Problem Set 5

Due: In class on Wednesday, March 17. Starred problems are optional.

Problem 5-1. For a circuit $G = (V, E, d, w)$, define the ***size*** of G as

$$|G| = \sum_{e \in E} w(e) .$$

Show that the problem of determining a retiming $r : V \to \mathbb{Z}$ such that $|G_r|$ is minimized can be reduced to a linear-programming problem. What about minimizing $|G_r|$ such that $\Phi(G_r) \le c$ for a given $c > 0$?

Problem 5-2. Recall that a ***c-slow*** circuit has c equivalence classes of computation that do not interact. For example, systolic conversion typically produces 2-slow systolic circuits. Describe an efficient algorithm that, given a circuit $G = (V, E, w)$, determines whether G is a c-slow version of some other circuit $G' = (V, E, w')$ for some $c > 1$, that is, that there exists a retiming $r : V \to \mathbb{Z}$ such that $G_r = cG'$. Give an efficient algorithm to produce a G' with maximum c. Analyze your algorithms.