Scattering amplitudes
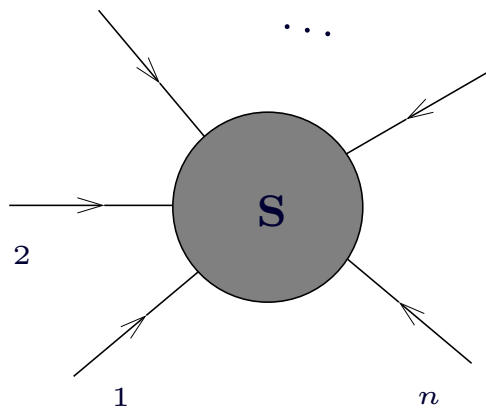
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Motivation

Why study scattering amplitudes?

✔ Basic objects in QFT.

✔ In planar $\mathcal{N} = 4$ they seem to have a remarkable structure.

✔ Duality to Wilson loops $\implies$ dual symmetries.

✔ New types of symmetries - quantum groups (Yangian) - even at loop level(!). How general is this?

✔ Symmetries $\implies$ solvability.

Future directions

✔ Solve the planar theory explicitly. Can we really explicitly understand an interacting 4d QFT?

✔ Higher order perturbative amplitudes.

✔ Combine anomalous symmetry, Wilson loop OPE, BFKL analysis in multi-Regge limits to fix amplitudes.

✔ Compare with strong coupling calculations - available from AdS/CFT.

✔ Analytic tools: theory of iterated integrals (symbols,...)

✔ Tools for calculating loop integrals.

✔ Correlation functions, OPE bootstrap...

✔ String amplitudes.

✔ Gravity amplitudes.