

MODELING AND VISUALIZATION OF THE INDUSTRY 4.0 CYBER AND PHYSICAL PRODUCTIONS

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An actual task is to design the modeling and visualizing components of the Industry 4.0 production division activity. The Industry 4.0 production division as a part of smart factory functions automatically with special cyber and physical systems (CPS). The smart factory projection is done as a program of the industrial economy sector prioritized development. To project a production division they use the systems of automatic projection (CAD) installed in an instrument designer PC. Smart factory CAD components are CPS graphical models means, which includes the production division graphical models and the models of product being manufactured. All graphical models have the full information similarity to the physical devices. There are components and description schemes of their interaction to create CAD software to project automatic productions.

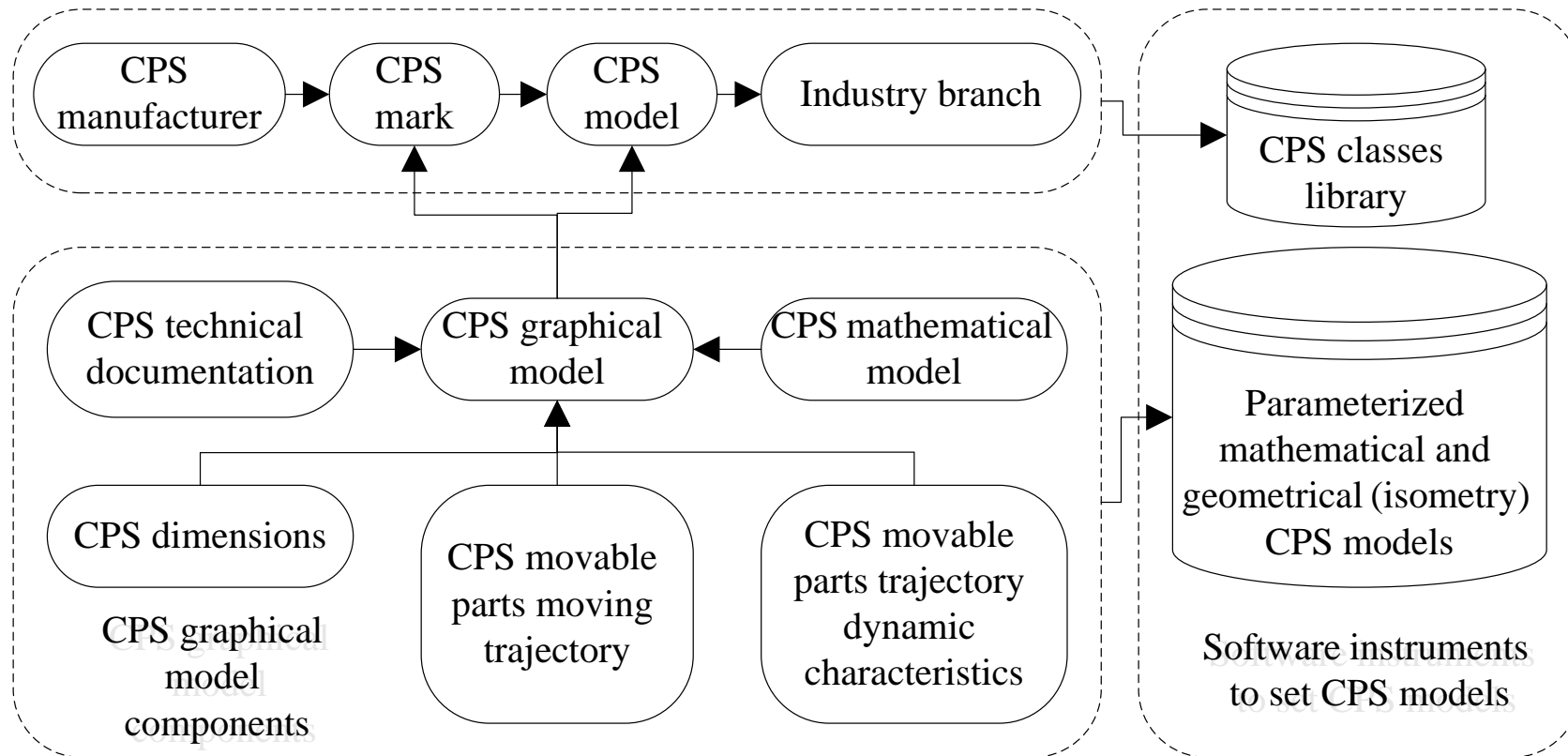


Figure 1. Components interaction scheme necessary to form CPS graphical models.

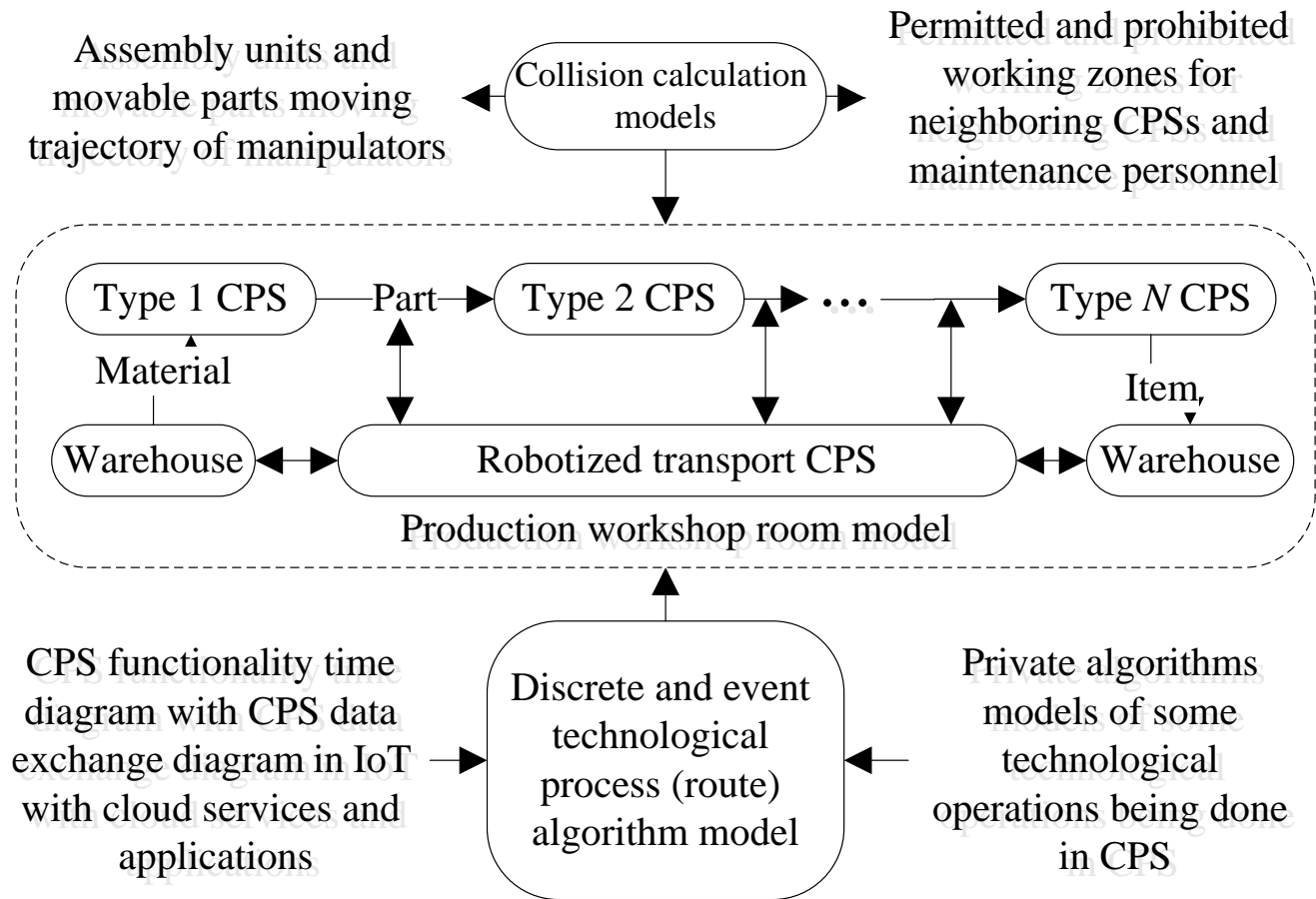


Figure 2. Interaction components scheme to form the Industry 4.0 smart factory production division graphical model.

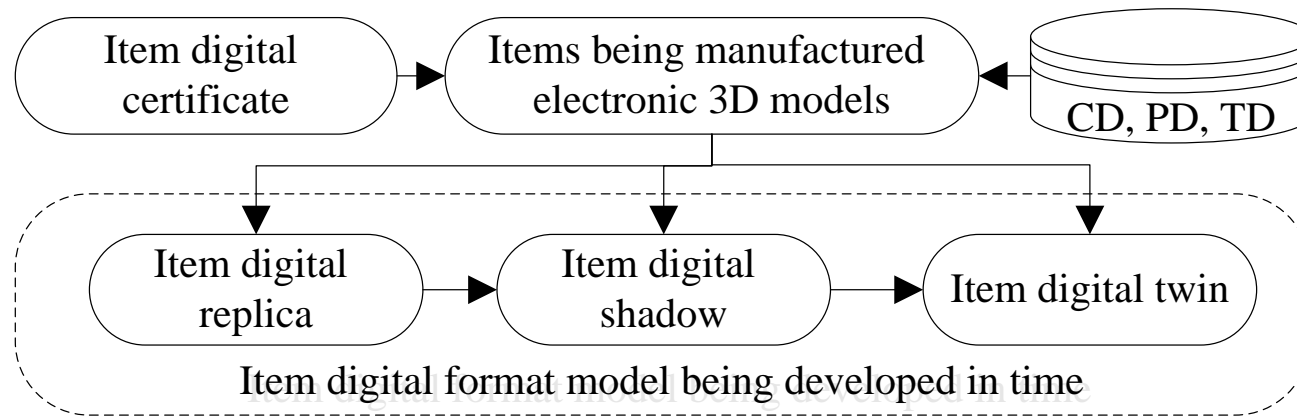


Figure 3. Components interaction scheme,
which are necessary to form the item graphical model.

Automatic production smart factory object is a complicated technical system where CPSs interact with different tactical and technical characteristics. CPS interaction methods and means research is done in the automatic projection system which help the designer to complete modeling and visuals project procedures of the cyber and physical production functionality in an instrument PC.

Projection system primary component is a set of graphical 3D production infrastructure objects models received after the physical device digital copy. For cyber and physical production modeling and visuals in the sketch and technical projection stage which can be used as CPS digital replica and the item being manufactured as the production objects representation initial form. When the calculations become more complicated and it require a more detailed project solution level (functioning projection stage) to visualize smart factory functionality it is necessary to use the object digital shadows. The smart factory project documentation final version can be obtained only after some model experiments in an instrument PC when the production infrastructure object digital twins are applied.

Implementation of new type item production for the existing (developed before) smart factories would require from the designer a conduct of model tests with CPS digital twins application installed in a company and the item digital twins obtained from the digital factory technical documentation archive. Those procedures must be completed in a specialized automatic projection system in a smart factory during the production technological preparation before the new set of items manufacturing.