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SCHEDULE OPTIMIZATION THROUGH DYNAMIC PRIORITY RULES IN A MODULAR ASSEMBLY SYSTEMCLE SCENTING UNITS

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Initial Situation:

In a modular assembly system, workpieces are assembled at several stations. Transport from one station to another is usually automated by an automated guided vehicle system (AGV). The route is determined by a work plan, which can also be different for different variants of the product. The control of such a system must be designed in such a way that a maximum output per time unit is possible. One approach is to work with a schedule or timetable, which can be optimized by mathematical approaches or genetic algorithms. Since such a modular assembly system is highly dynamic due to the transports themselves and possible failures in the assembly plants, such a schedule can only be calculated for a certain time window into the future (order of magnitude 10- 30 min. with cycle times in the minute range). When using genetic algorithms, one would achieve variants of such a schedule e.g. by selecting the vehicle allocation and can then select the best variant. The new idea describes a different way of generating different schedules.

Solution:

In the modular assembly system, the vehicles must share road resources and, especially in intersection areas, observe certain rules to avoid collisions. The following rules are applicable: Whoever comes first reserves a resource (the intersection) and a central system blocks this intersection for all other vehicles. Other rules could be derived from road traffic, i.e. main and secondary roads or right before left, etc. By controlling with a central system, these rules do not have to be rigid, but can be changed according to the situation, then only need to be transparent for all road users. This is also regulated by the central system. The idea now is to use different combinatorics of these rules for the generated schedules and to evaluate which schedule is the best one. So it may be that in one case it is optimal if the vehicle that first arrived at the area is the one that drives through it, but in another case it makes sense if it waits until another vehicle has passed by, because it is most useful for the overall progress of the schedule and thus the production. The optimization of the schedules takes into account which locally and situationally applied traffic rule is the best one and this rule is then applied.

In addition, it is also possible to learn recurring situations and thus limit the search space for the combinatorics for future calculations (reduction of computational effort).

Advantages:

- Optimization of schedules and production output.
- Can also be used for fully autonomous driving in road traffic, if centrally controlled.