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МАТЕМАТИЧНЕ ТА ПРОГРАМНЕ ЗАБЕЗПЕЧЕННЯ КОМП'ЮТЕРНИХ СИСТЕМ КЕРУВАННЯ ТРАНСПОРТНИМ ЗАСОБОМ

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MATHEMATICS AND SOFTWARE OF VEHICLE STEERING COMPUTER SYSTEM

Public transportation is one of the best ways to reduce traffic on the city streets and therefore noise, harmful emissions and car accidents. The problem with public transport is to ensure that the passenger capacity, regularity and punctuality of public transport are adequate. One of the most efficient kind of public transportation is a tram, but it also has disadvantages, the biggest of which is the need for laying rails and their further maintenance.

As a solution to this problem, a system can be suggested to control the rotation of all wheels of the vehicle and, as a result, make the long, multi-section bus behave like a tram on a conventional hard surface such as asphalt. The purpose of this thesis is to describe the necessary mathematical software, and to develop software to manage such a system.

Existing options of vehicle control systems include motion along a guide line drawn on the surface of the movement line. [1] The purpose of the study is to try to realize the movement of the vehicle along the virtual line drawn by the driver steering the first axle.

In order to accomplish this task, it is necessary to obtain and process data aimed to determine the current relative location of each section from other sections of the vehicle. Knowing the geometric parameters of each section, and the angles at which each section is relative to adjacent, it is possible to calculate the relative coordinates of each axis. When the vehicle starts to move, then taking into the consideration the speed and direction of movement the new first axis coordinate will be calculated. The task of each subsequent axis is to get in the coordinate of the previous axis. Considering that the movement occurs at a variable speed, it is necessary to measure the new coordinates after constant intervals of time. The speed of traffic within the city does not exceed 50 km/h, which is approximately equal to 14 m/s. [2] For a more or less accurate trajectory, it is necessary to have a distance no more than half a meter between the coordinates, which approximately corresponds to the radius of the wheel. For this accuracy, it is necessary to make 28 measurements per second. For comfortable operation, select the refresh rate of 50 Hz.

To calculate the angle of rotation of the wheels, a formula can be created that would determine the angle of change of motion relative to the current motion vector of the section. This task can also be delegated to machine learning, which in the future will be better able to respond to random events, as well as possible errors and quickly process and solve them. The artificial neural network will have input from the sensors of rotation on each axis of the section, from the same sensor at the points of connection of sections, as well as data about the speed of traffic. The output will include information about the required angle of rotation of the wheels on each axle. The number of input and output neurons must be scaled relatively to the number of vehicle axes.

Література

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