Bilinear Functions and Trees over the $(\max, +)$ Semiring

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Abstract. We consider the iterates of bilinear functions over the semiring $(\max, +)$. Equivalently, our object of study can be viewed as recognizable tree series over the semiring $(\max, +)$. In this semiring, a fundamental result associates the asymptotic behaviour of the iterates of a linear function with the maximal average weight of the circuits in a graph naturally associated with the function. Here we provide an analog for the 'iterates' of bilinear functions. We also give a triple recognizing the formal power series of the worst case behaviour.