

## On Spinorial Representations of Orthogonal Groups

Kostake TELEMAN

October 13, 2003

**Abstract** - The aim of this article is to make explicit the fundamental spinorial representations of the complex orthogonal groups  $O(2n)$  and  $O(2n + 1)$  and to explain their links to Supersymmetry.

**Key words and phrases** : orthogonal group, spinorial representation, Supersymmetry

**Mathematics Subject Classification** (2000) : 53C27, 81T60, 22E70

### 1 Introduction

Linear representations of real and complex orthogonal groups are well known since the works of Élie Cartan and Hermann Weyl. The theory of these representations was used with success in many chapters of Mathematics and Physics.

In particular, the spinorial representations, discovered by É. Cartan at the beginning of the last century, have been intensively exploited in Differential Topology and Particle Physics. At the basis of spinorial representations, Clifford algebras play an essential role.

An extensive account of these developments is given in the book of Lawson and Michelson (see [2]).

Orthogonal groups and Clifford algebras are also met in Supersymmetry, a mathematical tool intensively used in modern Field Theories such as the famous Witten theory about Donaldson Invariants.

The group  $O(12)$  is related to the  $N = 3$  extended Supersymmetry. Note that Witten's theory is related to the  $N = 2$  and  $N = 3$  extended Supersymmetries.

In view of certain applications (see [4]), we will make explicit some of general results regarding the theories mentioned above.