Assignment: self-stabilization

Write a self-stabilizing algorithm for finding a maximal independent set in an undirected connected graph. You should argue for its correctness (convergence) but you don't have to formally prove it.

Definitions

An undirected graph (V, E) is a set V of vertices and a set E of edges $\{a, b\} \in V \times V$ (assuming $a \neq b$). The graph is connected if there is a path of edges between all pairs of vertices. Two vertices, a and b, are said to be independent iff $\{a, b\} \notin E$, i.e. if there is no edge between a and b. A subset $S \subseteq V$ of vertices is independent if the elements are pairwise independent, and S is maximal if there is no $S' \supset S$ such that S' is independent. It follows that maximal independent sets are not unique; in fact, two maximal independent sets do not even have the same cardinality in general.

Assumptions

The following assumptions can be made without further motivation

- We assume a so-called central demon; a fair scheduler ensuring that not more than one process is executed at each instant;
- A process P_i may read the states of its neighbors $N(i)$ (and its own state) but may only modify its own state;
- We assume that reading the state of a neighbor and modifying the own state is an atomic action.

Further assumptions should be explained and argued for.