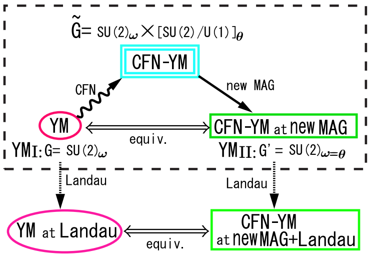
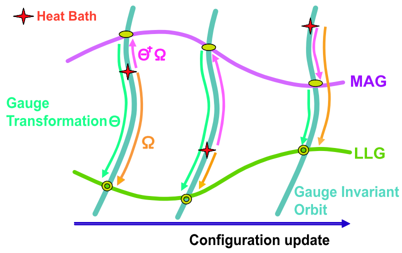
# Yang-Mills theory constructed from Cho-Faddeev-Niemi decomposition (II)[1]

Chiba University  Takeharu Murakami
E-mail: tomomo@graduate.chiba-u.jp

We have discussed the symmetry of the CFN–Yang-Mills theory.[2] The CFN-YM theory obtained by the CFN decomposition has the larger (local and global) gauge symmetry than the original Yang-Mills theory and becomes equivalent to the original Yang-Mills theory once the new MAG is imposed.




(Left)The relationship between the CFN-Yang–Mills theory and the original theory.

(Right)How to fix the enlarged gauge degrees of freedom in the numerical simulation.

We have chosen the new MAG condition so that the field such as "off-diagonal gluon $\mathbb{X}$" transforms as charged adjoint vector under the residual $SU(2)$ symmetry, where the field $\mathbb{X}$ is defined as a composite field of $\mathscr{A}$ and $n$ by CFN decomposition.

Now the CFN off-diagonal mass term $\mathbb{X} \cdot \mathbb{X}$ is $SU(2)$ gauge invariant and can emerge in the low energy effective theory. This does not contradict with the fact that the massless vector theory cannot have massive degrees of freedom because even the field $n$ is not independent degrees of freedom, once the new MAG condition is adopted.

Whether the situation occurs or not is a highly non-perturbative problem. We have done the lattice formulation of the CFN decomposition to examine the problem by numerical simulations.[4]

## References

[1] Y.M. Cho, Phys. Rev. D21 (1980) 1080,
L. Fadeev, A.J. Niemi, Phys. Lett. 82 (1999) 1624.

[2] K.-I. Kondo, T. Murakami and T. Shinohara, hep-th/0504107.

[3] K.-I. Kondo, T. Murakami and T. Shinohara, Eur. Phys. J. C 42, 475-481 (2005).

[4] S. Kato, K.-I. Kondo, T. Murakami, A. Shibata and T. Shinohara, hep-ph/0504054.
S. Kato, K.-I. Kondo, T. Murakami, A. Shibata, T. Shinohara and S. Ito, hep-lat/0509069.

[1]This talk is based on [2] in collaboration with K.-I. Kondo and T. Shinohara.
[2]T. Shinohara, "Yang-Mills theory constructed from Cho-Faddeev-Niemi decomposition (I)".