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Existence of extensions for generalized Lie groups

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Abstract

In this paper introducing the cohomology of generalized Lie groups, we characterize the extensions for generalized Lie groups by elements of the second cohomology group. Moreover we identify a cohomological obstruction to the existence of extensions in non-Abelian case.

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1 Introduction

The problem of extending a group in terms of cohomology can be found in [2]. This problem can be generalized to Lie groups and their generalizations. A special generalization of Lie groups is called generalized Lie groups or top spaces which was introduced by M. R. Molaei in 1998, [4]. In this generalized field, several authors (Araujo, Molaei, Mehrabi, Oloomi, Tahmoresi, Ebrahimi, etc.) have studied different aspects of generalized groups and top spaces [4], [3], [5].

Definition 1.1. [3] A top space T is a non-empty Hausdorff smooth d-dimensional differentiable manifold which is endowed with an operation "." called multiplication such that:

i. $(t_1.t_2).t_3 = t_1.(t_2.t_3)$, for all $t_1, t_2, t_3 \in T$.

ii. For each $t \in T$, there exists a unique $e(t)$ in T such that $t.e(t) = e(t).t = t$.

iii. For each $t \in T$, there exists $s \in T$ such that $t.s = s.t = e(t)$.

iv. $e(t_1.t_2) = e(t_1).e(t_2)$, for all $t_1, t_2 \in T$.

v. The mappings
$$. : T \times T \to T, (t_1, t_2) \mapsto t_1.t_2,$$
$$^{-1} : T \to T, t \mapsto t^{-1},$$

are smooth.

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