

Expansion of an Intelligent Control System for an HO Scale Train: Multiple Load/Unload Locations with Turnouts

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Prior undergraduate research projects were performed to create an intelligent control system for an HO scale model train using the LEGO NXT platform. That set up used a single grabbing arm to load and unload a car on the train at a specific location. Various locations were identified using the ultra-sonic sonar sensors in the standard NXT kit. In addition to the robotic grabber, a simple “hand” was used to turn the speed control knob on the voltage regulator. The current project being developed will consider the addition of a second grabbing arm to load and unload at a second location. This will also be done in coordination with the train traveling through or avoiding a turnout track section as part of the route. An additional NXT program brick will be used to control this second grabbing arm and communicate with the other bricks used by the previous project. Tests were carried out with both grabbers. This caused a myriad of errors. While debugging the system it was discovered that input/output exceptions were occurring and the system was stuck in a constant loop. Additional tests using only the second grabber were performed. The system began functioning properly indicating that the code and sensors were behaving correctly. Further research then showed that the addition of multiple NXT control units via Bluetooth increases latency dramatically, causing repeated IO exceptions between the master NXT and slave NXTs. Moving forward, another module will be added converting control from the NXT system to a computer via USB or Bluetooth. As any new modules are developed in the future not only will communication issues be addressed but overall system performance will be maintained facilitating ease of debugging, composability and scalability.