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Anton Dochtermann* (dochtermann@txstate.edu), **Eli Meyers**, **Raghav Samavedam** and **Alex Yi**. *Cycle and circuit chip-firing on graphs.*

Motivated by the notion of chip-firing on the dual graph of a planar graph, we consider ‘cycle chip-firing’ on an arbitrary graph G . The firing rule is governed by $\mathcal{L}^*(G)$, the dual Laplacian of G determined by choosing a basis for the lattice of integral flows. We show that any graph admits such a basis so that $\mathcal{L}^*(G)$ is an M -matrix, leading to a firing rule on these basis elements that is avalanche finite. This follows from a more general result on bases of integral lattices that may be of independent interest. Our results provide a notion of ‘z-superstable’ cycle configurations that are in bijection with the set of spanning trees of G . We show that for planar graphs, as well as for the graphs K_5 and $K_{3,3}$, one can find such an M -basis whose elements correspond to circuits of the underlying graph. We consider the question for arbitrary graphs and address some other open questions. Much of this work was done as part of a Mathworks summer program at Texas State University. (Received August 03, 2020)