Planning, Building & Programming an Autonomous Robot

Kendall, Jack

How do you take the idea of an autonomous robot and develop it from a concept into a functioning prototype? This question kick-started the project. The autonomous vehicle’s design objectives were to read target coordinates and to drive to them using GPS and a magnetometer whilst avoiding obstacles. During the planning phase the author chose the drive system, calculated the parameters for the motors, and determined the necessary sensors. A wooden mock-up chassis was created which allowed for corrections to be made to the CAD drawings before having it built from aluminium. After the batteries were installed, the tyres were mounted to the motors and the electronic components wired and soldered. Just like the hardware, the software was built from the ground up. The development of the code started at the beginning and was written in C++ in the Arduino 1.0.6 environment. The robot successfully made its maiden voyage on the 6th March 2015 weighing a total of 26 kg (57 lbs) and covered 5.5 km (3.4 miles) in just over an hour. A list of the target coordinates is saved to an SD card which is then processed by an Arduino Mega 2560. A beep code and LEDs are used to troubleshoot and to indicate status. The robot fulfilled its task by reliably reaching the target coordinates in various weather conditions on grass, snow, gravel and asphalt. Testing showed, the distance to seventy percent of the targets was below 2 meters and the autonomous vehicle requires at least 17 Nm of torque to start on flat terrain. The robot was the optimal autonomous vehicle which could be built with the available budget. The project successfully demonstrated and documented the development form an idea to a functioning autonomous robot.

Awards Won: