Design and Application of Automated Robots Powered by Inductive Smart Tiles

Balch, Andrew (School: New Horizons Governor's School for Science and Technology)

When touring an Amazon Warehouse I came up with the idea for this project as a way to use wireless charging to alleviate battery-related issues in their logistics robots. I created a mock warehouse consisting of a 5 by 5 grid of inductive Smart Tiles and 2 weighted shelves of the same size placed on certain tiles as payloads. The robot was randomly assigned “jobs” to travel to a shelf, pick it up, deliver it to a station, then place the shelf on another tile. It navigated via a Java path?nding algorithm that coordinated movement to avoid collisions. Data was recorded in the cloud to determine when each tile should turn on or off and to keep track of KPIs. This system was tested against a control group of battery-powered robots. Due to delays and multiple issues regarding the robot’s drive system, full-scale, real-world tests were not achievable by the project’s deadline. As an alternative, the fully operational algorithm that coordinates the robots’ movement, which was accurate in predicting the robot’s position within a fraction of a second, was retooled to output theoretical data of real world tests. It was found that induction robots boasted a 30.7% higher Overall Equipment Effectiveness rating, 18.4% higher efficiency, carried a total load of over 101,000 kilograms compared to about 90,000 for the battery-powered alternative, and battery tests showed a 117.14% increase in average cycle time vs induction. An induction system would win out when it comes to KPIs. However, induction requires extensive infrastructure and high amperage draw of multiple robots would require regulated ‘grids’ to avoid failure. When long-term ROI is concerned, induction could be well suited for large-scale warehouses due to its potentially lower maintenance costs and robot overhead.

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