TRUDY INSTITUTA MATEMATIKI I MEKHANIKI UrO RAN

Vol. 26 No. 1 **2020**

MSC: 00A05

DOI: 10.21538/0134-4889-2020-26-1-27-38

A TRAJECTORY MINIMIZING THE EXPOSURE OF A MOVING OBJECt

V. I. Berdyshev, V. B. Kostousov

A corridor Y for the motion of an object is given in the space $X = \mathbb{R}^N$ $(N = 2, 3)$. A finite number of emitters s_i with fixed convex radiation cones $K(s_i)$ are located outside the corridor. The intensity of radiation $F(y)$, $y > 0$, satisfies the condition $F(y) \geq \lambda F(\lambda y)$ for $y > 0$, $\lambda > 1$. It is required to find a trajectory minimizing the value

$$J(\mathcal{T}) = \sum_i \int_0^1 F\big(\|s_i - t(\tau)\|\big)\, d\tau$$

in the class of uniform motion trajectories $\mathcal{T} = \big\{t(\tau)\colon 0 \leq \tau \leq 1,\ t(0) = t_*,\ t(1) = t^*\big\} \subset Y$, $t_*,\ t^* \in \partial Y$, $t_* \neq t^*$. We propose methods for the approximate construction of optimal trajectories in the case when the multiplicity of covering the corridor Y with the cones $K(s_i)$ is at most 2.

Keywords: navigation, optimal trajectory, irradiation, moving object.

REFERENCES

1. Liu W. Path planning methods in an environment with obstacles (A review). *Matematika i Mat. Modelirovanie*, 2018, no. 1, pp. 15–58 (in Russian). doi: 10.24108/mathm.0118.0000098 .
2. Arutyunov A.V., Magaril–Il'yaev G.G., Tikhomirov V.M. *Princip maximuma Pontryagina. Dokazatel'stvo i prilozheniya* [The Pontryagin maximum principle. Proof and applications]. Moscow: Faktorial Press Publ., 2006, 144 p. ISBN: 5886880828 . (in Russian).
3. Korobkin V.V., Sesekin A.N., Tashlyikov O.L., Chentsov A.G. *Metody marshrutizacii i ih prilozheniya v zadachah povyisheniya bezopasnosti i effektivnosty atomnykh stancii* [Methods of routing and their appendix in problems of increase of efficiency and safety of operation of nuclear power plants]. Moscow: Novyie Tekhnologii Publ., 2012, 234 p. (in Russian).
4. Chentsov A.G., Grigoryev A.M., Chentsov A.A. Optimization "In windows" for routing problems with constraints. *Mathematical Optimization Theory and Operations Research — 18th International Conference* / eds. I. Bykadorov, V. Strusevich, T. Tchemisova (MOTOR 2019): Revised Selected Papers, Communications in Computer and Information Science; vol. 1090 CCIS, N Y, Berlin: Springer Verlag, 2019. P. 470–485. doi: 10.1007/978-3-030-33394-2_36 .

Received December 25, 2019
Revised January 23, 2020
Accepted January 27, 2020

Vitalii Ivanovich Berdyshev, RAS Academician, Krasovskii Institute of Mathematics and Mechanics Ural Branch of the Russian Academy of Sciences, Yekaterinburg, 620108 Russia,
e-mail: bvi@imm.uran.ru .

Viktor Borisovich Kostousov, Cand. Sci. (Phys.-Math.), Krasovskii Institute of Mathematics and Mechanics Ural Branch of the Russian Academy of Sciences, Yekaterinburg 620108 Russia,
e-mail: vkost@imm.uran.ru .

Cite this article as: V. I. Berdyshev, V. B. Kostousov. A trajectory minimizing the exposure of a moving objects, *Trudy Instituta Matematiki i Mekhaniki URO RAN*, 2020, vol. 26, no. 1, pp. 27–38 .