SENIOR DESIGN PROJECT: ROBOT 2 ABSTRACT

The goal of our group project was to take a Turtlebot 3 kit assembled in the Waffle Pi configuration and make it operate autonomously utilizing the light detection and ranging (LIDAR) sensors on the robot. Autonomous travel has a myriad of potential applications in today's world, from self-driving cars to automated vehicles that can go to places far too dangerous for human beings to venture.
We researched the capabilities of the robot before deciding to attempt to make it autonomous. Then we considered our options and came to the conclusion that adding a system of removable bumpers and covers might be beneficial to protect the Turtlebot while in use.

Professor Tristan Hill at Tennessee Tech is very knowledgeable in robotics, and he offered to lend us his help as well as pointing us to an online manual. This manual ended up proving indispensable when it came to deciphering the maze of commands leading to our goals. As with most things relating to programming, we spent a large amount of time tracking down issues with some of the more fickle aspects of the robot; namely the IP it was assigned and ensuring the installations were all kept up to date. Team member Jordan Layne researched aspects of Solidworks, and decided upon bumpers built around using the "loft" tool. The robot was measured to ensure a snug fit for both the 3D printed, thermoplastic polyurethanes (TPU) bumpers, and the laser-cut acrylic case plates. The result was a more durable robot, but with all of the required plugs and switches still easily accessible.

At the end of the project, we were sadly unable to achieve autonomous travel with our Turtlebot. Issues related to IP and proper hostname recognition doggedly delayed forward progress; at a critical moment our entire project was moved by a third party and several components were misplaced, resulting in even greater delays. We had to devote a great deal of time and energy just to keeping the Turtlebot operational. LIDAR was successfully activated; however due to time constraints, we could not pursue its use in relation to autonomous movement further. On a brighter note, the case and bumpers were completed, giving the robot a needed visual overhaul as well as protection from longer term wear and tear. Major takeaways were the incredible amount of time resolving seemingly simple issues can take, and that being stuck at times is an inextricable part of working on such a robot.