1153-05-525 **Kyle A Miller*** (kmill@berkeley.edu). *Invariants of virtual spatial graphs based on topological graph polynomials.* Preliminary report.

The Yamada polynomial is an invariant of spatial graphs, which are ribbon graphs embedded in S^3, and it can be thought of as an extension of the second-colored Jones polynomial that handles vertices of arbitrary degree. The diagram of a spatial graph is a planar graph with special degree-4 vertices representing crossings, and generalizing to non-planar diagrams leads to *virtual spatial graphs*.

The Yamada polynomial for planar spatial graphs calculates an evaluation of the Tutte polynomial, and, like it, the Yamada polynomial has a diagrammatic contraction-deletion relation. One extension to virtual spatial graphs was considered by Fleming and Mellor, but by considering the Bollobàs–Riordan polynomial one can obtain other extensions. I will describe an algebraic method for computing the Bollobás–Riordan polynomial and show how to construct virtual spatial graph invariants from it. These invariants are capable of showing certain virtual spatial graphs are not classical, extending a result of Miyazawa. (Received September 03, 2019)