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# MODERN SOLUTIONS OF PARKING AUTOMATION

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Automated control system or ABS is a set of hardware and software designed to control technological process, production, various processes within the enterprise. ABS is used in various industries, energy, transportation, etc. The term automated, in contrast to the term automatic, emphasizes the retention of some function by a human operator, or the most general, purposeful, or inappropriate.

Any automatic control system (ABS) consists of two main parts, which are called the control object and the control device. In general, the objects of management can be living organisms, human communities, industrial enterprises, individual workshops, aggregates, etc. In this course, only technical objects are considered, and therefore the control object is understood as the technical device that implements the process that needs to be controlled. a simpler control system can also be considered as an object [1, 2, 3, 4, 5, 6, 7, 8, 9].

The state of the object, its mode of operation is determined by a number of physical quantities characterizing the effect of the external environment on the object and the control device, as well as the process occurring in the object itself. Some of them are measured during operation and are called controlled quantities, while others are not measured and are called uncontrollable quantities, but they affect the operation of the object.

The effect created by a control device or given by a person to the object is called the control effect (magnitude), and the effects that do not depend on the control system are called saturators.

Automation includes many vital elements, systems, and work functions.

Automation benefits almost every industry. For example:

• Manufacturing, including food and pharmaceuticals, chemical and petroleum products, pulp (soft tooth tissue, meat, meat) and paper;

• Transport, including road, aerospace and railway transport;

• Utilities, including water and wastewater, oil and gas, electricity and telecommunications;

• Defense;

• Technical activities including security, environmental control, energy management, security and other building automation, etc.

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It is expedient to organize a personal automated parking lot not as an important element of infrastructure in our country, but to give a high status to the trade, entertainment and business centers being built. They are usually free.

The situation is changing as a result of the significant increase in the number of personal vehicles. Lack of parking space and ensuring the safety of vehicles is becoming an acute problem.

The paid parking infrastructure has evolved from a fenced perimeter, where the parking operator is tasked with all the basic functions of managing, deploying and collecting vehicles, to multi-level automated parking where all the work is done by specialized technical devices [10, 11, 12, 13, 14, 15, 16, 17].

Single-story high-rise parking is the simplest type, where parking automation is minimal. It was they who became the first option of modern paid parking lots.

In order to organize parking systems in such parking lots, it was necessary to purchase and install a gate or barrier at the entrance, and to designate parking spaces for cars. Access control, security, and fee collection were handled by a supervisor (operator).

The next step was the emergence of paid parking lots, parking counters, where the parking system was to count the time spent in the area and pay through fees.

In the conditions of urban construction, non-multi-storey parking lots began to occupy a significant area, so they were replaced by multi-level complexes - underground, surface or mixed. The organization of such spaces provided additional requirements for hardware and software systems and led to the widespread use of automatic parking systems [18, 19, 20, 21, 22, 23, 24, 25].

The primary automation of parking complexes is carried out with the participation of the operator involved in the entry and exit process, as well as in the payment process.

Such systems belong to partially automated systems.

Parking lot automation has allowed significant savings in entry/exit, space search, and parking payment time [26, 27, 28, 29, 30, 31, 32, 33].

Fully automated parking lots and garages

They started using them to ensure faster entry/exit of more vehicles, avoid traffic jams and other inconveniences, as well as improve ease of use of parking spaces. Automation includes automatic parking systems, full control, traffic management and payment for the use of parking spaces [34, 35, 36, 37, 38].

Bunday komplekslar qo'llaniladigan hududlarda haydovchi kirishda unikal identifikatorni oladi. Amalga oshirishning eng keng tarqalgan versiyasi - barcha kerakli mashinalar ma'lumotlarini (joriy sana, kirish vaqti, tarif rejalari) o'z ichiga olgan shtrix-kodli qog‘oz chipta [39, 40, 41, 42].

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For multi-user indoor parking lots, a clear and strictly structured traffic pattern within the parking area is required. At the moment, in order to organize such parking systems, it is necessary to purchase additional parking equipment (information boards, speed limiters, bollards) that ensure more comfortable and safer parking.

For these purposes, almost all systems that provide security, control and regulatory functions are used. Thus, automatic parking systems in modern parking lots not only provide vehicle registration and control, but also solve safety and traffic control problems [43, 44, 45].

It is beneficial for parking lot owners to implement automated systems with barcode tickets. They allow the owner to protect himself from the abuse of his authority by the parking lot operators. When the truck was parked at one of the city's facilities for several days, the driver found out how much he owed during this time and asked the guard to "manually" release it for a certain fee. In this way, the owner of the parking lot lost a significant amount of money. If parking lots were automated, this would not happen. In addition to net profit, such systems allow you to monitor all transactions that take place in them and get a full report on them. In addition, such information is also accessible through the Internet.

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