METHODS OF MOBILE TRAFFIC MANAGEMENT

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In order to be competitive, robotic systems must have the following properties: relative ease of operation; ease of use; easy to set up; adaptability to change; safety in use; ergonomics of units and mechanisms; energy efficiency, ensuring autonomous energy supply; versatility.

The most important areas of robotics development are: development of intelligent robot control systems and the introduction of virtual reality in robot control.

There are a huge number of mobile robots for various purposes, which are used in almost all environments around us, be it water, air, earth or space. Despite the huge differences, all works have three main common features that must be relied upon in the construction:

1. All works have a certain set of mechanical properties (shape, size, materials used, etc.) necessary to perform the tasks.

2. All works have a certain set of electronic components. This aspect is used for motion (through motors), sensors (electrical signals are used to measure things such as heat, sound, position and state of energy) and control (works require a certain level of electrical energy supplied to motors and sensors, to activate and performing basic operations).

3. All works contain a certain level of computer program code. Programs are the main essence of the robot, because without programs it is impossible to operate a mobile robot. There are three different types of robotic programs: remote control, artificial intelligence and hybrid.

The mobile robot can be represented as a set of basic systems: navigation and control systems, transport and special technological system. The navigation and control systems of the mobile robot provide information about the environment and paving the way from the starting point to the goal, taking into account obstacles. Among the existing methods of local navigation we will allocate the following: use: histograms of a vector field [1], a potential field [2], the diagram of close distances [3]. In [4] - the method of tangential avoidance.

In fact, robot control is possible with the help of values of angular and linear velocities (ω, v), so it is enough to find such values at which the condition of the problem $\rho \to 0, a \to 0$ is considered. coordinates:

$$\dot{p} = -v\cos a, \dot{a} = -\omega + v\frac{\sin a}{p}\dot{\theta} = -v\frac{\sin a}{p} \quad (1) \quad \rho \to 0, a \to 0$$

The work proposes to use the apparatus of the Lyapunov function, which includes the distance to the target and the course angle:

$$V(a, p) = \frac{1}{2}p^2 + \frac{1}{2}a^2$$

Where the derivative of the function must be strictly negative:

$$V(a, p) = p\dot{p} + a\dot{a} < 0$$

Given the first equality, we obtain

$$\dot{V}(a, p) = -pu \cos a + a\left(-\omega + u\frac{\sin a}{p}\right)$$

Then, as a control effect from the Lyapunov function, we obtain the following values of velocities:

u = p cos a; ω = k ω a + u max u / p sin

To avoid obstacles, we introduce an amendment to the calculation of the exchange rate:

$a = \theta - \psi - K_p(d_{min} - d)$ при $(d_{min} - d) > 0$; $a = \theta - \psi$ при $d_{min} - d \leq 0$

where - the coefficient of the proportional component of the course angle, - the distance to the obstacle and the minimum possible distance to the obstacle, respectively.$K_p d, d_{min}$.

When solving the navigation problem, two main approaches are used: global and local. In the global approach, the absolute coordinates of the device are determined when traveling long distances. In this case, the trajectory is selected before the start of the movement on the basis of the received information;

In the local approach, determine the coordinates of the device relative to some (usually the starting point).

In this work the local approach is considered. Planning is set only for a small segment of the trajectory, at the end point of which the next trajectory is selected.

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