

## ON THE GEOMETRY OF THE SET OF ORBITS OF KILLING VECTOR FIELDS ON EUCLIDEAN SPACE

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**Abstract.** Smooth orbifolds can be considered as a natural generalization of smooth manifolds, when model space is not  $\mathbb{R}^n$ , but factor space  $\mathbb{R}^n/G$  by a finite group  $G$  of diffeomorphisms. In modern theoretical physics, orbifolds are used as string propagation spaces and are motivated by the preference for models on orbifolds over models on ordinary manifolds. Orbifolds arise in the theory of foliations as “good” spaces of leaves. It is known that the existence of a proper leaf with a finite holonomy group for a transversally complete Riemannian foliation is a necessary and sufficient condition for the space of leaves to be an orbifold.

The purpose of our paper is study the structure of the space of leaves of singular foliation which generated by orbits of Killing vector fields. Geometry of Killing vector fields is a object of many investigations due to their importance in geometry and physics. We will prove that the space of orbits of family of Killing vector fields on Euclidean space is a smooth orbifold.

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### 1. Introduction

Orbifolds arise in the theory of foliations as space of leaves. As shown in [20], if a transversally complete Riemannian foliation has a proper leaf with a finite holonomy group, then the space leaves is an orbifold. It is known from [14] that this also holds if all leaves  $F$  are closed. It is also known that a compact foliation has an orbifold as the space of leaves if and only if it is locally stable [3], [19]. Now we give the concept of orbifold, which is a generalization of the concept of manifold.

**Definition 1.** An orbifold chart on a topological space  $X$  is a four-tuple  $(\tilde{U}, G, U, \varphi)$ , where  $U$  is open subset of  $X$ ,  $\tilde{U}$  is open in  $\mathbb{R}^n$  and  $G$  is finite group of homeomorphisms of  $\tilde{U}$ ,  $\varphi : \tilde{U} \rightarrow U$  is a map which can be factored as  $\varphi = \tilde{\pi} \cdot \pi$ , where  $\pi : \tilde{U} \rightarrow \tilde{U}/G$  is the orbit map and  $\tilde{\pi} : \tilde{U}/G \rightarrow U$  is a homeomorphism.