SPEAR

(Small Portable Economical Autonomous Robot)

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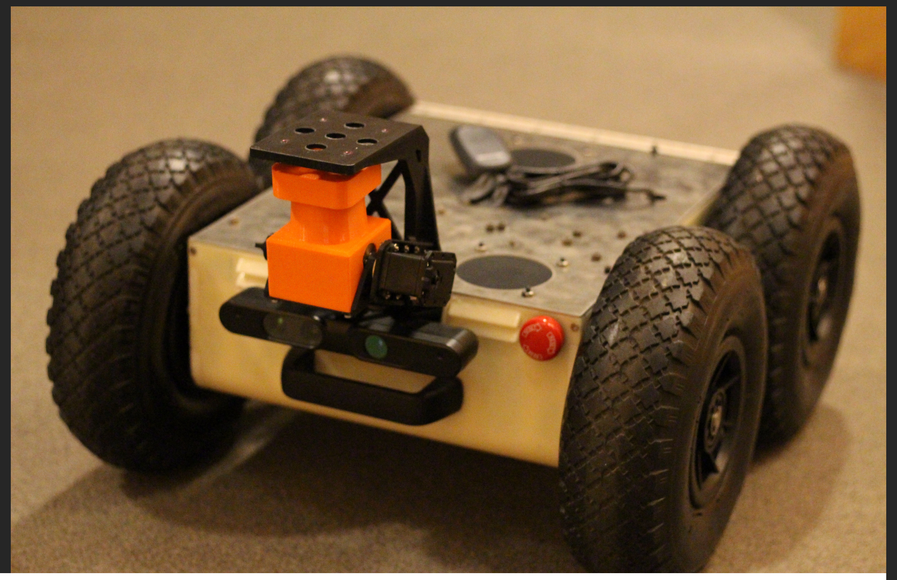
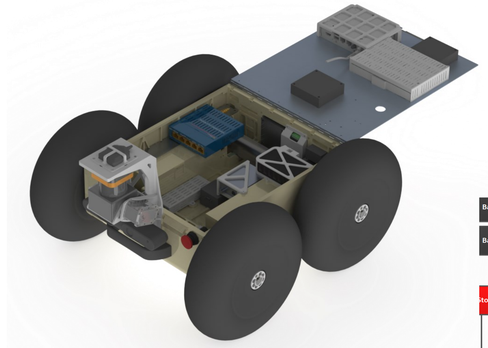


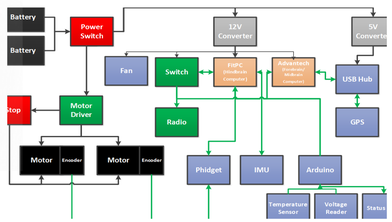
Mission

The 2012-2013 Olin College SCOPE team worked in collaboration with the Army Research Laboratory to design and fabricate a small, man-portable, autonomous ground vehicle to support ARL's research work in advanced autonomy algorithms. The goal of the project was to develop a platform that provides the necessary functionality for research robotics at a significantly lower cost than those currently on the market. The system supports modular payloads to allow sensors to be easily swapped in and out for different research and testing needs. The vehicle has been designed with sufficient mobility and

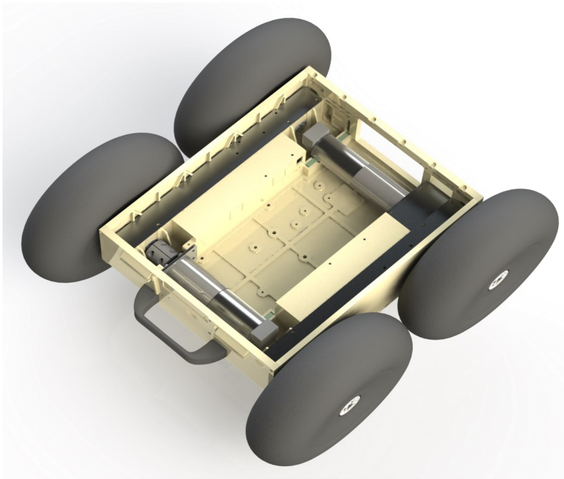
Electrical System

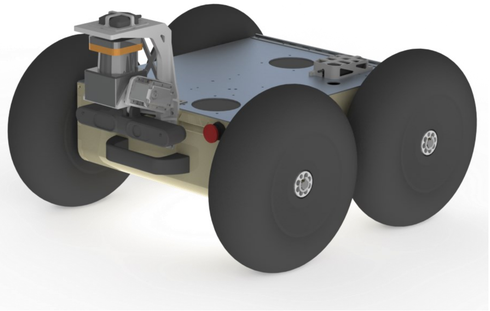


The electrical system uses two 22.2V batteries to provide power to two on-board PCs as well as their I/O interfaces, an Arduino and powered USB hub. It also powers the motors, motor controller, and a set of fans to keep all electrical components cool.



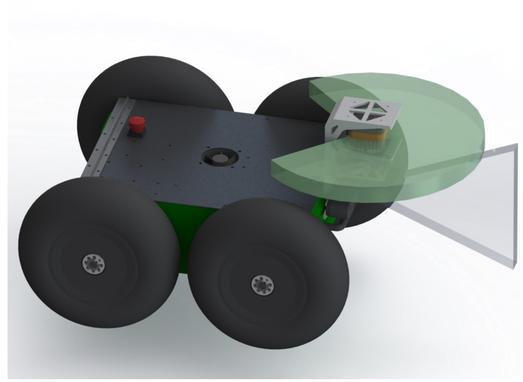
Mechanical Design





The chassis is constructed from fiberglass, epoxy coated FDM ABS. The drivetrain is simple wheeled skid steering . The vehicle can travel at speeds up to 2.3 m/s^2. The vehicle can drive over obstacles up to 4-5 inches and on slopes up to 40°. It can also drive on a wide variety of terrains including carpet, grass, gravel, and mud. The robot can withstand falls and bumps associated with a testing environment and is designed to protect sensors from reasonably foreseeable incidences.

Software Architecture



The robot has an Advantech i7 PC and a FitPC2. The FitPC serves as the "hindbrain" of the robot and manages the driving behaviors as well as the health of the robot by looking at temperatures and voltages throughout the electrical system. The Advantech i7 serves as the "midbrain" and "forebrain" of the robot, taking sensor input and making high level decisions for path planning and other autonomous behaviors. The ARL team will be able to load any algorithms on to the Advantech PC to control the robot and test their algorithms.