TRUDY INSTITUTA MATEMATIKI I MEKHANIKI UrO RAN

Vol. 24 No. 2 **2018**

MSC: 00A05

DOI: 10.21538/0134-4889-2018-24-2-40-45

CHARACTERIZATION OF OPTIMAL TRAJECTORIES IN $\mathbb{R}^3$

V. I. Berdyshev

We characterize the set of all trajectories $\mathcal{T}$ of an object t moving in a given corridor Y that are furthest away from a family $\mathbb{S} = \{S\}$ of fixed unfriendly observers. Each observer is equipped with a convex open scanning cone $K(S)$ with vertex S. There are constraints on the multiplicity of covering the corridor Y by the cones K and on the "thickness" of the cones. In addition, pairs S, S' for which $[S, S'] \subset (K(S) \cap K(S'))$ are not allowed. The original problem $\max_{\mathcal{T}} \min\{d(t, S) : \ t \in \mathcal{T},\ S \in \mathbb{S}\}$, where $d(t, S) = \|t - S\|$ for $t \in K(S)$ and $d(t, S) = +\infty$ for $t \notin K(S)$, is reduced to the problem of finding an optimal route in a directed graph whose vertices are closed disjoint subsets (boxes) from $Y \setminus \bigcup_S K(S)$. Neighboring (adjacent) boxes are separated by some cone $K(S)$. An edge is a part $\mathcal{T}(S)$ of a trajectory $\mathcal{T}$ that connects neighboring boxes and optimally intersects the cone $K(S)$. The weight of an edge is the deviation of S from $\mathcal{T}(S)$. A route is optimal if it maximizes the minimum weight.

Keywords: navigation, tracking problem, moving object, observer.

REFERENCES

1. Berdyshev V.I. Observers and a moving object in $\mathbb{R}^3$. *Dokl. Math.*, 2017, Vol. 96, no. 2, pp. 538–540. doi: 10.1134/S1064562417050246 .
2. Berdyshev V.I. The most concealed $\mathbb{R}^3$-trajectory. *Proc. of the 48th International Youth School-Conf. "Modern Problems in Mathematics and its Applications"*, Ekaterinburg, 2017, vol. 1894, pp. 123–128 (in Russian). At available: http://ceur-ws.org/Vol-1894/vis2.pdf .

The paper was received by the Editorial Office on April 17, 2018.

Vitalii Ivanovich Berdyshev, RAS Academician, Krasovskii Institute of Mathematics and Mechanics, Ural Branch of the Russian Academy of Sciences, Yekaterinburg, 620990 Russia,
e-mail: bvi@imm.uran.ru .

Cite this article as:
V. I. Berdyshev. Characterization of optimal trajectories in $\mathbb{R}^3$, *Trudy Inst. Mat. Mekh. UrO RAN*, 2018, vol. 24, no. 2, pp. 40–45 .