ADAPTIVE CONTROL OF SUPPLIES AND ADVERTISING

Reshetnikova G.N., Kotcubinskiy V.P.

National Research Tomsk State University

Tomsk, Russia

Khabibulina N.Yu.

Tomsk State University of Control Systems and Radioelectronics

Tomsk, Russia

hnu@kcup.tusur.ru

Abstract — The problem of supply control and advertising costs is considered in the article. A function was introduced that describes the impact of advertising on the consumer. A mathematical model was constructed in the form of a system of linear stochastic differential equations. Determination of the volume of advertising rates and costs was carried out by the system of adaptive control in the case of tracking the planned income. Restrictions are imposed for the volume of supplies and advertising expenses.

Key words — mathematical model, adaptive control, supplies, advertising, advertising influence function.

Our time is characterized as the era of the digital economy. At the same time, it becomes clear that the digital economy is the basis for managing business, the social sphere, the market of goods and services, etc. Thus, the digital economy is the control of economic processes using digital technologies.

One of the main logistic tasks is control of supplies in the market of goods and services. An entrepreneur uses advertising in order to obtain the planned income, advertising makes it possible to increase consumer interest in the product, and, consequently, the pace of sales. It should be taken into account that advertising should appear at the right time, i.e. under some certain conditions. In addition, it is necessary to take into account the change of influence of advertising on the consumer over some time and the delay of advertising occurrence in accordance to the moment of its payment.

The tasks of supplies control and advertisement control were considered in [1-3], but these works did not take into account the fact that advertising begins to act not from the moment of payment, but from the moment of its occurrence, gradually reducing its impact. We propose a function that describes the influence of advertising, which depends linearly on advertising expenses, takes into account the delay of advertising occurrence after payment, and the varying intensity of the advertising effect on a consume in this paper. In this case, it becomes possible to identify the negative impact of advertising when evaluating the parameters of the model.

In this paper, we consider the problem of combined synthesis of digital adaptive supply control and advertising expenses. A mathematical model is constructed, when the cost of advertising is paid from the entrepreneur's income. A function is proposed that is linearly dependent on the cost of advertising, which describes the impact of advertising on the consumer and takes into account the time of payment, the occurrence and duration of the advertising. Restrictions are imposed for the volume of supplies and advertising costs. The results of numerical modeling illustrate the operability and quality of the proposed algorithms.

The system of restrictions for advertising costs can be used to make decisions about the use of advertising of a particular type.