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1003-15-332 **Bao Qi Feng*** (`bfeng@tusc.kent.edu`), Department of Mathematical Sciences, Kent State University, Tuscarawas Campus, 330 University Drive, NE, New Philadelphia, OH 44663.
Hadamard Product and Tensor Product of Matrices. Preliminary report.

In 2000, Visick gave an explicit version of the relationship between the Hadamard and tensor product of two matrices. We will attempt to generalize Visick's identity to cover the products of finitely many matrices: Suppose $k \geq 2$. Let A_i $(1 \leq i \leq k)$ be $m \times n$ matrices. Then

$$\prod_{i=1}^{k} \circ A_i = P_{km}^t \left(\prod_{i=1}^{k} \otimes A_i \right) P_{kn},$$

where $O^{(n)}$ for the $n \times n$ matrix with all entries equal to 0; for each $1 \leq i,\ j \leq n$, $E_{ij}^{(n)}$ is the $n \times n$ matrix, which has a single 1 in the $(i, j)^{th}$ position and zeros elsewhere; an $n^k \times n$ matrix P_{kn} such that

$$P_{kn}^t = \left[E_{11}^{(n)} O^{(n)} \dots O^{(n)} E_{22}^{(n)} O^{(n)} \dots O^{(n)} \dots O^{(n)} \dots O^{(n)} E_{nn}^{(n)} \right],$$

where there are $\sum_{l=1}^{k-2} n^l$ zero matrices $O^{(n)}$ between each pair of $E_{ii}^{(n)}$ and $E_{i+1,i+1}^{(n)}$ $(1 \leq i \leq n-1)$; P^t is the transpose of P. Using this explicit version we will extend some known inequalities for the Hadamard products of two matrices to inequalities for the Hadamard products of finitely many matrices, which in general cannot be deduced simply from two matrices. (Received September 10, 2004)