A benchmark for diagnosis

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This document describes a benchmark for diagnosis proposed for contributors to the special Benchmark Session at WODES'08 (http://www.wodes2008.org).

The benchmark describes a family of manufacturing systems characterized by three parameters: n, m and k.

- n is the number of production lines.
- m is the number of units of the final product that can be simultaneously produced. Each unit of product is composed of n parts.
- k is the number of operations that each part must undergo in each line.

To obtain one unit of final product n orders are sent, one to each line; this is represented by observable event t_s. Each line will produce a part (all parts are identical) and put it in its final buffer. An assembly station will take one part from each buffer (observable event t_e) to produce the final product.

The part in line i ($i = 1, \ldots, n$) undergoes a series of k operations, represented by unobservable events $\varepsilon_{i,1}, \varepsilon_{i,2}, \cdots, \varepsilon_{i,k}$.

After this series of operations two events are possible: either the part is regularly put in the final buffer of the line, or a fault may occur.

- Putting the part in the final buffer of line 1 corresponds to unobservable event $\varepsilon_{1,k+1}$, while putting the part in the final buffer of line i ($i = 2, \ldots, n$) corresponds to observable event $t_{i,k+1}$.
- There are $n-1$ faults, represented by unobservable events f_i ($i = 1, \ldots, n-1$). Fault f_i moves a part from line i to line $i+1$. Note that on line i ($i = 1, \ldots, n-1$) the fault may only occur when the part has finished processing and is ready to be put in its final buffer; the part goes to the same processing stage in line $i+1$.

A Petri net model of this system is shown in Figure 1, where thick transitions represent observable event and thin transitions represent unobservable events.

Design a diagnoser for different values of n, m and k, specifying the time required to design the diagnoser and the number of states it contains.

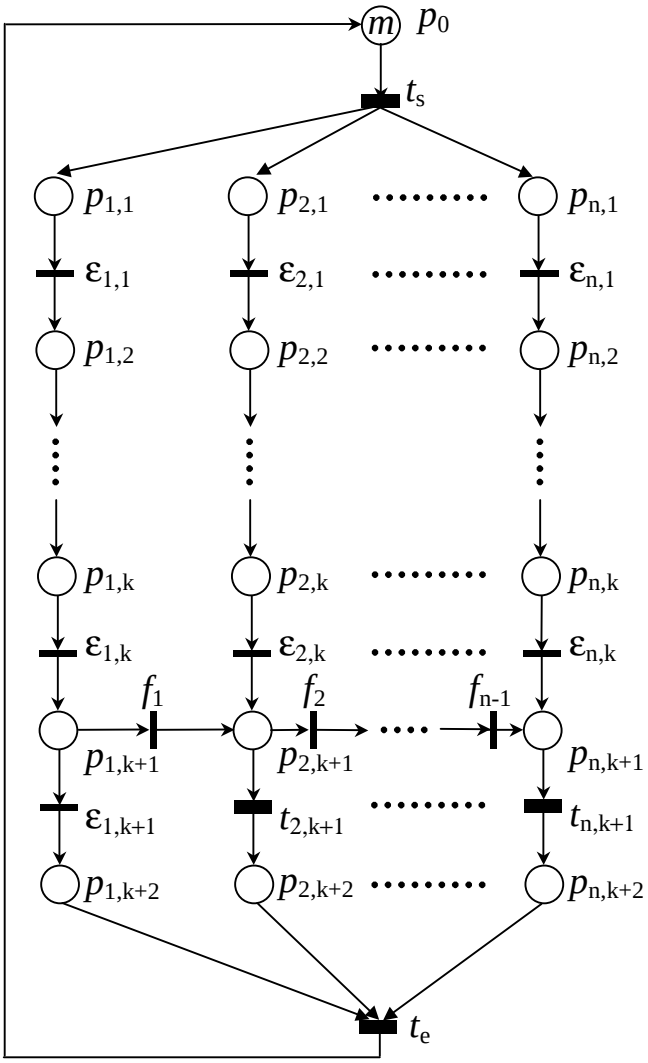

Figure 1: The Petri net model of the manufacturing system.