Motivation

- Scheduling and control have great influence on the performance of manufacturing systems
- Traditional approaches are not able to react on dynamic events in real-time
- Simulation-based optimisation (SBO) combines the strengths of simulation and optimisation for computing production schedules
- However, traditional SBO approaches are not able to consider dynamic influences

Objectives

- Data-driven adaptive simulation-based optimisation approach
  - Exchanging real-time data (using Cyber Physical Systems)
  - Dynamic adaptation (by means of simulation model changes)
  - The project connects data-oriented research on the usage of smart components with research on optimising manufacturing processes

Industrial Partner

Rudolph Usinados (Timbó - SC, Brazil)

- Production of mechanical parts, in particular for automotive industry
- Use case: production lines for different transmission forks
  - 22 different product variants
  - 8-12 operations per product
  - Parallel machines
  - Machines are shared with up to 55 other products

Results and Outlook

Results

- Data-driven adaptive simulation-based optimisation method (aSBO) for production control has been developed
- aSBO considers the current state of a real production system continuously and reacts on dynamic events (such as machine breakdowns) in real-time
- aSBO outperforms static scheduling and static dispatching rules:
  - Shorter time-to-completion of all jobs in one month
  - Shorter throughput times of single jobs
  - Reduced number of tardy jobs
  - More accurate planning of completion times of single jobs

Outlook (until March 2018)

- Consider other dynamic events, e.g. workers’ absence, rush orders
- Tune up the method to further improve computation times

Statistics

Partners

- 1 German university – 6 researchers
- 1 Brazilian university – 12 researchers
- Phase 1: April 1, 2016 – March 31, 2018

Publications

- 4 journal publications
- 8 publications at international conferences
- 2 submitted journal papers (+ 6 submissions until March 2018)
- 5 submitted conference papers (+ 3 submissions until March 2018)

Organized Special Sessions

- IFAC World Congress 2017
- IFAC INCOM 2018, MIM 2019 (accepted)

Exchange of Research

- 14 missions of 8 Brazilian and 2 German researchers

Theses

- 3 Ph.D. theses in process
- 3 Master theses in process
- 1 Bachelor thesis in process

Partner institutions:

- Prof. Dr.-Ing. Michael Freitag, BIBA, Germany
- Prof. Dr.-Ing. Enzo M. Frazzon, UFSC, Brazil
- Prof. Dr. Guilherme E. Viera
- Prof. Dr. Fernando A. Forcellini
- Prof. Dr. Maurício U. Maldonado