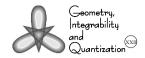
Twenty Second International Conference on Geometry, Integrability and Quantization June 8–13, 2020, Varna, Bulgaria Ivaïlo M. Mladenov, Vladimir Pulov and Akira Yoshioka, Editors **Avangard Prima**, Sofia 2021, pp 136–141 doi: 10.7546/giq-22-2021-136-141



EXTREMALS AND ISOPERIMETRIC EXTREMALS OF THE ROTATIONS IN THE PLANE

JAN KŘÍŽEK†, JOSEF MIKEІ, PATRIK PEŠKA† and LENKA RÝPAROVÁ‡

[†]Department of Algebra and Geometry, Faculty of Science, Palacky University in Olomouc, 779 00 Olomouc, Czech Republic

[‡]Institute of Mathematics and Descriptive Geometry, Faculty of Civil Engineering, Brno University of Technology, 602 00 Brno, Czech Republic

Abstract. In the paper we study the extremals and isoperimetric extremals of the rotations in the plane. We found that extremals of the rotations in the plane are arbitrary curves. By studying the Euler-Poisson equations for extended variational problems, we found that the isoperimetric extremals of the rotations in the Euclidian plane are straight lines.

MSC: 49Q20, 53A04 *Keywords*: Extremals of a rotation, isoperimetric extremals of a rotation, Euclidian plane

1. Introduction

It is known that the first variational problem appears in Newton (minimal resistance problem in hydrodynamics) followed by the problem solving the mechanical task of the brachistochrone curve. It was firstly solved by Bernoulli in 1698. He also formulated and solved the second variational problem solving the geometrical task of finding the shortest path between two points on the surface, i.e., geodesics. These results published Euler in 1833 and he also developed the general theory of variational calculus. The great contribution to general theory brought Lagrange, Poisson, and Ostrogradski.

In the 19th century, Poincaré studied astronomical three-body gravitation problem leading to the finding of curves, for which geodesic and Gaussian curvature are proportional, see Blaschke [1, p. 229].