Robotics Challenge
“Search and Rescue Vehicle”

LEVEL: High School

TYPE OF CONTEST: Team

COMPOSITION OF TEAMS: 6-8 students per team

NUMBER OF TEAMS: Determined by the UCI MESA Staff

BACKGROUND: Recent earthquakes in Haiti and Chile have brought great chaos and devastation to many lives. In these extreme situations, it is crucial for different organizations to come together as one to bring aid to those in need. It is also a time when searching for and rescuing victims becomes a daily task. Rescue vehicles are an essential part of this process because they can navigate autonomously through hard to reach places and find any survivors.

The purpose of the competition is to encourage gracious professionalism that leaves everyone involved feeling valued with a sense of integrity and teamwork. The goal is not just to win, but to participate fairly and to extend gracious professionalism and respect to all teams and students involved. ©FIRST Robotics

OVERVIEW: Each team will design and build a human-operated and autonomous search and rescue vehicle that will navigate around debris, locate a survivor in the rescue zone, and escort it to the safety zone. On the day of competition, teams will be randomly paired, and each team will rescue one of the two survivors in the rescue zone. Teams will be timed individually and as a two-robot group. Additionally, teams will be required to submit an academic display.

MATERIALS: VEX Robotics Dual Control Starter Bundle – #276-2330-EASYC
Only parts included in this kit are allowed. Optional VEX Power Pack (#276-0036) can be purchased separately at www.vexrobotics.com.

Provided by UCI MESA:
- Field (see attached Field Map & Specifications)
- Survivors (2 soft flight golf balls)
RULES:

1. The team must design and build a human-operated and autonomous rescue vehicle entirely from the parts included in the VEX Robotics kit. No additional parts or source of energy other than the 14-AA batteries or power pack may be used.
   a. Modification of any of the kit pieces will result in disqualification. (i.e. sanding, cutting, melting, gluing, etc).
   b. The robot’s name and school must be clearly visible on the robot. A 3-point deduction will be assessed for failure to do so.
2. Teams will be grouped randomly on the day of the competition. Each group will perform the following task one team at a time:
   a. Manually navigate through a Debris Zone to the Rescue Zone.
   b. Manually locate one survivor and set up the vehicle for the rescue.
   c. Autonomously pick up the survivor and escort it to the Safety Zone.
   d. The second team will be allowed to go only after the first team has completely crossed into the Safety Zone.
3. Team members are not allowed in the Field at any time during a run.

Start Zone:

4. The start zone will be divided into two sections, A and B. For each group, teams will decide where to place their rescue vehicles and which team will go first.
5. The vehicle must be placed behind the Start Line and await the judge’s “START” command.
   a. The timer will begin when this command is given, so the vehicle must be ready to go, and cannot be touched once the timer starts.
   b. FALSE START:
      i. The vehicle is released before the Judge’s signal.
      ii. Each team will get two false starts, with the second one resulting in a disqualified run for that team.
   c. Interference that is out of the team’s control will not be deemed a FALSE START. Once the vehicle fully enters the Debris Zone, the run is considered legitimate and will be counted barring outside interference.

Manual Navigation through Debris Zone:

6. One team member will operate the rescue vehicle and navigate it through the debris field consisting of five immovable objects. (See Field Map)
   a. It must stay within the given boundaries and may not return to the Start Zone at any time.
   b. The vehicle may navigate around the objects only. A 3-second penalty will be assessed for displacing the objects.
   c. Should a team displace any of the objects or survivors, the field will be reset to its original state before the next team makes its run.
7. The vehicle must be driven to 1 of the 2 survivors in the Rescue Zone and positioned in a manner that is ready for autonomous operation.

Autonomous Navigation & Survivor Rescue:

8. In autonomous mode, the vehicle must pick up the survivor completely off the ground and carry it to the Safety Zone. A 5 second penalty will be assessed if the survivor is pushed, rolled, thrown, etc. to the Safety Zone.
Safety Zone:

9. The timer will be stopped when the entire vehicle has crossed into the Safety Zone.

10. The second vehicle must wait for the first vehicle to complete its run before starting.

11. A 10 second penalty will be assessed if the survivor is not taken to the Safety Zone. (i.e. the vehicle successfully crosses into the Safety Zone but the survivor was not picked up or it was dropped along the way.)

12. Each vehicle will be given a maximum of 2 minutes to complete its run.

Academic Display:

13. Each team must submit a display with a maximum area of 4ft x 3ft. This is equivalent to a tri-fold display board.

14. The following items will be scored:
   a. Student Names, School, Rescue Vehicle Name
   b. Vehicle Synopsis
      i. This component is intended to introduce your rescue vehicle to the reader. Information in this section can include, but is not limited to: purpose, scientific and engineering principles, design and building process, technical data of the vehicle, challenges and recommendations, etc.)
      ii. Use of graphics, charts, tables, etc.
   c. 3-part Scale drawing
      i. 3 Views: 1) Top 2) Front 3) Side. Each view must be on a separate piece of 8.5”x11” paper.
      ii. Proper labeling of all dimensions
      iii. Scale (example: 1cm=1in)
      iv. The drawings may be hand-made or computer generated images. They cannot be photographs of the device.

JUDGING:

1. Teams will be randomly matched with another school.
2. Each team will get 2 non-consecutive runs. Adjustments may be made to the vehicle between runs but teams must remain within the designated competition area. When called, groups will have 2 minutes to set up for their run.

SCORING:

1. Individual time: best of the two runs. Worth 50 points towards Overall Score.
2. Group time: best combined time from the same run.
3. Academic Display: up to a maximum of 50 points.

AWARDS: 1st, 2nd, 3rd: Overall Score (Display + Individual Time)
1st, 2nd, 3rd: Best Individual Time
1st, 2nd, 3rd: Best Group Time

ATTACHMENTS: - Field Map – High School
The Field will be made of 3/8” Multi-purpose EVA foam mats. www.getrung.com/10mm

The outer walls will be made of 3/4” plywood.