ARCHITECTURE AND MODEL OF MOBILE ROBOTIC SYSTEM MOTION CONTROL

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The purpose of the paper is to formulate requirements, choose approaches and design principles, develop architecture and the motion control model for the mobile robotic system which takes into account the basic kinematic and dynamic characteristics of the system.

The main objectives of the paper are: the development of the architecture for the mobile robotic system, which is based on combining two types of architectures and the motion control model development for such mobile robotic system.

The object of the research is the process of the mobile robotic system motion control.

The subject of research is the architecture and the control model of the mobile robotic system.

The architecture and the model of the mobile robotic systems motion control are developed on the basis of the research. The new results are obtained, such as:

• The architecture of the mobile robotic system is developed based on an integrated approach, taking into account modern components and tools of the mobile robotic system, methods and algorithms for intelligent control and for data evaluation from sensors in terms of noise and incomplete information, methods and tools for computer-aided design of hardware and software for the mobile robotic system.

• The model for the motion control of a wheeled mobile robotic system is developed that takes into account the environment parameter and the parameter of the robotic system for determining the velocity of the wheels to prevent skidding.

The practical value of the results:

• The usage of the developed architecture for the mobile robotic system provides its adaptation to the requirements of specific applications;

• The usage of the developed model for the motion control enhances the control precision when the environment parameters or the parameters of the mobile robotic system are undergoing changes.

The main results are obtained by the authors independently and include the following: the basic requirements for the mobile robotic system and its individual components are formulated; the construction principles of the mobile robotic system that takes into account the basic requirements for the mobile robotic system are defined; the architecture of the mobile robotic system that consists of a kernel and hardware and software interchangeable modules is developed; the motion control model that takes into account the environment parameter and the parameter of the robotic system is proposed.

Conclusions:

1. The requirements for the mobile robotic system and its individual components are formulated. The main are: size and weight reduction; high mobility; reduction of energy consumption and the increase in the mobile robotic system autonomous movement; high reliability and real time motion control.

2. We propose to use the following construction principles for the remote objects research mobile robotic system: hierarchy, the systematic, variable composition of equipment, modularity, openness, compatibility, coordination of data acquisition intensity with computing power of tools and the ability to use the basic set of design decisions.

3. The architecture of the remote objects research mobile robotic system is variable in composition, consisting of core and variable hardware and software modules that provide the adaptation to the requirements of specific applications.

4. The motion control model is developed to prevent the drift and to improve the accuracy of the mobile robotic system control, based on consideration basic parameters of the mobile robotic system and parameters of the environment.

Keywords – mobile robotic system, model of motion control system, vision systems, ultrasonic distance sensors.