Notes on Quiver Gauge Theories

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Abstract

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1 | The supersymmetric sigma model

1.1 | Generalities

A supersymmetric non-linear sigma model is a theory of maps

$$\Phi : \Sigma^{(D,\mathcal{N})} \to \mathcal{T}$$

where $\Sigma^{(D|\mathcal{N})}$ is the superspace, i.e. a supermanifold[1] of dimension $D|\mathcal{N}$ and $\mathcal{T}$ the target space. They are scalar superfields. Let $z = (\xi, \theta)$ be coordinates on the superspace. If $\mathcal{T}$ is a super manifold of dimensions $n|\mathcal{N}$, we can write $\Phi = (\Phi^1, \dots, \Phi^n)$ and view Φ^i $(i = 1, \dots, n)$ as coordinates on $\mathcal{T}$. The action is given by

$$S[\Phi] = -\frac{1}{2} \int \mathrm{d}^D x \; D^2 (g_{ij}(\Phi) D^a \Phi^i D_a \Phi^j) \tag{1.1}$$

where g is a riemannian metric on $\mathcal{T}$, $\alpha = 1, \dots, D-1$, $D^2 \equiv D^\alpha D_\alpha = \eta^{\alpha\beta} D_\alpha D_\beta$ and

$$D^I_\alpha \equiv$$

with $I = 1, \dots, \mathcal{N}$.

1.2 | On ALE space

[1] Recall that a super vector space V is a $\mathbb{Z}_2$-graded vector space. It can always be decomposed in $V = V^0 \oplus V^1$, V^0 being its even part and V^1 its odd part. Denoting by $\mathbb{R}^{m|n}$ the super vector space with even part $\mathbb{R}^m$ and odd part $\mathbb{R}^n$, a super manifold of dimension $m|n$ is a manifold with base space $\mathbb{R}^{m|n}$.

A | Notations and conventions

References

[He04] Yang-Hui He. *Lectures on D-branes, Gauge Theories and Calabi-Yau Singularities.* 2004. arXiv: hep-th/0408142 [hep-th].

[CV20] Andrés Collinucci and Roberto Valandro. "A string theory realization of special unitary quivers in 3 dimensions". In: *Journal of High Energy Physics* 2020.11 (Nov. 2020). ISSN: 1029-8479. DOI: 10.1007/jhep11(2020)157.

[Lin12] Ulf Lindström. *Supersymmetric Sigma Model geometry.* 2012. arXiv: 1207.1241 [hep-th].