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# The conformal vector fields on conic Kropina manifolds via navigation data

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**Abstract**

In this paper, we study the Kropina metrics as singular solutions of the Zermelo's navigation problem with the navigation data $(h, W)$. We characterize the conformal vector fields on Kropina manifolds via navigation data. Further, we completely determine conformal vector fields on Kropina manifolds of weakly isotropic flag curvature in dimension greater than two.

**Keywords:** Kropina metric, conformal vector field, flag curvature, navigation data, sectional curvature.

## 1 Introduction

Randers metrics were first introduced by physicist G. Randers in 1941 from the standpoint of general relativity, which can be expressed in the following form:

$$F = \alpha + \beta,$$

where $\alpha = \sqrt{a_{ij}(x)y^i y^j}$ is a Riemannian metric and $\beta = b_i(x)y^i$ is a 1-form on a manifold $M$ with $\|\beta_x\|_\alpha < 1$. There is another special and important class of Finsler metrics in Finsler geometry which can be expressed in the form $F = \frac{\alpha^2}{\beta}$, which we call the *Kropina metrics*. Kropina metrics were first introduced by L. Berwald when he studied the two-dimensional Finsler spaces with rectilinear extremal and were investigated by V. K. Kropina (see [1][7][8]). Later, M. Matsumoto defined the C-reducible Finsler metrics by Cartan torsion on manifolds of dimension $n \geq 3$. In 1978, M. Matsumoto and S.-i. Hōjō proved that any C-reducible Finsler metric is just a Randers metric or a Kropina metric ([10]). However, Randers metrics are regular Finsler metrics but Kropina metrics are Finsler metrics with singularity. Hence, Kropina metrics are not classical Finsler

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