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Infinite volume limits in Euclidean quantum field theory via stereographic projection

I shall present a general scaling limit construction of probability measures obeying the Glimm-Jaffe axioms of Euclidean quantum field theory in arbitrary space-time dimension in which the ultraviolet and the infrared (infinite volume) limits are obtained simultaneously. Given a sequence of mollifiers on the standard sphere and a sequence of functionals defined on smooth functions that satisfy simple integral bounds, one defines a sequence of measures on smooth functions on the sphere. These measures are then transferred to smooth functions on Euclidean space via a scaling limit procedure utilizing the stereographic projection and one shows that the transferred sequence contains a subsequence weakly convergent on distributions.

A particular example of the above construction is obtained by taking a uniformly bounded sequence of densities arising from an arbitrary real continuous function (representing a self-interaction of a scalar field) and an appropriate sequence of coupling constants. One expects that in many special cases the limit measures so obtained coincide with the free scalar field measure, however I shall also discuss the possibility of constructing non-uniformly bounded densities that have a better chance for producing non-Gaussian models.

This talk is largely based on my preprint "On scaling limits in Euclidean quantum field theory" available at arxiv.org/abs/1701.05569.