

## Announcement for Master/Bachelor Thesis

# Control Synthesis for Infinite Behaviour of Discrete-Event-Systems under Partial Observation

### Motivation

“Men made systems” like a production line are modelled and controlled by Discrete-Event-System (DES) framed in terms of automata and formal languages. Missing information in the physical plant, e.g. due to the lack of a sensor, can be modelled as non-observed events. Some plant models require the liveness property, which states that some event eventually occur without bounding the amount of events that may precede it. This is expressed by using  $\omega$ -automata, i.e. it accept infinite-string languages. Algorithms for synthesizing a supervisor under partial observation are known for the finite and infinite behaviour and are based on determinization of non-deterministic automata. Nevertheless the effective synthesis for the infinite case is intricate and may need further restrictions for an efficient implementation.



Figure 1: Plant: production line

### Open Thesis Projects

- Appreciation of the literature [1] and identifying of special cases to reduce computational complexity
- Implementaion of adapted Safra's determinization construction for controller synthesis under partial observation
- Evaluation in the context of an example

### Requirements

Basic programming skills in C++ and basic knowledge about formal languages and automata is required. Basic knowledge about DES are welcome (e.g. having attended the course Ereignis Diskrete Systeme). The thesis can be written in either English or German.

### References

[1] Thistle, J. G., Lamouchi, H. M. (2009)  
Effective Control Synthesis for Partially Observed Discrete-Event Systems. *SIAM Journal on Control and Optimization*, 48(3), (1858-1887)

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