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The structure of quasi-transitive graphs avoiding a minor with applications to the Domino Conjecture

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An infinite graph is quasi-transitive if the action of its automorphism group on its vertex set has finitely many orbits. Roughly speaking, this means that the graph has a lot of symmetries. Starting with the work of Maschke (1896), a lot of work have been done on the structure of planar Cayley graphs, and more generally of planar quasi-transitive graphs. On the opposite, only few research has been done about the more general class of minor-excluded quasi-transitive graphs. In this talk, I will present a structure theorem for such graphs, which is reminiscent of the Robertson-Seymour Graph Minor Structure Theorem. The proof of our result is mainly based on a combination of the work of Thomassen (1992) together with an extensive study of Grohe (2016) on the properties of separations of order 3 in finite graphs. Our proof involves some technical notions from structural graph theory and I will spend some time to present some of the key concepts involved and especially how they must be adapted to take into account the symmetries of the studied graph. Eventually I will explain how such a result can be used to prove the so called *domino problem conjecture* for minor-excluded groups, extending previous results from Berger (1966) and Aubrun, Barbieri and Moutot (2019). I will also spend time to present other applications both at the group and at the graph level.