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ARCHITECTURE OF THE CONTROL SYSTEM FOR MOBILE ROBOTIC PLATFORMS USING BLOCKCHAIN TECHNOLOGIES

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The modern development of technologies leads to the integration of innovative solutions that enhance efficiency and security across various sectors. Mobile robotic platforms (MRPs) and blockchain technologies are examples of such solutions that, when combined, can significantly change the approaches to control, monitoring, and automation of processes in industries, logistics, military operations, and other areas [1-5]. This article is dedicated to the development of an architecture for a control system for MRPs based on blockchain technologies, focusing on its structural components.

The goal of this work is to develop an architecture for a control system for MRPs based on blockchain technologies that ensures a high level of security, transparency, and decentralized control.

Main tasks: 1) analysis of system requirements; 2) selection of blockchain technology and network structure; 3) design of the system architecture.

1. Analysis of system requirements. The analysis of requirements is the basis for constructing an architecture that will ensure effective control of MRPs. To develop the aforementioned system, the following requirements must be considered: functional (decentralized control, continuous data exchange, modularity and extensibility), non-functional (security, performance, reliability, scalability) and constraints (resources, bandwidth of communication channels).

2. Selection of blockchain technology and network structure. Based on the requirements, the appropriate blockchain technology and network structure are chosen to ensure the reliability and performance of the system.

Type of blockchain. Considering the need for privacy and restricted access to the system, a private or consortium blockchain is most suitable.

Platforms for blockchain implementation. Hyperledger Fabric and Quorum are popular choices for creating private blockchain solutions that provide a high level of confidentiality, have a flexible permission structure, and can be configured to meet various needs. Ethereum (with a private network) is also an option, but its performance may be lower if the network expands.

Network structure. It is proposed to build a structure based on nodes, where each MRP acts as a separate node, along with central nodes that can serve as "beacons" for coordinating the overall operation of the network. To ensure reliable data exchange between MRPs, it is suggested to use a peer-to-peer (P2P) network that allows autonomous devices to exchange information directly.

3. Design of the system architecture. The design of the architecture is based on the principles of modularity, flexibility, and security. The proposed architecture includes key components that provide decentralized control of MRPs through blockchain technologies: a server part (acting as a coordinating node, providing access to the transaction history stored in the blockchain), a client part (MRPs equipped with a system for data exchange with other nodes, which ensures the processing of received instructions, task execution, and transmission of results through the blockchain) and a blockchain segment (the core component of the system responsible for data exchange between nodes in a distributed network and serving as a central database for storing information about all interactions of MRPs).

The combination of MRPs and blockchain technologies opens new opportunities for automation and optimization in industry, logistics, military operations and other areas. The use of blockchain can significantly enhance the security and efficiency of MRPs; however, the implementation of such solutions requires careful consideration of potential risks. Successful integration of MRPs and blockchain technologies will lead to significant changes in resource control across various industries.

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