Overview models available in literature

Nr.	Short name	Full name	Description	$\lvert I\rvert$	$\lvert J\rvert$	$\lvert I'\rvert$	uss	Reference
1	**agv**	Automated guided vehicles	A set of five automatic guided vehicles (AGVs) serve several workstations in a manufacturing cell. Each AGV travels on one of the fixed circular routes serving two input stations, three work stations, and a single output station.	5	8	5	$1.7 \cdot 10^3$	Holloway & Krogh (1990)
2	**ball-system**	Ball sorting system	This system sorts steel balls that are placed in a queue at the processing station. Depending on the size of the ball, the ball is transported in a lift to one of the two levels. Once arrived at the destination level, a rotating arm picks the ball and places it back into the starting queue. As the complete model is not presented in the original source, the model as available in the tool Supremica is used, see Malik *et al.* (2017).	70	14	65	$2.5 \cdot 10^4$	Čengić & Åkesson (2008)
3	**central-lock-3doors**	3 doors central lock system	This models the central locking system of a BMW car. The modeled system consists of three doors controlled by a central locking system. The model is derived from the KorSys project and it is available in the tool Supremica, see Malik *et al.* (2017).	74	35	74	$2.6 \cdot 10^5$	N/A
4	**circular-table**	Circular table manufacturing cell	In this manufacturing cell metal pieces are drilled and tested. The machine consists of a four-stages circular table with four operational devices: an input conveyer, a drilling machine, a test device, and a manipulator.	5	8	5	$3.2 \cdot 10^1$	de Queiroz & Cury (2002)
5	**cluster-tool**	Cluster tool system	An integrated manufacturing system that is used for processing wafers. Four robots move the wafers in the system that consists of nine work chambers, three buffers, an input load lock, and an output load lock. Wafers need to be processed according to a pre-specified routing.	18	16	1	$2.6 \cdot 10^8$	Su *et al.* (2010)
6	**intertwined-production**	Intertwined production system	This models a manufacturing system where two types of products are processed. The system consists of two machines, four handling devices, and six buffers. For each type of product, a pre-specified production cycle is given.	6	6	2	$2.6 \cdot 10^2$	Lin & Wonham (1990)
7	**agent-formation**	Multi agent formation	This multi-agent formation problem considers a circular route where three agents can only travel clockwise. There are two alternative desired formations possible: an equilateral triangle and an alignment curve. A team leader or a remote operator decides which formation is currently needed.	4	13	1	$1.0 \cdot 10^3$	Cai & Wonham (2014)
8	**production-cell**	Production cell	In this production cell, metal blanks need to be forged by a press. The feed belt forwards blanks from the stock to the elevating rotary table. The first arm of the robot picks up the blank and places it in the press. After processing, the second arm from the same robot picks the blank and drops it on the deposit belt. At the end of the deposit belt, the test unit checks whether the forging was successful. If it passes the test, the blank leaves the system, otherwise it is moved back to the feed belt by the crane.	11	19	10	$3.8 \cdot 10^8$	Feng *et al.* (2009)
9	**testbed-rail**	Testbed railway system	A railroad system is used to resemble a set of three interacting work units in a manufacturing cell. The trains simulate AGVs that handle material to and from each work unit. Each unit has a small crane for loading and unloading the material. Several switches in the track allow for different train paths.	56	29	4	$5.6 \cdot 10^9$	Leduc (1996)
10	**transfer-line**	Transfer line	In this transfer line, products are processed by two machines. The first machine places the products after processing them in the first buffer. The second machine takes products from the first buffer and places them in the second buffer. A test unit verifies whether the products in the second buffer are acceptable. If accepted, the products leave the system, otherwise the products move back to the first buffer.	3	2	3	$8 \cdot 10^0$	Wonham & Cai (2019)
11	**wafer-scanner**	Wafer scanner	This model concerns the routing of wafers through a wafer scanner. The system consists of two areas: the wafer stage where wafers are measured and exposed, and the wafer handler where several pre-exposure steps are performed. The wafers enter and exit through the wafer handler area. Furthermore, there are two dummy wafers available in the system.	48	37	1	OoM	van der Sanden *et al.* (2015)
12	**work-cycle**	Work cycle manufacturing system	This manufacturing system consists of three machines and two buffers. Parts are supplied through an input buffer and are after processing stored in two output buffers. In this system, the first buffer has a capacity of 16 products and the second buffer a capacity of 8 products.	5	2	1	$1.2 \cdot 10^3$	Ouedraogo *et al.* (2011)
13	**adas**	Advanced driver assistance system	A car is modeled with two Advanced Driver Assistance Systems (ADASs): Cruise Control (CC) and Adaptive Cruise Control (ACC). CC is used to maintain a desired velocity using feedback control. ACC is used to maintain a constant inter-vehicle time gap with respect to the predecessor. The user operates the ADASs with a human-machine interface and can therefore choose between manual control, CC, or ACC.	28	33	27	$3.4 \cdot 10^9$	Korssen *et al.* (2017)
14	**lock**	Waterway lock	A waterway lock is used in rivers and canals to raise and lower vessels between different water levels. This model has various subsystems: gates, paddles, culverts, two-lamp traffic lights, and three-lamp traffic lights. An operator can interact with the system through a human-machine interface.	71	198	51	$6.0 \cdot 10^{32}$	Reijnen *et al.* (2017)
15	**festo**	FESTO production line	This didactic production line system consists of 28 actuators and 59 sensors. Products undergo various processing steps in six different workstations: distributing station, handling station, testing station, buffering station, processing station, and sorting station.	113	211	88	$1.5 \cdot 10^{26}$	Reijnen *et al.* (2018a)
16	**container-terminal**	Container terminal	A LEGO model of a container terminal system is used to demonstrate model-based engineering. The system consists of three lanes each with a moving crane and a truck transporting containers between the three lanes. Containers are loaded into the system in one lane and finally unloaded via one of the other two lanes. The choice between one of the two unload lanes depends on the color of the container.	45	35	15	$3.8 \cdot 10^{22}$	Reniers & van de Mortel-Fronczak (2018)
17	**swarm-segregation**	Robotic swarm segregation	A model of a swarm of robots is used to demonstrate supervisory control theory in this domain. Several experiments were performed with eventually 600 robots. Four different swarm problems were considered: segregation, aggregation, object clustering, and group formation.	6	3	6	$6.4 \cdot 10^1$	Lopes *et al.* (2016)
18	**swarm-aggregation**	Robotic swarm aggregation	See above.	2	4	2	$1 \cdot 10^0$	Lopes *et al.* (2016)
19	**swarm-clustering**	Robotic swarm object clustering	See above.	2	6	2	$1 \cdot 10^0$	Lopes *et al.* (2016)
20	**swarm-formation**	Robotic swarm group formation	See above.	6	6	6	$8.0 \cdot 10^1$	Lopes *et al.* (2016)
21	**bridge**	Movable bridge		126	189	26	$5.9 \cdot 10^{33}$	Reijnen *et al.* (2018b)
22	**sumo**	Sumo robot	This is a model of a robot playing sumo, just like humans playing sumo. The goal is to take the opponent out of the ring, which has a circular shape and bordered with a detectable white line. Two DC motors, each at one side of the robot, allows it to move.	6	4	1	$4.3 \cdot 10^1$	Torrico *et al.* (2016)
23	**mri**	MRI scanner patient table		17	17	6	$3.6 \cdot 10^3$	Theunissen *et al.* (2014)
24	**themepark**	Themepark vehicle safety system		17	49	17	$2.9 \cdot 10^5$	Forschelen *et al.* (2012)
25	**transmission-grid**	High-voltage direct current transmission grid	A point-to-point link in a high-voltage direct current transmission grid is modeled. The two stations at the end of this point-to-point link convert alternating current to direct current and vice versa. The components in these stations are modeled. Requirements are formulated to ensure a correct startup of these two station.	3	2	1	$3.0 \cdot 10^1$	Romero-Rodríguez *et al.* (2019)
26	**power-substation**	Power substation system	A preventing electric mal-operation system for a power substation is modeled. It consists of several switches, circuit breakers, and ground switches. Requirements are formulated based on unsafe state transitions.	22	27	22	$2.1 \cdot 10^{10}$	Chao *et al.* (2017)
27	**information-system**	Control of process-aware information systems		5	3	5	$1.8 \cdot 10^2$	Alves Portela Santos *et al.* (2013)
28	**robot-navigation**	Robot navigation in industry 4.0 environment		4	3	2	$9.4 \cdot 10^2$	Gonzalez *et al.* (2018)
29	**mri-state**	MRI scanner state based	The state based version of the MRI scanner	19	17	?	?	Theunissen (2015)
30	**marijkesluis**	Prinses Marijke comples		?	?	?	?	Reijnen *et al.* (2019)
31	**blockchain**	Blockchain Networks		4	2	1	24	Seow (2019)

Models available as Petri nets

Short name	Full name	Description	Reference
fms1	Flexible manufacturing system 1	This manufacturing system consists of four machines, each able to hold two parts at the same time. Three robots move parts around, each able to hold a single part. Finally, three input buffers and three output buffers ara available for interaction with the environment. Three different types of parts are processed in this manufacturing system, each having their own predefined route.	Li *et al.* (2008)
fms2	Flexible manufacturing system 2	This manufacturing system was developed at Rensselaer Polytechnic Institute as a physical 1/6 scale model of an automated factory shop floor. The system receives two types of raw products, machines them into the desired shapes, and the assembles these two parts together.	Zhou *et al.* (1992)
sensor-network	Coordination of cooperating heterogeneous wireless sensor networks		Giordano *et al.* (2006)

Unpublished or incomplete models

Short name	Full name	Description	Reference
lane-change	Lane change module of autonomous vehicle		Zita *et al.* (2017)
baggage-handling	Baggage handling system		Swartjes *et al.* (2017)
robot-cell	Extended robot cell		Shoaei *et al.* (2011)
function-block	Function block exucution		Čengić *et al.* (2006)
production-cell-efa	Production cell modeled with EFAs	In this production cell, metal blanks need to be forged by a press. The feed belt forwards blanks from the stock to the elevating rotary table. The first arm of the robot picks up the blank and places it in the press. After processing, the second arm from the same robot picks the blank and drops it on the deposit belt. At the end of the deposit belt, the test unit checks whether the forging was successful. If it passes the test, the blank leaves the system, otherwise it is moved back to the feed belt by the crane. The modeling formalism of Extended Finite Automata is used.	Fabian *et al.* (2014)
flexible-assembly	Flexible assembly cell		Pétin *et al.* (2007)

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