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RESOLUTION OF VEHICLE DEADLOCKS IN A MODULAR ASSEMBLY SYSTEM

Axel Unger
Bertrandt Ingenieurbüro GmbH

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RESOLUTION OF VEHICLE DEADLOCKS IN A MODULAR ASSEMBLY SYSTEM

Initial situation:

A modular assembly system consists of several assembly stations where products are assembled. Such assembly steps can be e.g. bolting, pressing in of perimeters, etc. The assembly stations are specialised in such activities. Different products can be assembled in this assembly system. These can have different assembly sequences, so that the stations are also approached in different order. The transport from one station to the next is done by a driverless transport system. The products are on workpiece carriers. The driverless transport vehicle therefore transports such a workpiece carrier. When it arrives at a station, it hands over the workpiece carrier and is then free again for the next transport job. The transports depend on the respective assembly sequence and the current availability of the vehicles. This makes the system highly non-deterministic. In such systems, it can happen that the system gets into a deadlock situation (e.g. stations blocking each other, vehicles blocking each other on the routes), which must be recognised and resolved. If this resolution is not done, the system may come to a standstill. Production thus comes to a standstill.

Another blockade situation to be solved here is when all vehicles are loaded with a workpiece carrier and want to deliver it to the next station, but this station is not capable of receiving it because it is still occupied. Even if the processing in the occupied station is now completed and the workpiece carrier could be picked up again, no vehicle is available to pick it up because all vehicles are occupied and cannot deliver their workpiece carrier. Even in this case, production would stop if the situation is not detected.

Solution:

The procedure described below is designed to detect and resolve such a deadlock situation. Each time a vehicle cannot deliver a workpiece carrier because the station is still occupied, it must be checked whether the situation is the same for all other vehicles. If this is the case, such a deadlock situation has occurred and has also been detected. In this case, the vehicle that got into this situation last (but it could also be any other) moves the workpiece carrier onto a buffer belt that is only set up for such cases (and it must have at least one free space) and hands over the workpiece carrier there. The vehicle is then free again, can pick up a workpiece carrier from another station and thus ensure that the workpiece carriers can slide in at this station, the entrance becomes free, the vehicle standing there can hand over its workpiece carrier and can be ready for the next order.

Advantage:

Avoidance of a production standstill