ASME
Extended Reality Challenge:
Autonomous Vehicles

Rules

2023

ATTENTION E-FESTERS! Please read this important announcement about

ASME E-Fests® and ASME EFx® Events in academic year 2022 & 2023

We will be returning to IN-PERSON ASME EFx® events in academic year 2022-2023! EFx events will be IN-PERSON locally organized throughout the world and several EFx events will include our ASME competitions. Please visit the ASME E-Fest website for an updated list of events at https://efests.asme.org/. Events will be added as they are confirmed.

ASME will ALSO continue to host our two signature FULLY virtual events: E-Fest Careers (Nov. 12, 2022) and E-Fest Digital (March 25, 2023).

We encourage students, competitors, and faculty members to take advantage of the learning experiences provided by both our competitions and other digital offerings throughout the year. Questions may be directed to efests@asme.org.

The Extended Reality Challenge: Autonomous Vehicles will ONLY be held VIRTUALLY at E-Fest Digital.

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1.   Objective

The ASME Extended Reality Challenge (XRC): Autonomous Vehicles provides an opportunity for students to apply course learnings in a virtual reality competition with a focus on CAD and programming skills.

2.   General Info

2.1.   Superiority of the rules

These rules have been established by the ASME Extended Reality Challenge Committee. Should any conflict arise between these rules and those of the ASME, the ASME rules shall take precedence. Should any conflict arise between these rules and other information regarding the ASME XRC, whether generated by the ASME or any other organization, these rules shall take precedence.

2.2.   Questions

Post questions about the competition, rules, and software platform to the XRC forum: https://forums.siminsights.com

General questions about ASME E-Fest Digital may be sent to efests@asme.org

2.3.   Location and competition information

All XRC competitions will be held virtually. The competition dates, deadlines, and rules will be posted on the official ASME XRC website. Teams and individuals wishing to participate should consult the website and forum.

Official website: https://efests.asme.org/competitions/asme-extended-reality-challenge

2.4.   Definitions

Behavior graph: algorithm that is called in the simulation to control the virtual object
Competition: XRC events where the entries are tested
Competitor: an individual who is competing in the competition
Individual: a single participant of a competition and likely a team member
HyperSkill: the XRC software platform
Registration: the process to record individual and team information by ASME
Simulation: the environment in which submissions are tested
SimInsights: XRC sponsor and creator of HyperSkill
Virtual object: 3D models uploaded to HyperSkill are treated as a Virtual Object (VO)

3.   Problem statement

Design your own autonomous vehicle! Create a vehicle design using CAD, build a robust algorithm to navigate around a race course, and compete head-to-head against other teams in a virtual race track.

4.   Deliverables

Student teams will design a vehicle and build a navigation algorithm. **Teams may consist of one or more students.**

4.1.   Registration and HyperSkill access

Teams must choose one team captain that will register for themselves AND register the vehicle through the E-Fest Digital registration form before the XRC deadline.

All competitors must register for E-Fest Digital before the XRC deadline.

Once registration is complete, registrants will be emailed the HyperSkill User Guide which will include instructions to create a HyperSkill account and operate HyperSkill for the competition.

Each competitor can create a HyperSkill account if they wish to aid in behaviour graph and vehicle development. One team member account per team will serve as the official team account and will contain the final vehicle and behaviour graph for that team.

4.2. Vehicle design and constraints

Each team will design one vehicle using the 3D CAD software of their choice. Once complete, the vehicle design will be exported in the file format specified in the HyperSkill User Guide and uploaded to HyperSkill.

The original CAD files must also be submitted before the posted deadline to ensure that the design was created by the team. Designs that weren't created by the team will be disqualified.

4.2.1. Vehicle Style Constraints

Vehicles must look like a 4-wheel vehicle and fit within the min and max rectangular prism dimensions. The size will be checked by the judges.

4.2.2. Vehicle Size Constraint

Max: 7m tall x 7m wide x 10m long
Min: 1m tall x 2m wide x 3m long

4.2.3. Vehicle Speed Constraint

The max speed of the vehicle will be limited to ensure stable performance of the vehicles and Hyperskill. The max speed will be specified in the User Guide.

4.3. Vehicle testing and course

Once the vehicle and behavior graph are complete, teams may test their designs in HyperSkill on the practice courses provided and adjust their designs to improve performance until the submission deadline.

Instructions on accessing the practice courses will be described in the HyperSkill User Guide.

The course during the competition won't be available to teams beforehand so the control algorithm must be robust enough to handle changes.

4.4. Deliverable submission

Following the registration deadline, the list of teams will be sent to the competitors along with assigned team numbers.

Teams will be required to share their official vehicle with the head judge within Hyperskill by the posted deadline.

The vehicle name must include the team number and team name before sharing with the head judge.

Late submissions will not be accepted.

5. Competition rounds and ranking

Each team will submit one vehicle and associated behavior graph. Each vehicle will be entered into a virtual race against one other team on a course that was not previously available to the teams. All races will be available to publicly view live online.

Ranking will be based on the shortest time it takes to complete the course.

Vehicles that lose control will be reset at the discretion of the head judge and will be held in place for 5 seconds as a penalty.

Vehicles that aren't able to complete the course without being reset will be ranked lower than teams that can complete the course despite the time.

The competition will take place in two rounds:

5.1. Elimination round

All teams will compete in the elimination round prior to E-Fest Digital (date TBA)

5.2. Final competition

The top 10 teams or individual competitors from the elimination round will advance to the final competition to be held at the E-Fest Digital (March 23, 2023).

6.   Eligibility

6.1.   Team eligibility

The Extended Reality Challenge is both a group and individual based competition. Entry is open to any college, community college, or university in the world.

6.2.   Team member eligibility

Students participating in the competition must be enrolled as an undergraduate engineering student in any engineering discipline.

Full-time undergraduate engineering students, enrolled for the next upcoming semester/quarter, or have been enrolled for the previous semester/quarter, but graduated no earlier than six months prior to the competition date, are eligible to fully participate in the competition.

6.3.   Team limits

Teams can be 1 to 10 members each and the total number of teams will be limited to 100. Teams will be accepted on a first-come-first-serve basis.

Each student may only participate on one team and there is no limit on the number of teams from each school.

7.   Clarification and modification of rules

These rules may be modified by the competition judges as necessary to maintain the competition as a challenging and rewarding experience for engineering students. No changes by any party shall be made without the written consent of the XRC committee chair. Judges may at their discretion disqualify teams that are not competing in the spirit of the competition.

Questions or recommended changes to the rules should be submitted to the XRC Question Forum.

8.   Prizes & winners

- 1st place - $250
- 2nd place - $150
- 3rd place - $75

Competition winners will be announced during E-Fest Digital during the awards ceremony on March 23, 2023 (Time TBA).