ZMP Seminar Proposal: Separation of Variables

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In this ZMP seminar, we would like to study the method of "Separation of Variables" (SoV) from the theory of integrable models, as well as its relations to neighboring topics in physics and mathematics. SoV is a universal tool to solve integrable systems, both classical and quantum, that was originally developed by Sklyanin in the 1980s. It is an active field of research in mathematical physics that interconnects a diverse range of topics, including classical Hamiltonian systems, quantum spin-chain models, AdS/CFT integrability, Hitchin moduli spaces, representation theory of quantum groups/algebras, and the geometric Langlands program. In the context of the AdS/CFT duality, it is believed that the SoV framework can lift the integrability of the spectrum to the dynamics of correlation functions.

The subject aligns very well with the focus of the new SFB, and we believe that it will be of special interest to many of the new postdocs and PhD students arriving this fall.

Our goal would be to study the overarching structures that constitute the subject, but also consider various specific example applications. An (incomplete) list of possible topics is:

- SoV in classical systems (action-angle variables, spectral curves)

- Quantum SoV for lattice models a la Sklyanin

- Relation to Hitchin moduli spaces and geometric Langlands

- Q-operators and representation theory

- Application to the AdS/CFT duality

- Relation to $\mathcal{N} = 2$, $d = 4$ supersymmetric QFT

References

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