Semi-Autonomous Mobile Informational Tour Robot

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Abstract

The objective of this project is to design and implement an autonomous robot to navigate the Advanced Systems Center of Nexteer Automotive and will showcase their product. The purpose of this robot is to provide informational tours to visitors at Nexteer and give them a better understanding of who they are as a company. The Pioneer P3-DX is the robot that was selected for the project and a structure will be built to connect to the top of the Pioneer P3-Dx to house any Nexteer part. The path of the tour at Nexteer will be set up with RFID (radio frequency identification) tags that will be read with the antennas. These antennas will be on each side of the structure that is built onto the robot and will interface with the onboard computer so that the robot will be able to localize itself within the computer program. There are also sonar sensors that will be used to detect and avoid obstacles while on the tour. There are different localization methods that were looked into prior to choosing RFID. These methods include dead-on reckoning, Bluetooth and active and passive RFID. Passive ultra-high frequency (UHF) RFID was chosen because it uses radio frequency waves to send off and retrieve information using the RFID reader, antennas and RFID tags that hold specific information needed to localize. It is hard to control a tour and it be the same every single time. Obstacles can happen such as a person walking in front of the robot or an object not being in its usual location. The sonar sensors will detect an object at a certain distance and move around the obstacle keeping its distance the same all the way around. With the surface of the Pioneer P3-DX being fifteen inches by eighteen inches, having a load capacity of approximately thirty-eight pounds and having a monitor around eye-level, center of gravity needed to be calculated to check stability of the moving structure. The force it takes to tilt the robot can be calculated and adjustments can be made to help prevent the robot from tipping such as adding caster wheels to the bottom so if the robot starts to tilt, the caster wheels could help the robot regain balance. Another goal would be to increase the force it would take to tip so the robot could handle if random pressure was added to it.