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Research Article

ADAPTATION OF SITUATIONAL MANAGEMENT PRINCIPLES FOR USE IN AUTOMATED DISPATCHING PROCESSES IN PUBLIC TRANSPORT

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ABSTRACT

The article presents a schematic algorithm that shows the sequence of the dispatcher's work on the analysis of the automated dispatching management of the city public transport, the process of studying the contents of the movement, as well as the elimination of any inconvenience (increased waiting time for passengers, the implementation of an inefficient movement procedure, Traffic Safety).

KEYWORDS

ADMS, algorithm, dispatch action groups, monitoring, operation, passenger, traffic.

INTRODUCTION

Analyze the main features of technological operations and evaluate the possibility of using a situational approach to increase the level of automation. The dispatching behaviour in a

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dispatching system is usually complex, including negotiations and technological operations. To improve the technological processes of urban passenger transport operational dispatching management, these operations can be integrated into a single complex for the situation that occurs in each operational environment. This automated dispatch management system requires a science-based approach to situation management tailored to the dispatcher. The operating mode of the automated dispatching system is a regular mode of operation, which consists of controlling the process of routing passengers on a pre-established and announced schedule of urban passenger transport. However, relatively minor disturbances of the transport process are offset by the regulatory impact of the control system. However, there are cases when it is not possible to carry passengers according to a pre-arranged schedule when operating transport in the conditions of high-density traffic flows. Let's look at the conditions under which the dispatch system can move to situation management.

MATERIALS AND METHODS

To improve the technological processes of automated dispatching management of urban passenger transport, the following basic rules have been formed, which substantiate the possibility of using situational management methods.

1) There is no universal approach to dispatch management. Different problem situations during transportation require different approaches to solving them.
2) Situational probability factors should be taken into account in the technological processes of the automated control room to achieve effective decision-making in the management of urban public transport complex.
3) There are many ways to achieve the goal of increasing the efficiency of ADMS operating in high-density traffic flows.
4) The results of the same control effect of the dispatcher as part of the operating control room may differ from each other depending on the current traffic situation on the route network.
5) Any management problem related to possible failures and interruptions in the performance of transport operations may be close to any other problems.

   When deciding on any direction of urban public transport or passenger transport, the impact of this decision on other control objects of the automated dispatching system should be considered.
6) The implementation of the ADMS control effect on the dispatcher should be based on the situation in which they were received.
7) The operating control room should be based on the most repetitive operations, primarily due to the high degree of automation of the main functions of the dispatcher, which allows the system dispatcher to correctly identify and assess the traffic situation and the most effective management allows you to select methods.

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Thus, in order to adapt the situational approach to the operational problems of the public transport dispatch department, it is necessary to solve the following main tasks:

a) Create a model to represent multiple situational factors and situations in the form of ADMS situation variables (situation model);
b) Creation of a model of the functional ratio of situational variables of the transport process and internal features of ADMS (communication model);
c) Ensuring automated decision-making and implementation of management impacts on the transport process as part of SME activities based on the above models.

Within the framework of the formation of a model of the functional ratio of the situational variables of the transport process and the internal characteristics of the ADMS, the main reasons for the need to shift the management system to situational management are:

- Sudden and unexpected deterioration of transport conditions, which makes it impossible to transport in a certain mode;
- Blocking off a part of the route network due to road traffic accidents, and emergencies.

Automated decision-making and implementation of management impacts on the transport process as part of public transport activities should be carried out within the framework of the formal formation of a complex facility management task. S_i - complete i status of the control object, disabling the current situation (Q_j), which provides a set of information about the control object, as well as information about the status of the control system. Then, the initial action of the U_k control effect is presented as follows:

$$S_i;\ Q_j \underset{U_k}{\Rightarrow} Q_1 \qquad (1)$$

Transformation (1) means: if the object has the current Q_j state and the complete state S_i; U_k allows a management effect, it is applied and a new Q_j current status appears. Due to a large number of possible effects, many possible cases are divided into n classes, each of which corresponds to one of the possible control effects. If the same situation falls on more than one class, this means that multiple control effects can be selected. Such conversion was called a logical-transformational rule. Here is a clear example of the interpretation of the formed logical-transformational rules of the dispatching system. A complete list of logic and transformational rules defines the ability of a control system to influence the processes it controls. The software complex of the dispatcher must be technologically capable of using all the necessary data in an automated or automatic mode during operation. In particular, in the event of any external and internal disturbances, it is necessary to ensure the same or close computational range of the movement moving with the movement composition on the route. The implementation of this technology should, in fact, take into account the procedure for creating real-time action plans that adequately respond to events occurring along the route. In case of complicated road conditions, the

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dispatcher's motion algorithms should be developed. Thus, the effective use of situational management methods in the technological processes of automated dispatch control of public transport, mainly the analysis of information in the form of diagnostic signs of the situation, the movement of vehicles on routes and the elimination of irregularities in the process of their elimination. Based on the distribution of priorities between rt, depends on the efficiency of detection of the dispatcher. A typical scheme for selecting a control effect is shown in Figure 1. The control system generates information about the full current S1 status that is included in the input of the "analyzer". The task of the "analyzer" is to assess the current situation and determine the need to intervene in the process occurring at the facility.

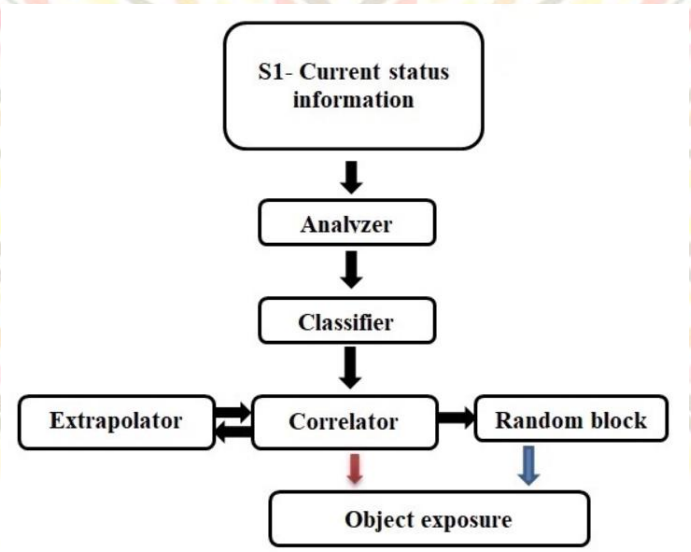

Fig. 1. A typical scheme for selecting a control effect

If a particular situation occurs, the data is entered into a "classifier," which refers to one or more classes of the situation that are eligible for a single-stage control effect. This information is transmitted to a "correlator" that stores all logical and transformational rules. A "correlator" defines a logic-transform rule (LTR) that can be used in this situation. If the "correlator" is only looking for a logical and conversion rule, it is given to the object as a control effect. If the "correlator" is looking for multiple LTR, they are sent to an "extrapolator" whose task is to evaluate the alternatives of the control effect and select the best option for the "correlator". In addition, the "correlator" transfers this control to the object to perform the effect. If according to the "extrapolator", there are possible solutions equal to several effects, then the correlator transfers these decisions to a random selection block, which is the number of controls transmitted to the control object for execution. Makes the final choice of the secret.

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CONCLUSION

1. Based on the analysis, the main factors and causes of situations arising in the process of urban passenger transport were identified. The role of the dispatcher in the traffic regulation process has been identified. The source of the high labour intensity of the control room is a large part of the manual operations in the analysis of the situation.
2. The analysis and systematization of technological operations of the control room were carried out depending on the nature of the impacts.
   To increase the level of automation of technological operations for each specific operation of the regulation of the transport process, diagnostic signs indicating the occurrence of the situation in an automated mode should be created and applied. It has been shown that with a clear consistency of this feature and situation, it is possible to fully automate the management effect or to ensure a sequence of actions to implement it.
3. The main features of the use of information technology in the development of technological operations of dispatching management of automated navigation systems for public transport management were analyzed. Increasing the automation and efficiency of the information retrieval process and the inclusion of relevant information in the system database will significantly increase the efficiency of dispatching operations.
4. Analysis and adaptation of the principles of situational management in order to use them in improving the technological processes of automated dispatching of urban passenger transport.

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