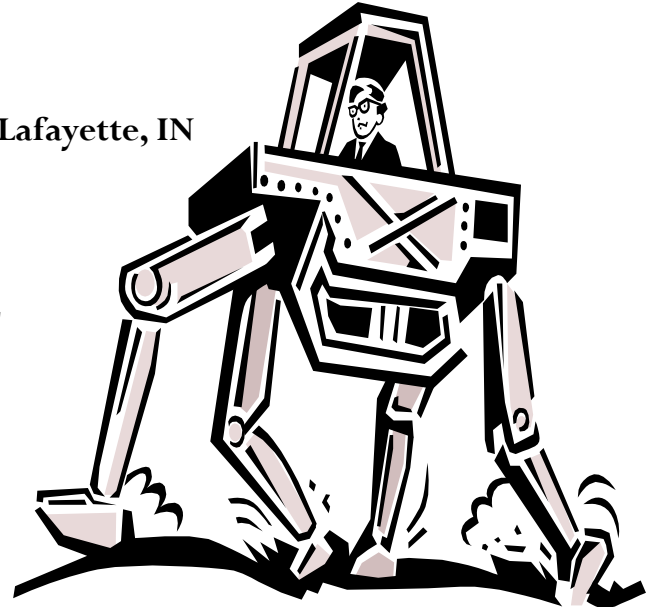




## NATIONAL 4-H ENGINEERING CHALLENGE

# ROBOTIC RECYCLING CAMPAIGN

October 4-6, 2009  
Tippecanoe County Fairgrounds, Lafayette, IN



### **Trash, Trash, Trash Everywhere!**

We need reinforcements. Your challenge, should you accept it, is to build a robot that can save the world from all the trash by helping us recycle our waste.

### GOAL

In order to promote recycling and cleaning up the environment, a task force of several teams has been created to develop robots that can help in the recycling campaign. In order to determine the best robot for the job, a contest has been developed. The judging will be based on a teamwork component, a craftsmanship component and upon performance tasks.

### PURPOSE

The **Robotic Recycling Campaign** is designed as a demonstration of skills and knowledge acquired by students in the area of robotics. Participants have an opportunity to challenge themselves as a part of a team by performing planning, fabrication, and operation of remotely-controlled robots in order to perform specific tasks.

### PARTICIPATION REQUIREMENTS

- Participants will compete in teams having a minimum of two persons. No individual participants will be allowed, as this would prevent the evaluation of a teamwork component.
- Participants must be 14 years of age as of January 1 of the current year.

### ROBOTIC RECYCLING CAMPAIGN CONTEST RULES

- **Teamwork** – Teams will be observed during the robot construction and testing portion of the contest. Judges will award team points accordingly. The planning skills will be judged during a discussion portion consisting of three separate discussion sessions with the judges. The first will be half-way through the robot's construction, the second before the performance tasks, with the final discussion taking place after the performance tasks. Scoring will also reflect the level to which all team members participate in the effort.
- **Craftsmanship Inspection** – Each team will construct a Vex ([www.vexrobotics.com](http://www.vexrobotics.com)) robot using only the parts supplied in one basic robot kit along with any accessories supplied by the event coordinators. Possible accessories may include: motors, motion components, metal, hardware and sensors. Parts may be cut, bent, or modified as needed to attain the required functionality. Teams will be judged on the soundness of their robot's design and upon the tidiness and preciseness of the construction techniques used.

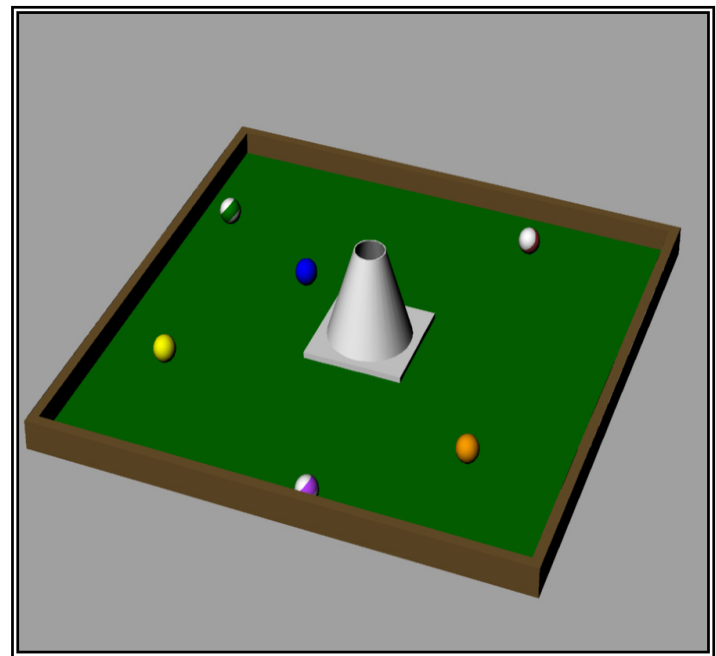


## ROBOTIC RECYCLING CAMPAIGN



### CONTEST RULES (CONTINUED)

- **Remote Control Performance Tasks** – The robot, operated by hand-held remote control, will retrieve plastic bottles, aluminum cans, waste paper, or other recyclable items and take them to a collection site. At the collection site, the robot must be able to place the object in one of two different types of recycling containers, “sorted” or “unsorted.” Teams will be allotted 10 minutes to recycle as many items as possible. The competition will continue until the time limit has been reached or all recyclables have been recycled. Containers may be simple open-top bins or be constructed such that the orientation of the object to be recycled must be manipulated to a match a corresponding opening in the container (obviously, a “sorted” container). More points will be awarded for using the “sorted” containers, but this may take additional time. Teams may wish to develop a strategy for using just one or both types of containers to maximize their point accumulation. Robots will operate within a fixed 10-foot square area. Two robots from competing teams will be on the operations area simultaneously competing against each other.
- **Automated Performance Task** – Using a pre-assembled VEX robot, teams will program the robot with the instructions needed to navigate through a predetermined maze. This task is not directly related to the recycling effort but gives the students an opportunity to acquire some of the logic and programming skills needed to be successful in this discipline. Points will be awarded based on the amount of time used to navigate through the maze. Points will be deducted for the robot touching the walls or crossing predetermined boundaries.
- **OVERALL SCORING** – The overall scoring will consist of totaling the points accumulated from each of the contest components: Teamwork, Craftsmanship Inspection, Remote Control Performance Tasks, and the Automated Performance Task. The team with the most accumulated points wins the competition.
- **EXAMPLE OF SIMILAR COMPETITION**  
Depicted to the right is an operating area for a similar type of robotic competition where the goal is for the robot to pick up and place billiard balls into a conical container. One team is responsible for collecting all striped balls while the other, all solid-color balls. The first team to place all of their balls in the container wins the competition.



For more information:

Website: [www.4engineering.org](http://www.4engineering.org)  
Contact: Roger Tormoehlen  
615 W. State Street  
West Lafayette, IN 47907  
Purdue University  
torm@purdue.edu  
765-494-8422