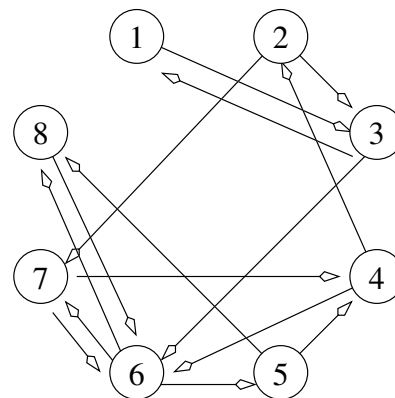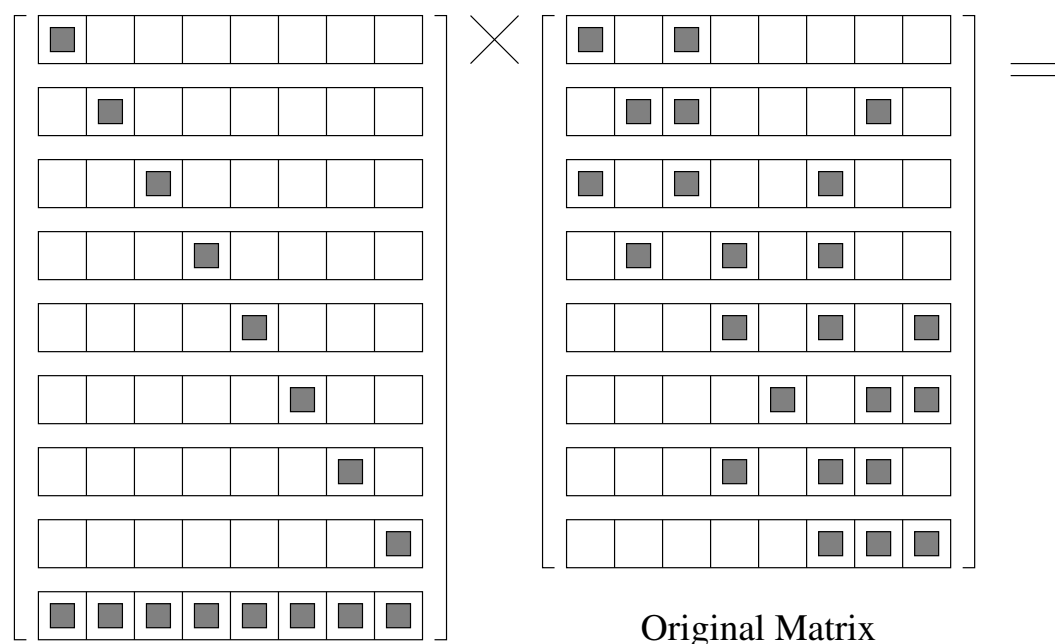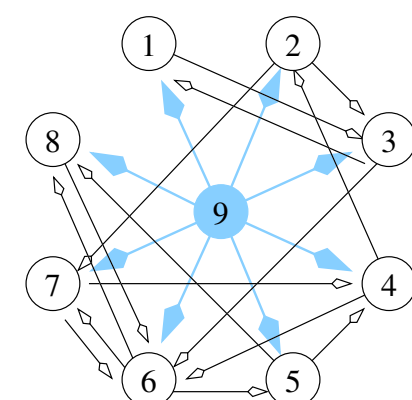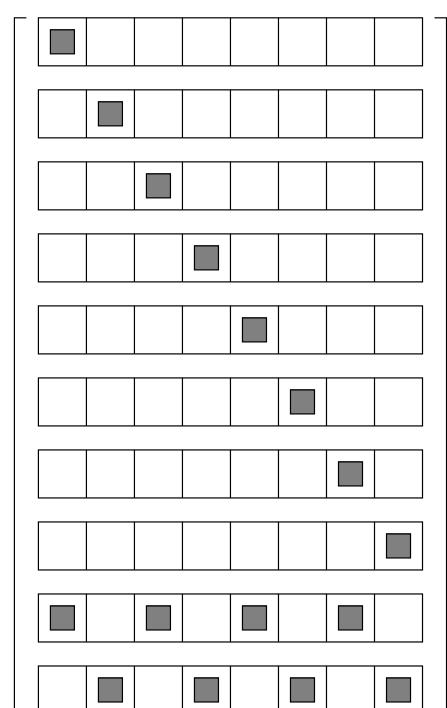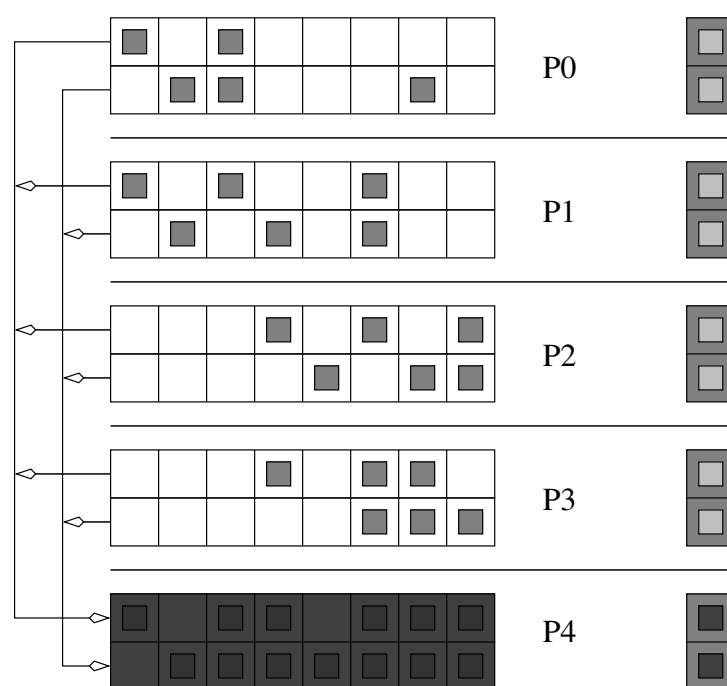(a) Original Matrix

(b) Graph of Original Matrix

(c) Augmentation Process: Multiplication by a distribution/ coding matrix.
Augmented matrix is tolerant to one node (row) failure.

Distribution (Coding) Matrix
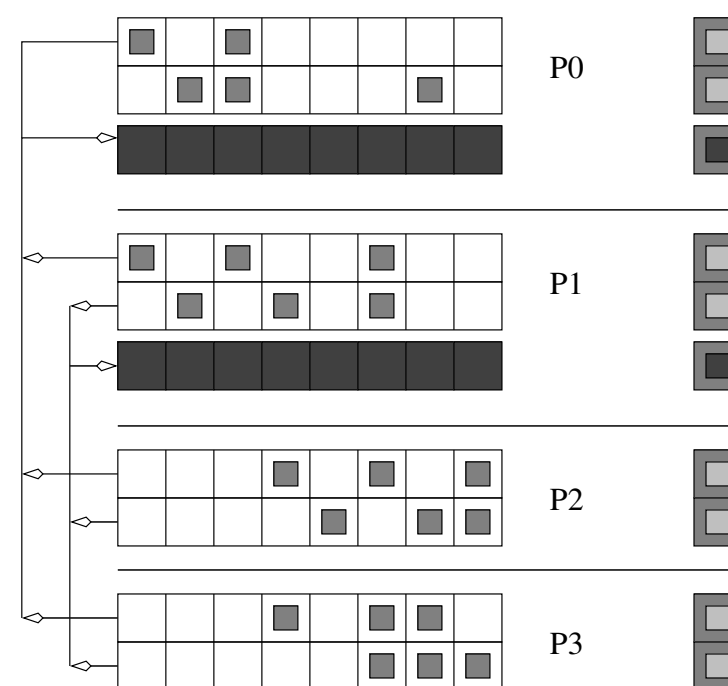
Original Matrix

Augmented Matrix

(d) Graph of augmented matrix

Distribution (Coding) Matrix

Controlling density of augmented blocks by combining blocks (first row at each processor is combined into first row of the augmented block). Note the reduced fill. Matvec is still tolerant to one process failure.

Augmentation block is now distributed across processors. This addresses problem of load imbalance. Note higher communication cost of this scheme. This can be amortized through coarse−grained processor partitions.

(e) An alternate distribution (coding) matrix that reduces density at the cost of increased augmentation for the same fault tolerance.