EFFICIENT AUTOMATED RECOVERY IN MULTI-ROBOT WORKCELLS

Time is money and downtime is big money.
But what causes downtime in the first place? There are two types of downtime:

Unplanned downtime results from the unplanned stoppages and failures that are inevitable from the sheer amount of volume that robots are required to maintain. This round-the-clock volume causes wear and tear, which can cause a part of the workcell (e.g., an end-effector or a conveyor belt) to fail. Additionally, there could be a power outage, software bugs, or operator error that disrupts the robot task.

Planned downtime can have many causes, but it is typically due to scheduled maintenance. Maintenance can involve replacement or recalibration of machinery. It can involve replenishment of consumed resources, like paint. It can also involve software upgrades. Planned downtime is less disruptive than unplanned, but it is nevertheless time in which the workcell is not productive.

realtime robotics

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CALCULATING COSTS

Manufacturers rely on robot workcells—often including a large number of expensive robots—to quickly and consistently churn out a high-value product. If an assembly line is down due to a failure, products are not being produced and revenue is being lost. Calculating downtime cost is simple arithmetic: if an assembly line is being used to produce a $30,000 product every minute, then every minute the assembly line is down is a loss of $30,000.

Downtime cost is typically high, as there is no reason to invest in a multi-robot workcell if that workcell is not producing high value. The workcell's uptime value, which is equivalent to its downtime cost, equals the product throughput (e.g., measured in products per hour) multiplied by the value per product.

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uptime value = downtime cost = product throughput x value per product
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This equation produces downtime costs that are always high, yet differ considerably across industries. It was reported in 2016 that the average downtime cost for all industries was $260,000/hour,[1] yet specific industries have far greater downtime costs. In the automotive industry, for example, a 2005 study reported downtime costs of up to $50,000/minute,[2] and that number has surely grown considerably since then.

REDUCING DOWNTIME

The only way to reduce downtime cost is to reduce downtime, and there are only two ways to reduce downtime: reduce the number of downtime events and reduce the length of each downtime event.

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total downtime = number of downtime events   latency of each downtime event
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These two strategies are complementary, and manufacturers strive to reduce both of them. We focus here on reducing the length of downtime events by speeding up recovery.

[1] *https://www.aberdeen.com/techpro-essentials/stat-of-the-week-the-rising-cost-of-downtime/*

[2] *https://news.thomasnet.com/companystory/downtime-costs-auto-industry-22k-minute-survey-481017*

REAL SAVINGS

RECOVERY PROCESS

After downtime, it is critical to get the robot workcell running again as fast as possible. Particularly after unplanned downtime, a significant amount of recovery time is currently spent in moving each robot back to a home pose or some other specified pose from which it can resume operation. This process has traditionally been slow, because an operator must enter the workcell and manually reset every robot to the desired post-recovery pose. Recovery is usually a sequential process, in which the operator resets robots one at a time, they would still have to painstakingly coordinate to ensure that robots do not collide while being reset. Thus the recovery time is greater for workcells with more robots—that is, the workcells that are most expensive and productive.

REAL UPTIME

Realtime Robotics has developed proprietary technology for decreasing downtime and increasing workcell productivity by dramatically shortening the length of downtime events. While downtime events are ultimately ineveitable, Realtime Robotics can drastically reduce their impact with the Realtime Controller. The Realtime Controller enables fast, push-button recovery of all robots in parallel, with none of the laborious and time-consuming operator actions previously required. Instead of the operators trying to reset each robot while avoiding collisions, the Realtime Controller automatically provides collision-free motion plans for all of the robots, enabling them to all reach their post-recovery poses and automatically return to home far faster than manual solutions.

REAL BENEFITS

+ **Increased throughput** with interlock-free multi-robot workcells
+ **Faster, easier robot programming** with accelerated offline motion planning
+ **Flexible workcells** with collision-free planning in real-time
+ **Safely deploy industrial robots** in shared workspaces for collaborative solutions

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