On the time evolution of dual orthogonal group-systems (DOGs)

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November 12, 2016

Abstract. *As it has been conjectured for a long time, dual orthogonal group-systems (DOGs) exhibit a non-static behaviour in the low temperature-limit. This article aims to explore the unitary transformations corresponding to the time-evolution of such systems in the limit of $\beta \to \infty$.*

1 Basic properties

A dual orthogonal group (DOG) can be understood as a collection of excitations of the fermionic quantum-fields, confined (and stabilized) by their couplings to a number of different gauge-fields, that are required by local gauge-symmetry[1].

Assuming the dual orthogonal system (DOG) can be described through the hermitian operator D and assuming that the system obeys the general rules of quantum mechanics (QM), it must hold that

$$i\hbar \frac{dD}{dt} = [H, D] \ , \tag{1}$$

where H is the Hamiltonian of the entire universe (of course, assuming the general validity of Riemann's hypothesis and the Scale-Symmetric theory

[1] In more mathematical terms, the set of dual orthogonal group-systems (DOGs) is a subset of the set of complex abelian nonorthogonal idempotent matrix algebraic Lie-group spaces (ANIMALs).arctime of

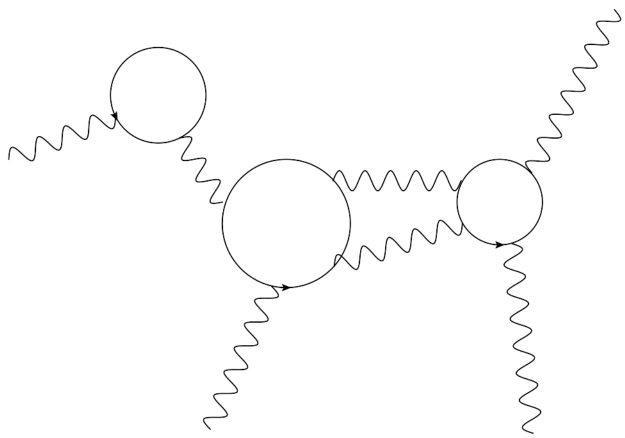

Figure 1: Perturbative approximation of a dual, orthogonal group (DOG) in 10th order.

(SST) [1]).
This expression can be expanded around $t = 0$ in the following manner

$$\begin{aligned} D(\Delta t) &= D(0) - i\frac{\Delta t}{\hbar}[H, D(0)] \ , \\ \Rightarrow D(2\Delta t) &= D(0) - 2i\frac{\Delta t}{\hbar}[H, D(0)] - \frac{\Delta t^2}{\hbar^2}[H, [H, D(0)]] \ , \end{aligned} \tag{2}$$

etc. One can already see, that the system is not static under the influence of time-evolution. This becomes even more apparent when looking at the finite-temperature, time-ordered correlation of the dual orthogonal group operator (DOGO)

$$\langle T(D(t)D(0))\rangle = \frac{1}{Z}\int \mathcal{D}[\phi]D(\phi(t))D(\phi(0))e^{-\int_0^\beta dtH[\phi(t)]} \ . \tag{3}$$

Clearly, to arrive at this expression we performed a wick-rotation to change from Minkowski- to Eucledian-Spacetime (therefore also the Hamiltonian, rather than the Lagrangian in the exponent).
Since this expression looks rather complicated, we assume that the correlator is non-trivial. If we take $\beta \to \infty$, we're probably going to project out the ground-state contribution.
Furthermore, it can be easily shown, that the total entropy must be conserved.

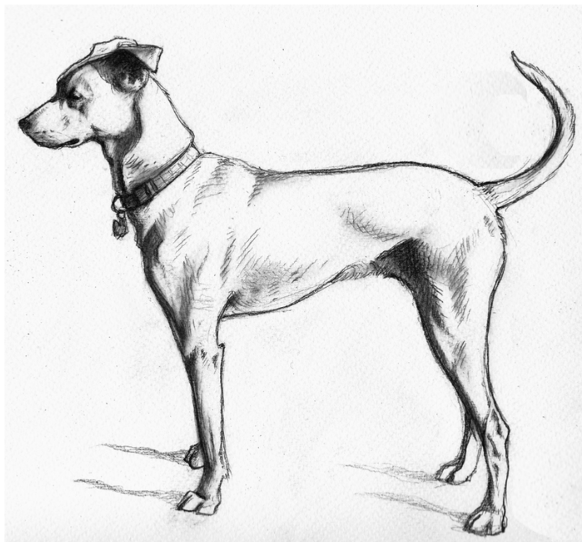

Figure 2: A schematic, non-perturbative representation of a dual orthogonal group (DOG), diagonal in position space. The overall structure can already be guessed from the perturbative approximation (as shown in Fig. 1).

2 Conclusion

In this article, we proved that dual orthogonal group-systems (DOGs) are clearly non-static and therefore might require the interaction with other dynamical systems.

Future research should focus on the interaction of dual orthogonal group-systems (DOGs) and their fermionic counterpart conformal abelian tachion-systems (CATs) in Anti de Sitter spaces (as well as the general implications from the AdS-CFT correspondence). The authors would like to thank Sylwester Kornowski for the inspiration to write this paper.

References

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[2] Claudia, *Pille, Kondom oder Spirale? So verhüten die meisten Mädels!*, 11.11.2016, http://www.bravo.de/pille-kondom-oder-spirale-so-verhueten-die-meisten-maedels-374720.html

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