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LIE TRANSFORMATION GROUPS AND GEOMETRY

ANDREAS ARVANITOYEORGOS

Department of Mathematics, University of Patras
GR-26500 Rion, Greece

Abstract. We present geometrical aspects of Lie groups and reductive homogeneous spaces, and some resent results on homogeneous geodesics and homogeneous Einstein metrics. The article is based on the four lectures given in Varna, June 2007.

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1. Introduction

The present article summarizes most of the four lectures that I have presented during the Varna Conference on Geometry, Integrability and Quantization, June 2007. They are based on my book *An Introduction to Lie groups and the Geometry of Homogeneous Spaces* [4], with additional recent results on homogeneous geodesics and homogeneous Einstein metrics.

The theory of Lie groups (i.e., a manifold with a group structure) is one of the classical well established areas of mathematics. It made its appearance at the end of the nineteenth century in the works of S. Lie, whose aim was to apply algebraic methods to differential equations and geometry. During the past one hundred years the concepts and methods of the theory of Lie groups entered into many areas of mathematics and theoretical physics.