2009 ASME Design Competition

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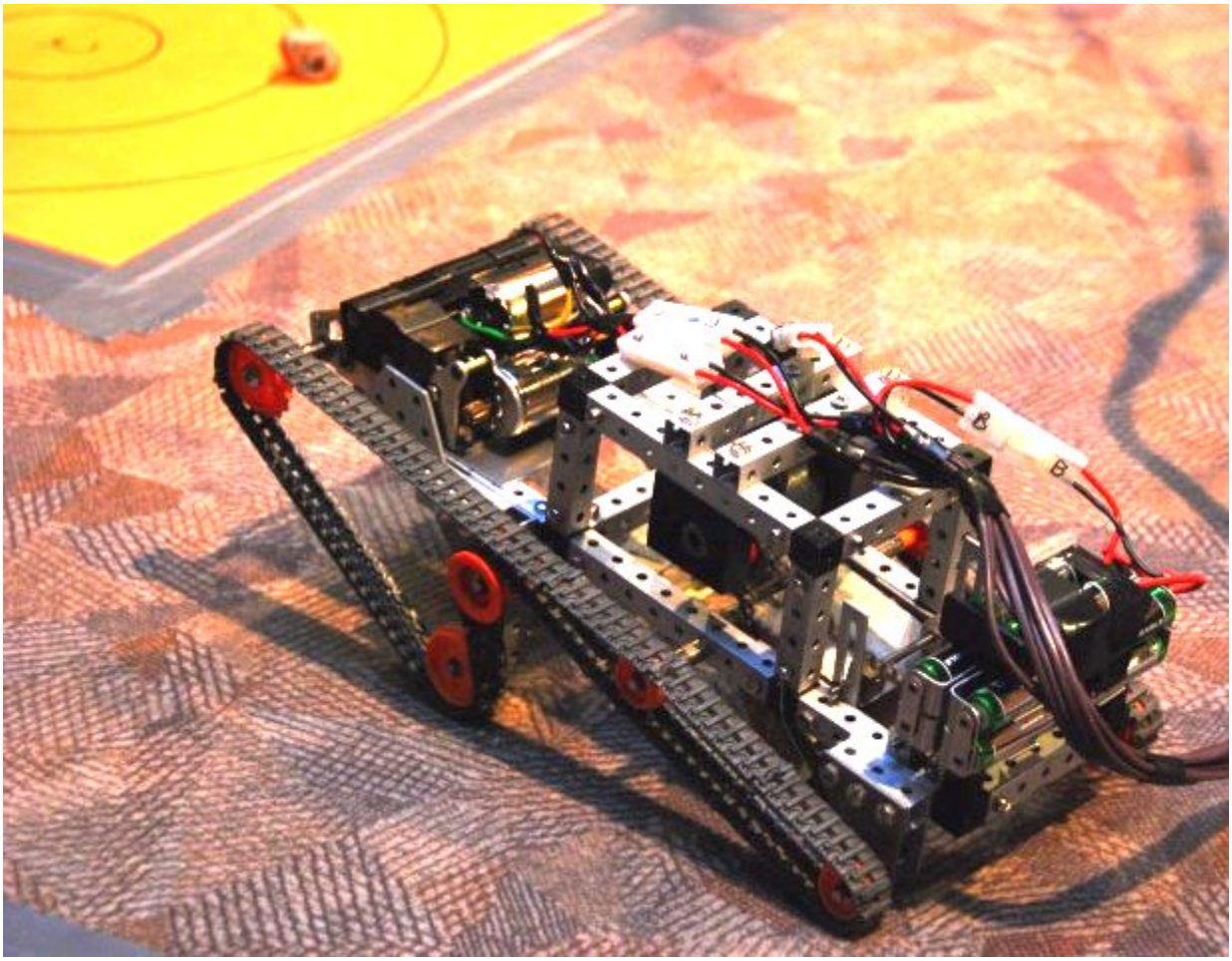
Every year the American Society of Mechanical Engineers (ASME) Center for Professional Development & Ethics and the ASME Knowledge & Communities Sector hold a competition nationwide in which student engineering teams are to design a prototype that is to perform specific tasks. This year, the competition was for the student teams to design a vehicle that was capable of surmounting obstacles and retrieving rocks. The competition was based off of the success of the Phoenix Mars Rover and gives student engineers a chance to design a vehicle that could possibly be used to collect rock specimens to study whether there was ever life on Mars.

Our design for the X45-L4-R0 (our vehicles designated name) was based off of a tank-style track system. However, instead of having one long base of the tread in constant contact with the ground, we pulled the track up to where there were two points of contact, one in the front slightly behind the drive sprocket, and on in the very back. The opening in the track was intended to decrease the maximum climb angle and prevent the vehicle from falling over backwards while climbing an obstacle. The drive system of the vehicle comes from two 6-volt motors which operate at 9000rpm and drive twin gear sets with a ratio of 59:1.

The scooper on the vehicle is designed similarly to the well known “Pooper-Scooper.” The bucket part of the scooper is attached to a rod in which it is able to pivot so the bucket slides over the rock as the vehicle gets into position to pick it up. Once the vehicle is past the intended target rock, the bucket falls back to the ground and the vehicle can back up to the rock so it is at the base of the bucket. The scoop (chain-driven and powered by a motor) then scoops the rock into the bucket. The scoop is attached to a rod which is mounted between to vertical slide-rails. This design allows the scoop to be pushed into the vehicle when there is a rock in the bucket as the vehicle goes over obstacles.

The contest allowed for two types of controllers. Either a radio transmitter/receiver type control or an umbilical cord could be used. For simplicity and budget reasons, our team decided to use an umbilical style controller. We used three double-throw switches with forward/off/reverse stations. One switch controlled the left track, one controlled the right track, and the third controlled the scooper motor.