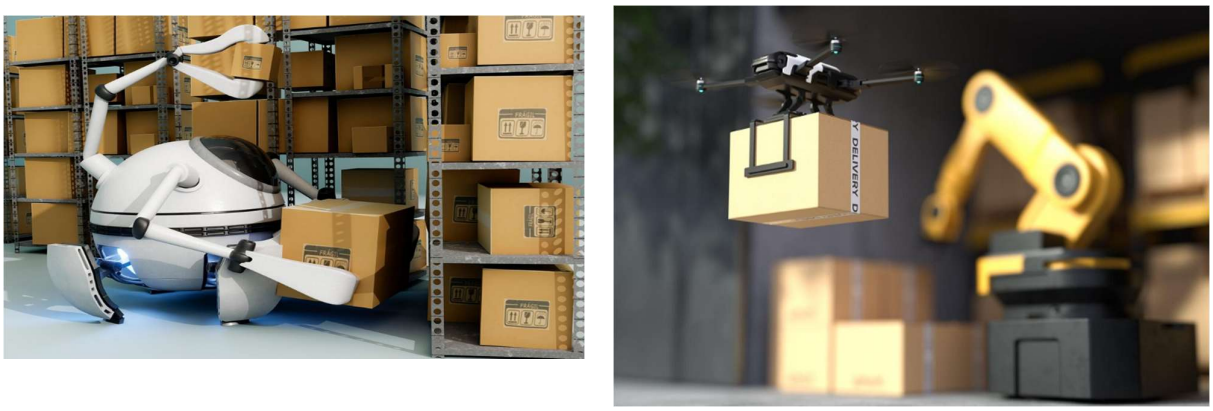

Fig. 2. An AI in logistics

An AI, using machine learning methods, collects data and, based on this, makes its own predictions and creates an optimal route, determining the delivery time very accurately. Data for analysis can be: type of customer, delivery area, floor, size and weight of the parcel, etc. It can also use data on traffic congestion during peak hours, road and weather conditions **(Fig. 3):**

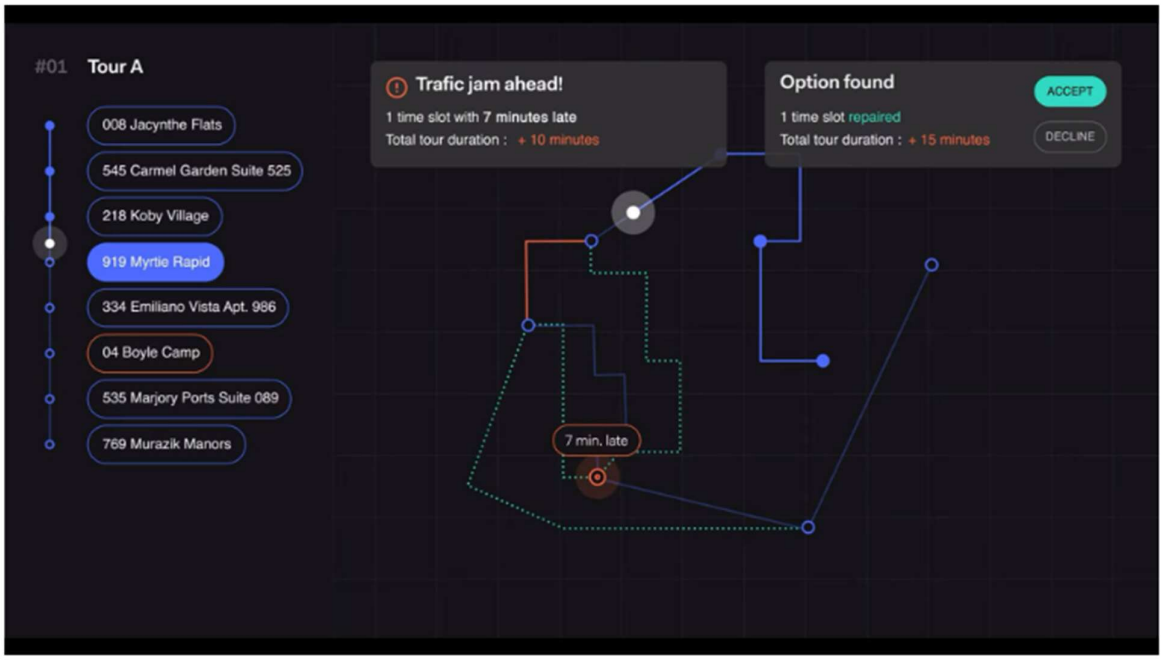

Fig. 3. A schematic of how AI works

Benefits:

- Fewer kilometres travelled;
- Lower costs and shorter delivery times;
- Higher service quality and customer satisfaction;
- Reduced CO2 emissions.

The development of artificial intelligence also has challenges:

➢ **Privacy and Security:** with AI systems capable of collecting vast amounts of information, there is a need to protect personal data, tighten data management rules and develop new policies [9-12].

➢ **Labour force reduction and employment issues:** the automation of industries will lead to significant changes in the labour market, which will require changes in social security policies and adaptation to new labour market requirements.

➢ **Transparency and explanation:** most AI models use a 'black box' effect, which means that their decision-making process is difficult to understand or opaque. This makes them difficult to use in areas where it is important to explain the logic behind decisions [13-17].

➢ **Responsibility and accountability:** who is responsible for the decisions made by artificial intelligence and the damage it causes? This question is particularly important in the sector of autonomous systems such as unmanned cars, as it is difficult to determine who is ultimately responsible - the system creator, the creator or the user [17-20].

3. Conclusion

As can be seen from the examples described above, AI already has a lot of possible applications in transport (public transport, railways), agriculture and logistics. Any tasks that require analysing large

amounts of data, accounting or calculating anything with the help of AI are solved much faster and more efficiently.

Of course, setting up and training any automated system based on artificial intelligence is a rather complex, lengthy and expensive process, but if the process is organised correctly, all investments will more than pay for themselves in the medium term. At the same time, it should be realised that AI technologies are now developing at a very rapid pace, and as they develop, they become more affordable.

The mission of artificial intelligence is twofold: it exists to enhance and improve human life, while encouraging us to use it wisely and ethically. When intelligently designed and used, AI can help create a more efficient, just and sustainable world. But like any powerful tool, it needs careful guidance to ensure that it truly serves humanity's best interest.

- Will AI change the world for the better? - I hope so.

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