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New algorithms for computing spin foam amplitudes

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Computing spin foam amplitudes explicitly is still a challenging task, in particular for 2-complexes consisting of multiple vertices. In this talk I will present three algorithms that will help construct and compute amplitudes more efficiently.
The first algorithm allows us to easily construct 2-complexes and the associated amplitude. We define the number of spin foam vertices and choose along which edges they are glued. For each edge we can specify the wiring of the faces. Then, the algorithm determines how many faces there are and whether they are in the bulk or at the boundary. Once the boundary data are specified, it computes the amplitude.
The second and third algorithm aim at making the calculation of spin foam amplitudes more efficient. In one we write the calculation as a contraction of a tensor network with smaller, lower-valent tensors, while the other uses a Monte Carlo algorithm for coherent intertwiners. I will demonstrate how they work for the coherent vertex amplitude and how they can be generalized to larger triangulations.
So far, these algorithms are for SU(2) BF theory as a proof of principle. Since they are written in Julia, it should be straightforward to interface them e.g. with the package sl2cfoam-next to compute Lorentzian EPRL amplitudes.
The projects are partially in collaboration with Seth Asante, Kevin Siebert and José Diogo Simão.

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