

Deformations of the Embedding of the $SU(2)$ Monopole Solution in $SU(3)$

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Abstract. This paper is concerned with static Yang-Mills-Higgs fields, in the Prasad-Sommerfield limit of no Higgs self-interaction. One can obtain $SU(3)$ multipole solutions from $SU(2)$ solutions by embedding, in several different ways. In some of these cases, the embedding belongs to a family of $SU(3)$ solutions that are not all embeddings; in other words, some embeddings can be deformed into non-embeddings. The simplest case, an embedding of the $SU(2)$ spherically symmetric monopole, is studied with the aid of the twistor construction procedure. The family of axially symmetric $SU(3)$ solutions to which it belongs is described.

1. Introduction

In recent years, there has been much progress towards understanding static magnetic multipoles in Yang-Mills-Higgs theories [1–9]. Most of this work has dealt with the case where the gauge group is $SU(2)$, but the recently-developed techniques apply just as effectively to larger, more general gauge groups (although, of course, things become more complicated). In this paper, the twistor method is used to investigate the following rather curious phenomenon, which occurs in the case of larger gauge groups.

One can construct multipole solutions for (say) the gauge group $SU(3)$ by embedding $SU(2)$ solutions into $SU(3)$. The general $SU(2)$ solution, of charge n , depends on $4n-1$ parameters [7]. So the embedding will belong to an $SU(3)$ family of at least $4n-1$ parameters; but in some cases (and this depends on the details of the embedding), the embedded $SU(2)$ solutions belong to a family of *more* than $4n-1$ parameters. In other words, some embeddings can be continuously deformed into solutions that are no longer embeddings. More details of this will be described in Sect. 3, and the subsequent sections go on to investigate the simplest

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