Department of Theoretical Physics

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New multiplets in N=2 conformal supergravity.

Bindusar Sahoo
(IISER-TVM)

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Conformal supergravity plays an important role in the off-shell construction of the physical Poincare supergravity by employing a set of procedures, which are collectively referred to as “superconformal multiplet calculus”. An important ingredient in the whole procedure is the knowledge of various multiplets, which are basically irreducible representations of the underlying superconformal algebra. One of such multiplets is the Weyl multiplet, which contains the graviton and its superpartner, and various auxiliary fields necessary to complete the field representation. In five and six dimensions, it has been seen that there exists two different versions of Weyl multiplet in the minimal supergravity, which differs in the auxiliary field contents. The version that contains a scalar field of Weyl weight +1 is referred to as the dilaton Weyl multiplet and the other version is referred to as the standard Weyl multiplet. In four dimensional N=2 supergravity, so far only the standard version of the Weyl multiplet was known. This is the version that is related to the standard version in five and six dimensional minimal supergravity via dimensional reduction. However, the general arguments of dimensional reduction also suggest that the dilaton version of the Weyl multiplet should exist in four dimensional N=2 supergravity. We will explicitly show the construction of this multiplet in four dimensions along with its complete supersymmetry transformation laws.

If time permits, we will also discuss the construction of a different matter multiplet in four dimensional N=2 supergravity that has 24+24 components and contains a real scalar field, which we refer to as the “real scalar multiplet”. This was a byproduct of our attempt to construct the above-mentioned dilaton Weyl multiplet using a different approach. We found that our multiplet is actually a curved space generalization of the multiplet introduced by Howe et al in 1983 in their attempt to understand off-shell version of the hypermultiplet. We will also discuss the embedding of the 8+8 component N=2 tensor multiplet in the real scalar multiplet by appropriately constraining the real scalar multiplet. We will end with some future directions.