Average mixing of quantum walks.

Let $X$ be a graph with adjacency matrix $A$. The family of matrices $U(t) = \exp(itA)$ (for $t \geq 0$) determines what physicists call a quantum walk. For matrices $M$ and $N$, let $M \circ N$ denote the Schur product. Then

$$
\hat{M} := \lim_{T \to \infty} \int_0^T U(t) \circ U(-t) \, dt
$$

is the average mixing matrix of the walk. If $E_1, \ldots, E_m$ are the idempotents in the spectral decomposition of $A$, then

$$
\hat{M} = \sum_r E_r \circ E_r.
$$

and so $\hat{M}$ also has an algebraic definition. We can view it as a graphical invariant. In my talk I will discuss some of the properties of this matrix, and some of the related open questions. (Received September 12, 2016)