

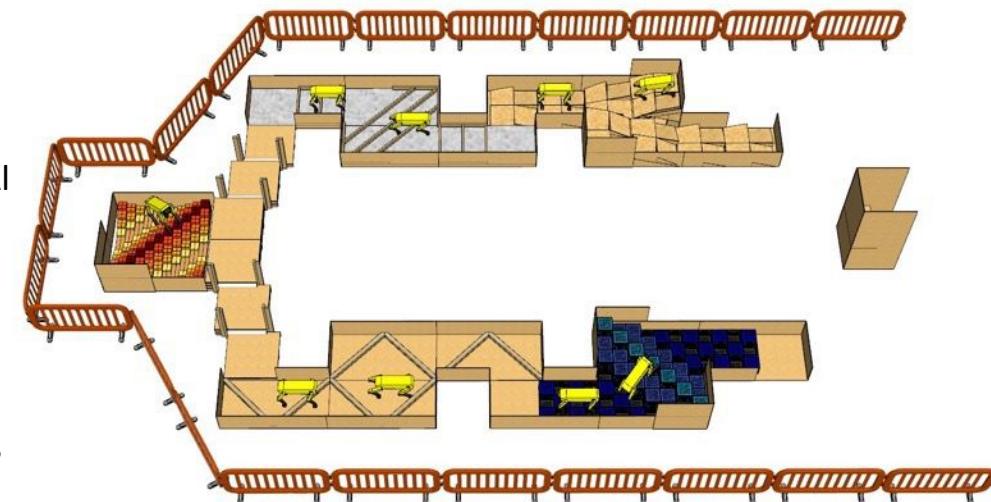


Objectives

ICRA Autonomous Quadruped Robot Challenge

Public Evaluations Inspire Innovation and Collaboration:

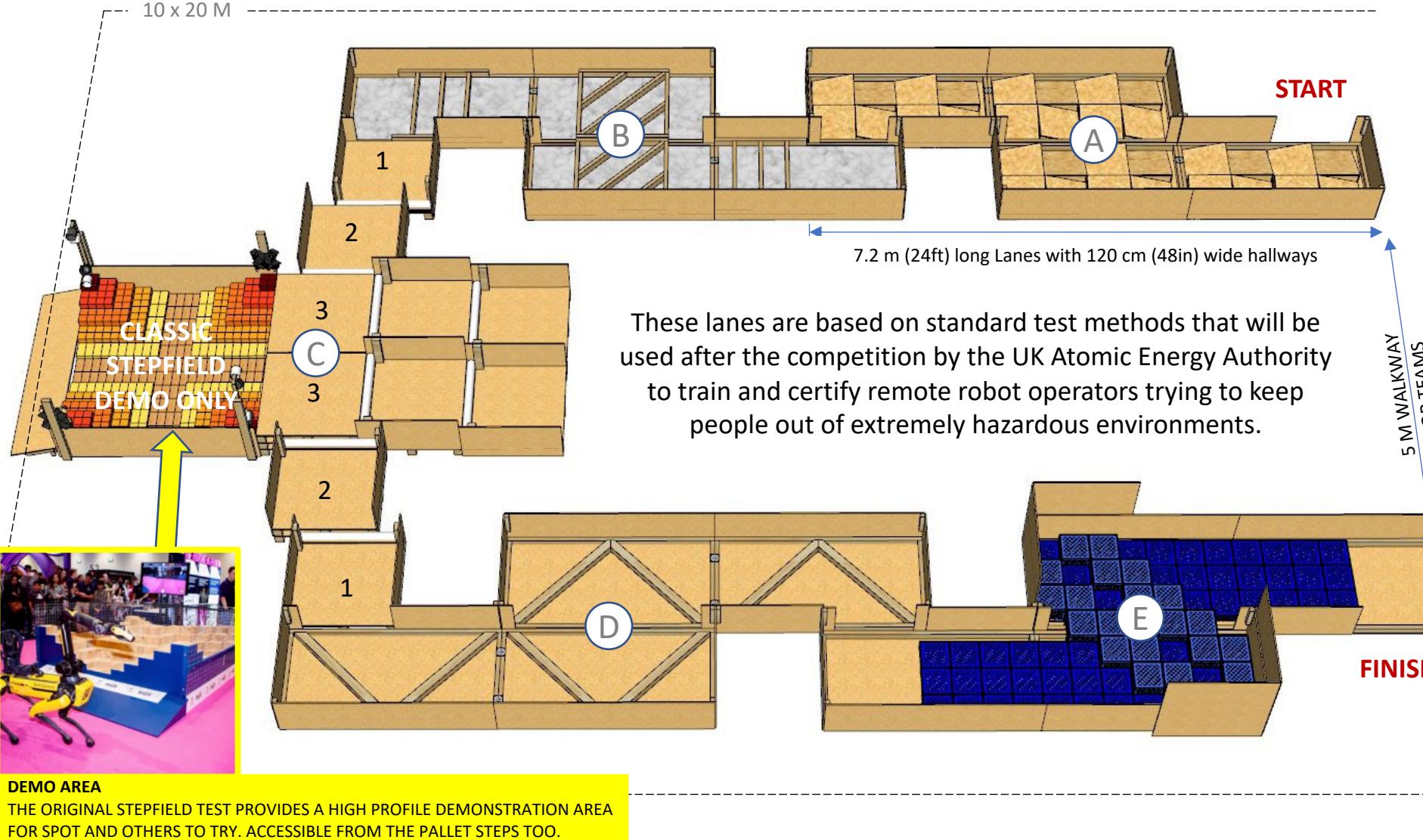
- Evaluate and Compare:** The main objective for teams is to challenge and learn about their robotic system capabilities while refining their approaches. Teams also learn what it will take for their robots to succeed in real-world applications. The best scoring teams can win awards to recognize their accomplishments.
- Inclusiveness:** Teams get as many trials as possible within the time available, so they can rigorously evaluate their robots across the terrains, obstacles, and tasks that support their research objectives. Teams schedule their own test plan each day to manage their own risks.
- Resilience to Failure:** Robot resets are allowed during trials to ensure some level of measurable success. A 2-minute penalty allows the robot to be safely carried and reset in the previous end zone to continue. The best “mini-trial” score counts. No talking to the operator is allowed during the trial except to reset a robot. The operator or team member with the best view of the robot should declare a reset.
- Remote Control:** Operators must remotely control their robots while out of sight of the lane. All situational awareness must come through the operator interface. No talking to the operator is allowed during the trial except to reset a robot. The operator or team member with the best view of the robot should declare a reset.
- Autonomy:** Autonomous behaviors are encouraged because real-world communications between the robot and the remote operator is often unreliable. NO INTERACTION WITH THE OPERATOR INTERFACE is allowed between end zones within each lane. Successful autonomous traverses score a 4x multiplier because autonomy is often slower than teleoperation. The operator can take over control at any time to finish as a teleoperative traversal.





Arena Overview – Flat / Easier Setting

ICRA Autonomous Quadruped Robot Challenge



A CROSSING RAMPS

CROSSING RAMP TERRAINS

Square ramps (15 degrees) are slippery like dust covered concrete after a collapse. They can be rotated to form different terrains.

Easier: Flat

Harder: Sloped 15 degrees

B SOFT FOAM

Thick foam floor allows robot feet to sink 10cm (4in) like sand, mud, or puddles. There are also step-over obstacles 10cm (4in) tall.

Easier: Flat

Harder: Sloped 15 degrees

C PALLET STEPS WITH PIPES

Elevation changes using 15cm (6in) tall covered pallets with rolling pipe edges to step over, which make them hard for tracked and wheeled robots.

Easier: Straight

Harder: Offset

D K-RAIL DIAGONALS

Smooth floors are slippery like dust covered concrete after a collapse plus diagonal rail obstacles to step over 10cm (4in) tall.

Easier : Flat

Harder: Sloped 15 degrees

E CRATE STEPFIELD – 15cm (6in)

Several reconfigurable topographies are possible with negative obstacles (holes) too.

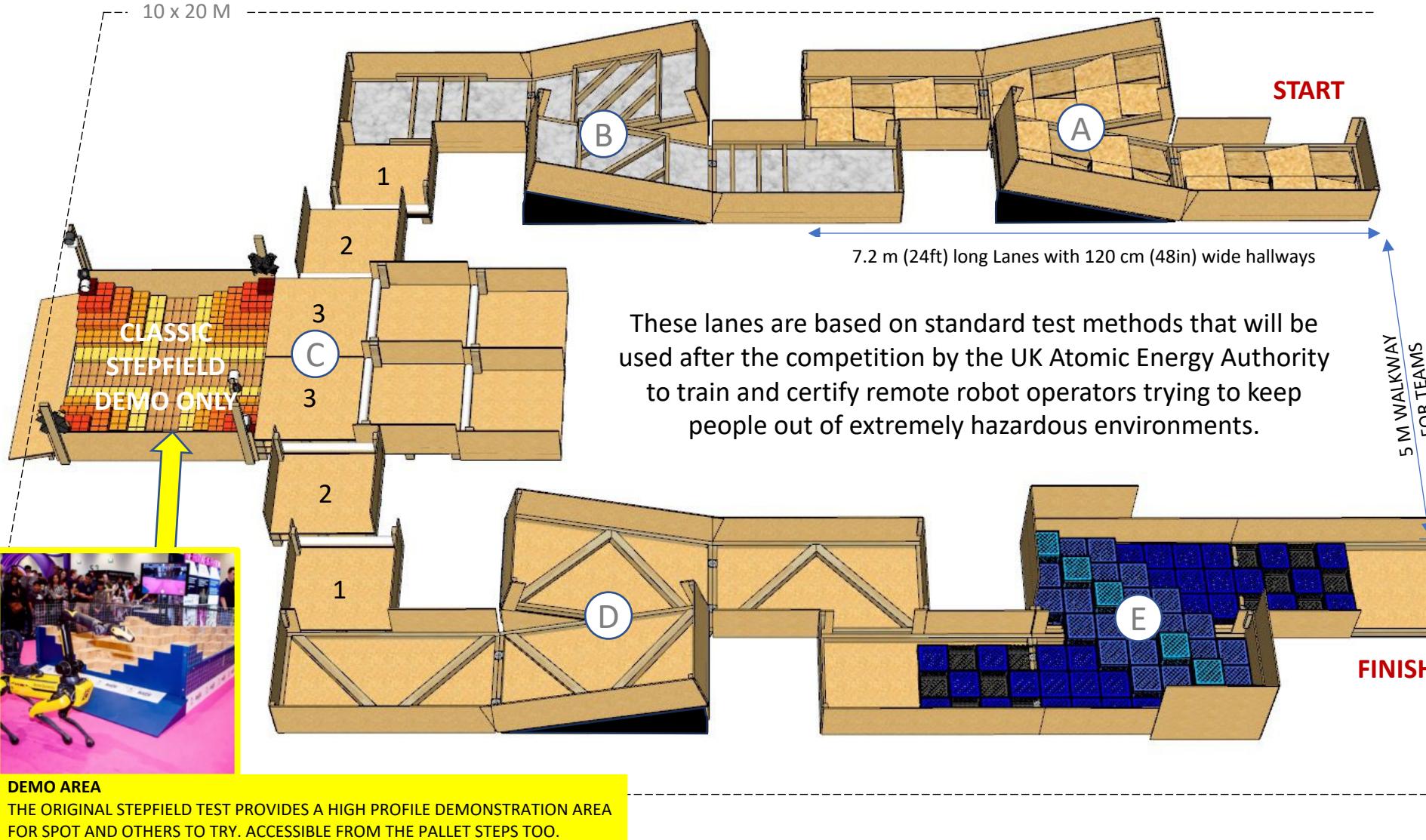
Easier : Diagonal Gap

Harder: Diagonal Hill



Arena Overview – Sloped / Harder Settings

ICRA Autonomous Quadruped Robot Challenge



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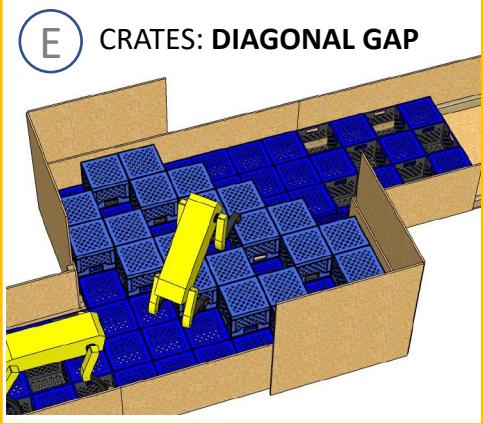
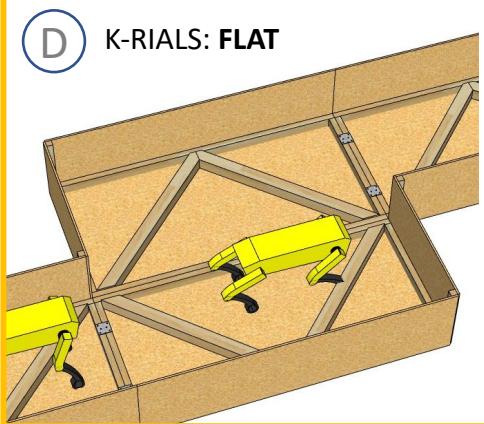
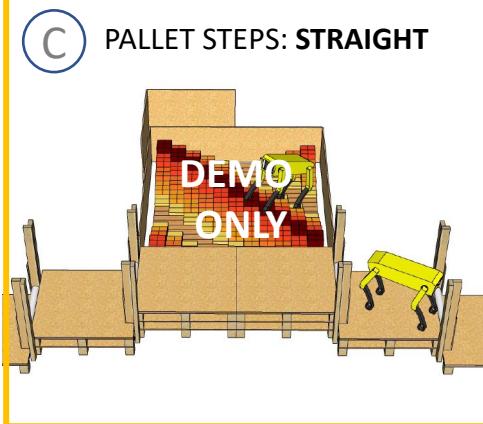
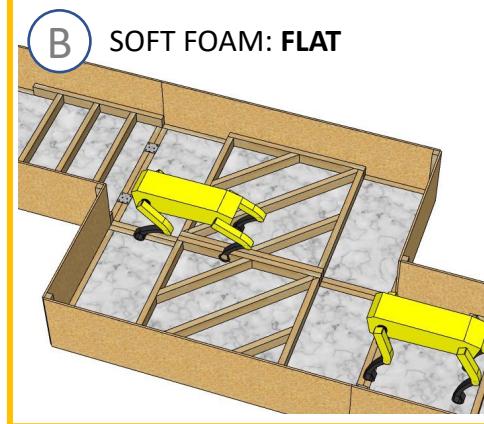
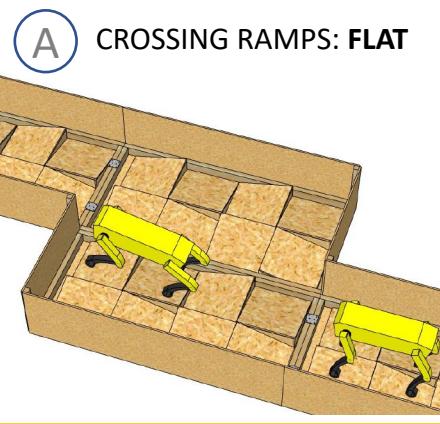
Harder: Diagonal Hill



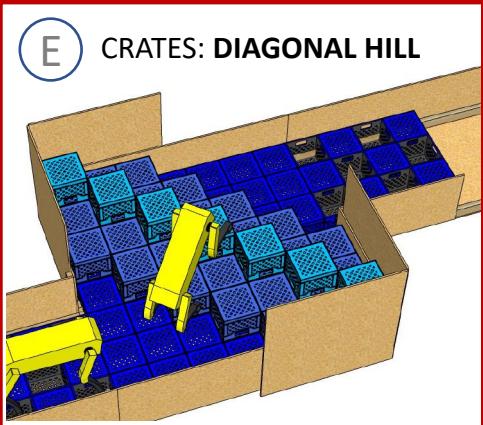
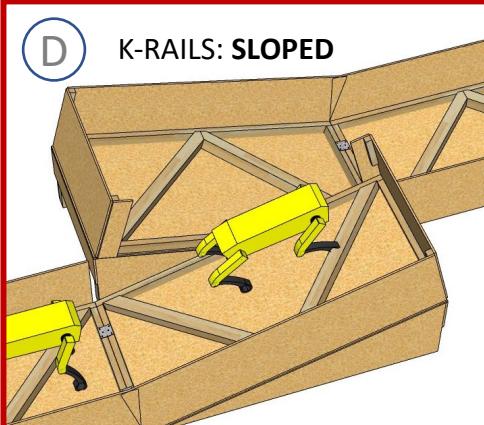
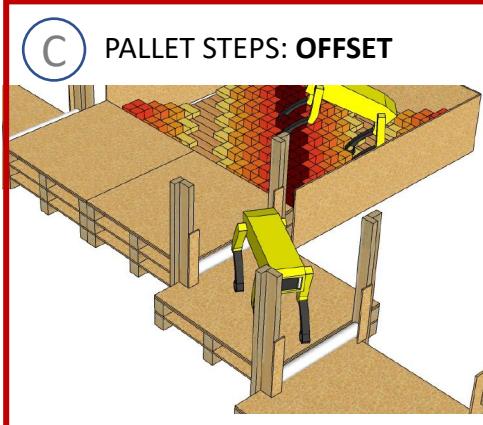
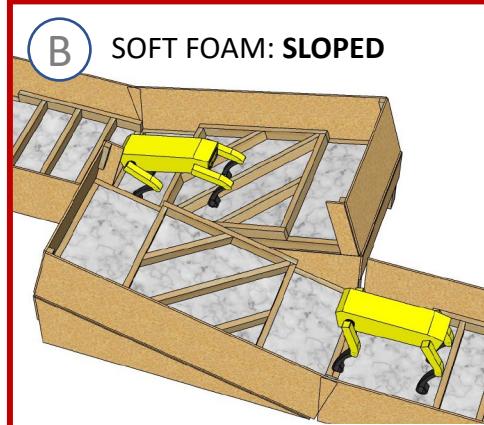
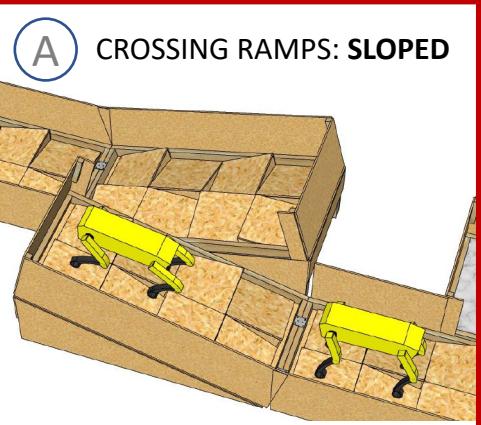
Flat/Easier or Sloped/Harder Lane Options

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FLAT / EASIER LANE SETTINGS



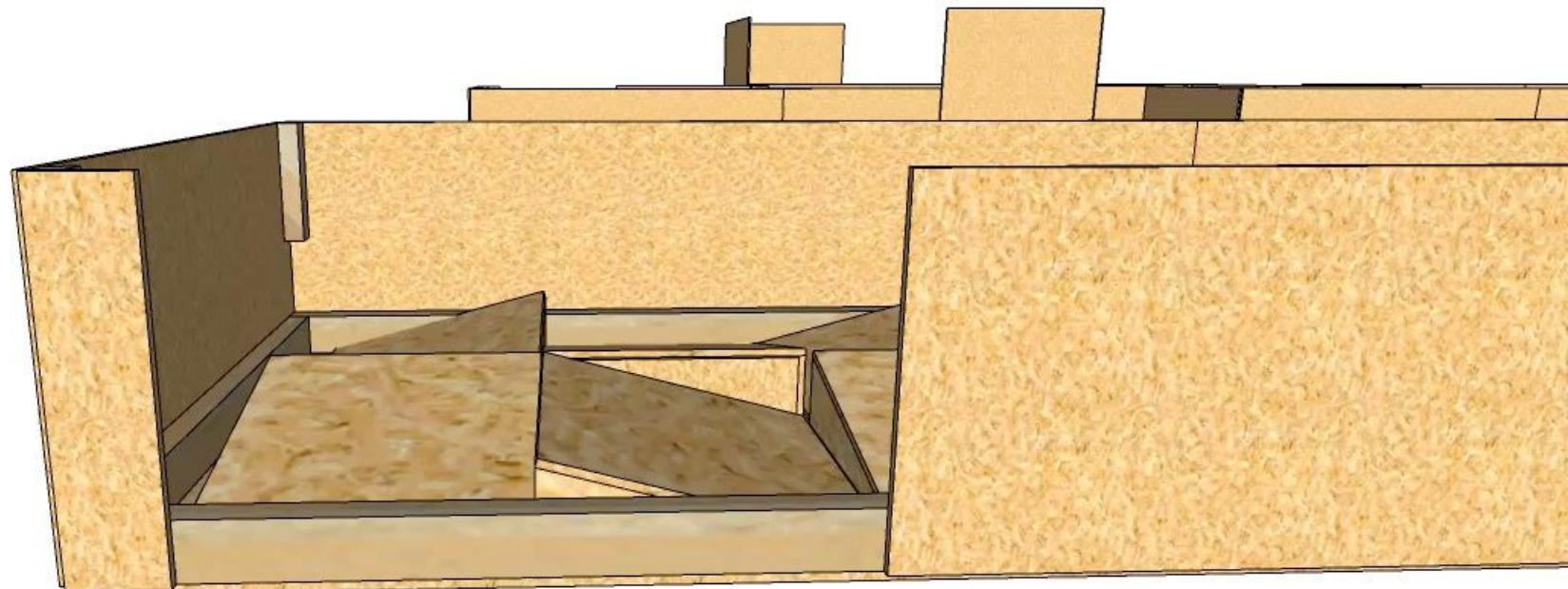
SLOPED / HARDER LANE SETTINGS





Flat / Easier Lanes Fly Through

ICRA Autonomous Quadruped Robot Challenge





Sloped Lane Option

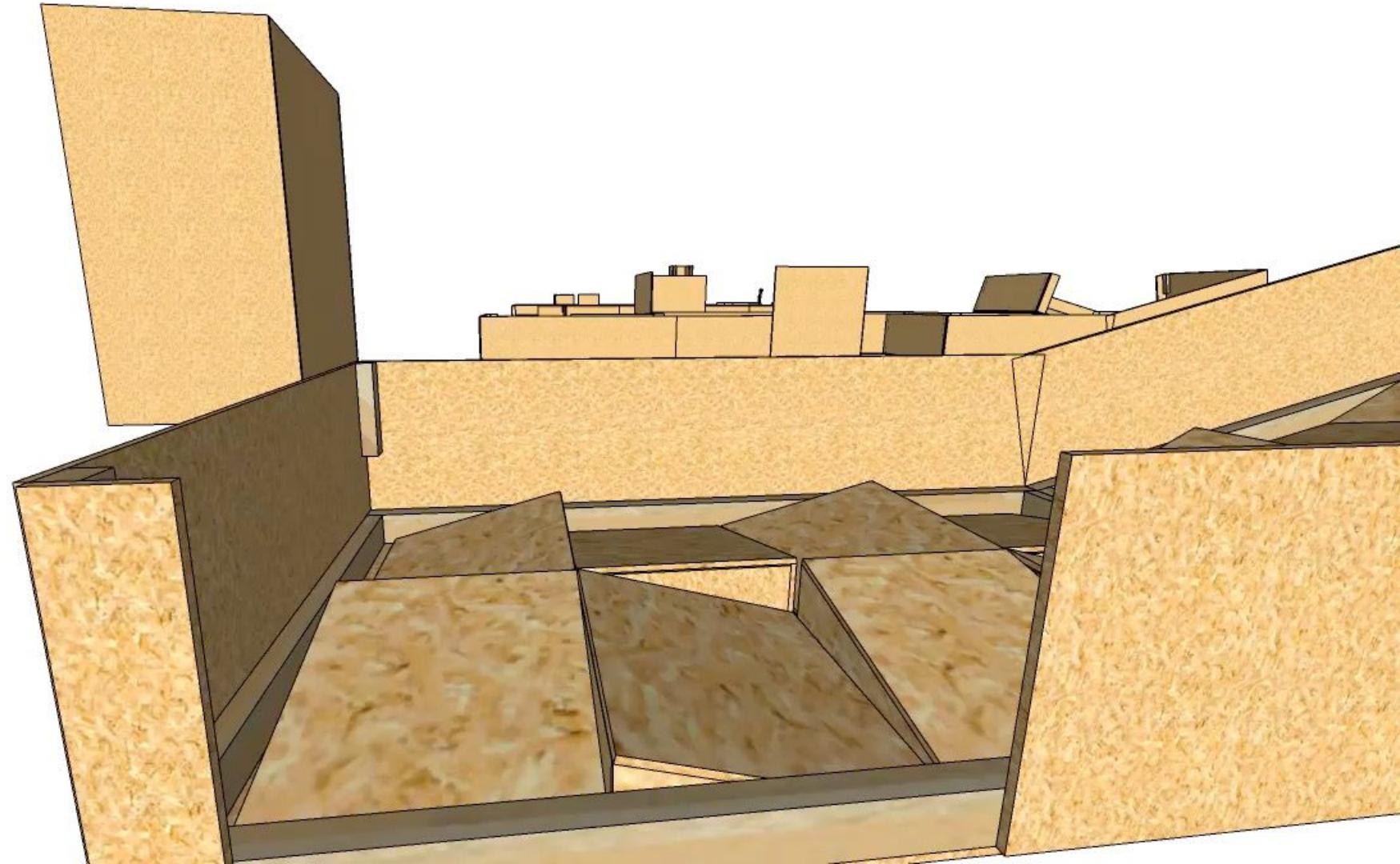
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Sloped / Harder Lanes Fly Through

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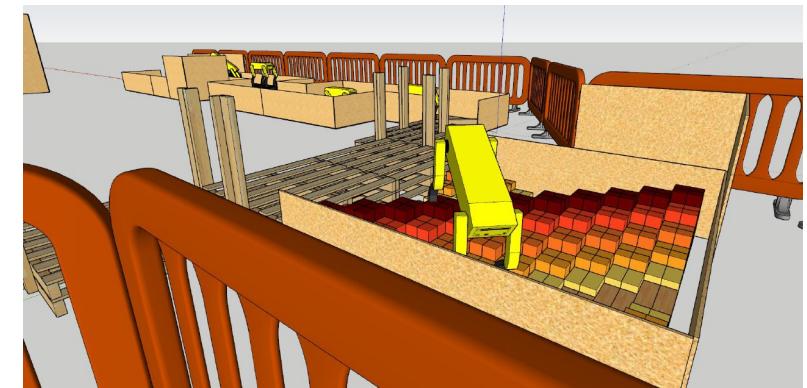
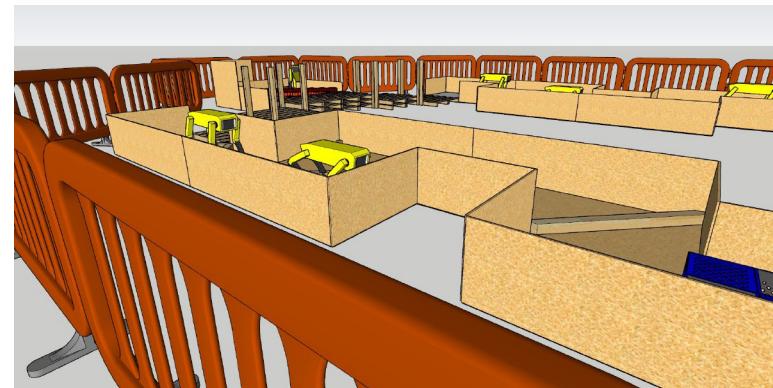
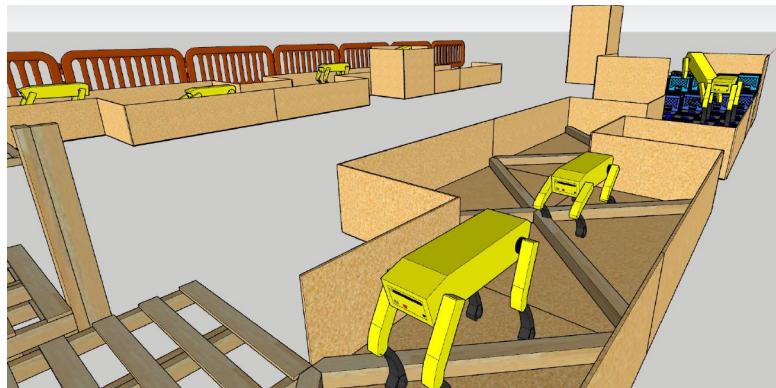
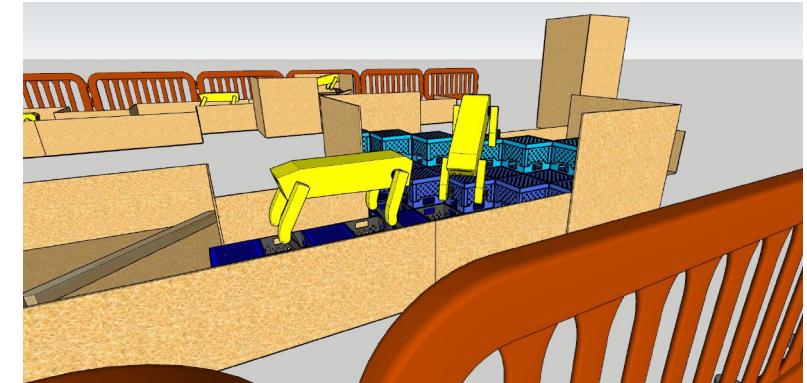
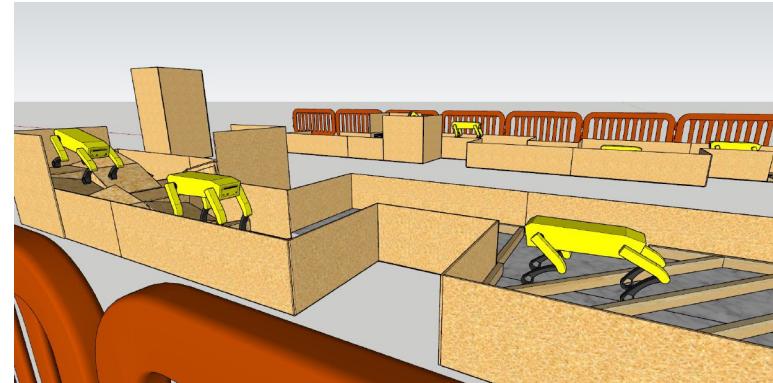




Audience Views

ICRA Autonomous Quadruped Robot Challenge

Walls are all 60cm (24in) tall, enough to contain the robot and guide autonomous path planners while short enough for the audience to see over. Teams can step over if needed to place their robots in any of the individual lanes for practice or CONCURRENT early round scoring to enable more team trials.





Rules

ICRA Autonomous Quadruped Robot Challenge

Trials start every 20 minutes (00/20/40 minutes past the hour)

- 5 minutes to set up
- **10 minutes of operating time**
- 5 minutes to exit

Prelims: Single Lane Trials (concurrent test lanes on a rotating schedule)

- Enables optimization for each challenge task to refine approaches
- All teams get 10 trials – 2 trials in each lane in FLAT/EASIER and SLOPED/HARDER configurations.
- Teams can **DROP 1 of 2 scores** in EACH LANE, so are encouraged to try the harder configurations.
- 5 concurrent start points with 20 minute trials = 15 trials per hour

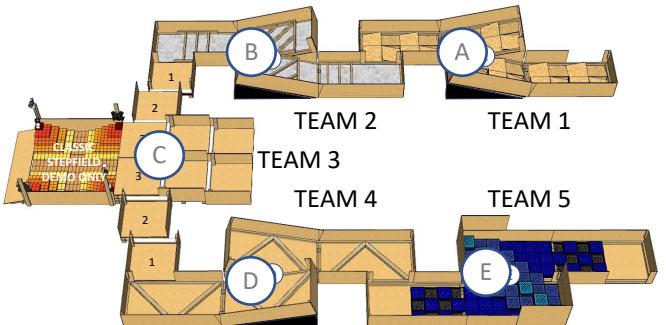
Semis: Multi Lane Trials (left-side and right-side sequences)

- Requires balancing system configurations for different lane sequences
- Perform lanes in any order according to risk, but have to drive a bit further if out of order.
- Teams can **DROP 1 of 4 scores** in the two sequences.
- 2 concurrent start points with 20 minute trials = 6 trials per hour

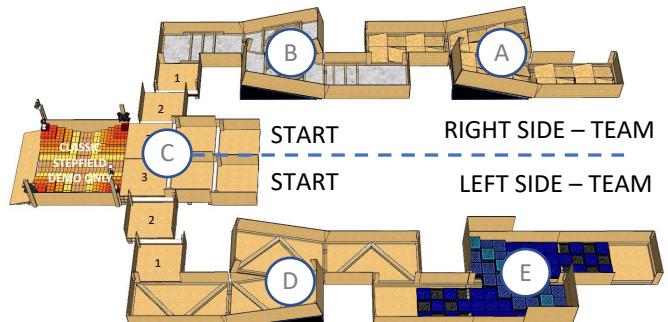
Finals: Continuous Circuit (clockwise then counter-clockwise sequences)

- This is a good final trial for the best performing teams because it requires traversing ALL the available test lanes in some prescribed order. Or teams can be allowed to choose their order.
- The time limit should be set to enable the best teams to finish all the terrains. If multiple teams finish all the lanes, the most efficient time is the winner.
- Perform lanes in any order according to risk, but have to drive a bit further if out of order.

PRACTICE and PRELIMS | 5 START POINTS



SEMIS | 2 START POINTS





Schedule

ICRA Autonomous Quadruped Robot Challenge

DAY 1 – Tuesday, May 30th

DAY 2 – Wednesday, May 31st



Scoresheet

ICRA Autonomous Quadruped Robot Challenge

NOTE: For continuous lane sequences performed in the order they are connected, skip the RETURN line for each lane until completed on the way back up range.

- A** Crossing Ramps **B** Soft Foam **C** Pallet Steps **D** K-Rail Diagonals **E** Crate Stepfield

ELAPSED TIME

MM : SS

TELEOP POINTS

AUTO POINTS



Venue Layout

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