

LAWRENCE TECHNOLOGICAL UNIVERSITY  
**ROBOFEST**

2022

**GAME**

# OceanBots

## (Environmental Rescue and Clean Up)

V 1.2 – **Final** Version for 2022 season (plus Q&A update)

This file is posted on **Get Involved** → **Game** page  
Coaches are responsible for communicating rule updates to contestants

[www.robofest.net](http://www.robofest.net)

[robofest@ltu.edu](mailto:robofest@ltu.edu)

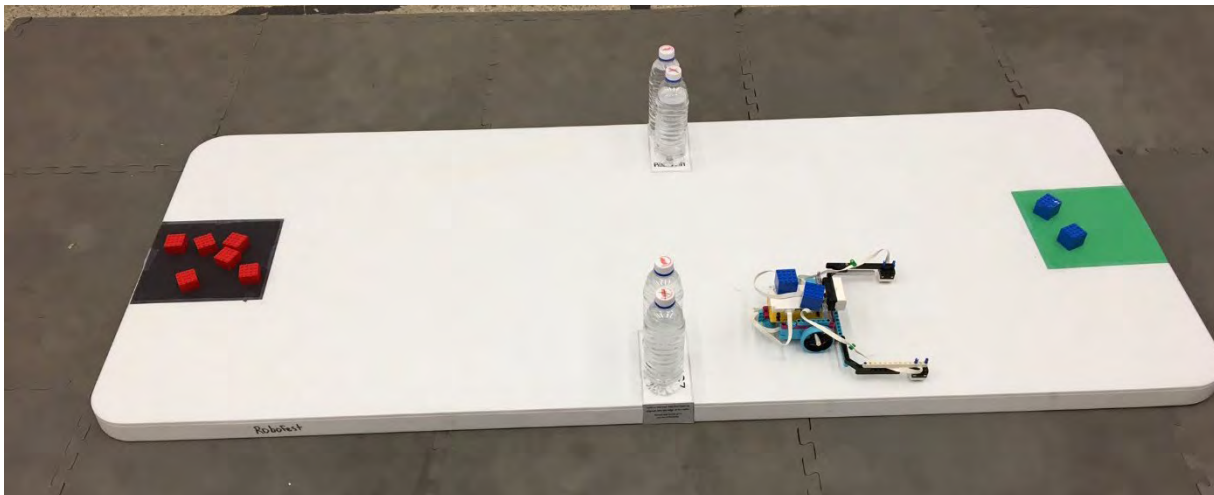
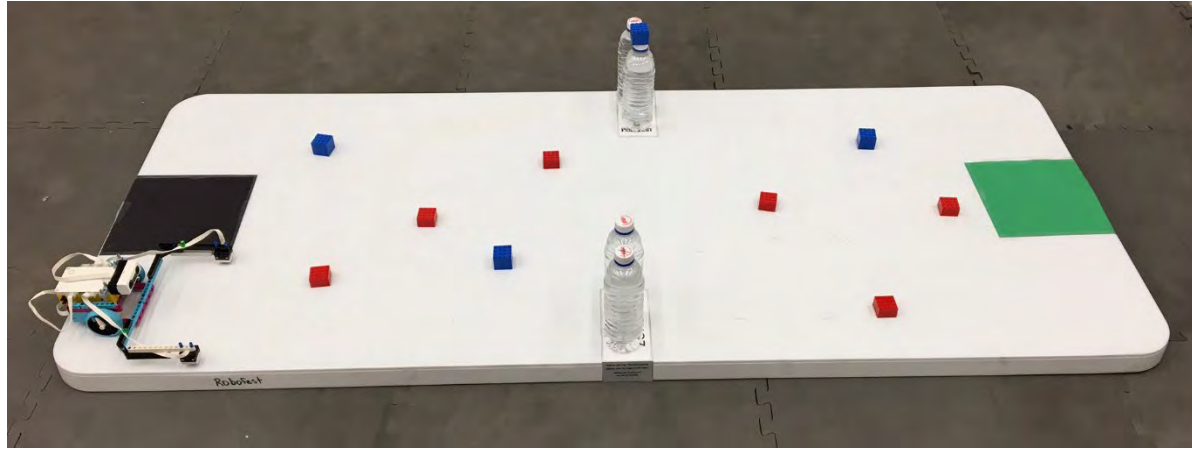
248-204-3568

Room J233 Taubman Complex, LTU  
21000 West 10 Mile Road, Southfield, MI 48075, USA

# 1.1 Game Scenario

- The Sea Turtles are in trouble! A garbage barge has spilled Trash into the Turtle's habitat and the researchers need to see if the Turtles are injured and to clean up the Trash.
- You must build and program an autonomous robot that will find the Turtles (blue LEGO blocks), bring some onboard the robot, deliver others to the researchers on the beach (green target) AND find the Trash objects (red LEGO blocks) and deliver them back to the garbage barge (black target) while avoiding the pilings (water bottles) without human help in 2 minutes.
- Maximum points will be given if all the Turtles and Trash items are delivered to their targets (onboard robot or target zone), and partial points will be given if items are delivered to the opposite target or moved from their original location. Points will be lost if the pilings are displaced.
- For Jr. Division, the location of the Turtles, Trash and pilings will be unveiled at the start of a 30-minute work time. For Sr. Division, some locations will be unknown until after impound.
- Additional unknown tasks and/or objects may be added for the World Championship competition.

# 1.2 Game Synopsis



- Move 2 Turtles (blue blocks) and 6 Trash objects (red blocks) from the table into their respective targets AND bring 2 Turtles onboard the robot
- For a game run, max 2 minutes are given and one full-reset is allowed
- All the tasks must be done autonomously without any external help
- UTF (Unknown Task and Factors) will be unveiled just before the 30 minute work-time
  - The starting location and orientation of the robot
  - Remaining object locations (Jr Div only)
  - New items/landmarks may be added on the table for the Game-Ending task
- STEM Learning Goals
  - Geometry/degrees/logic/computational thinking
  - Localization and navigation
  - Object detection and manipulation

## 2. Demo Videos

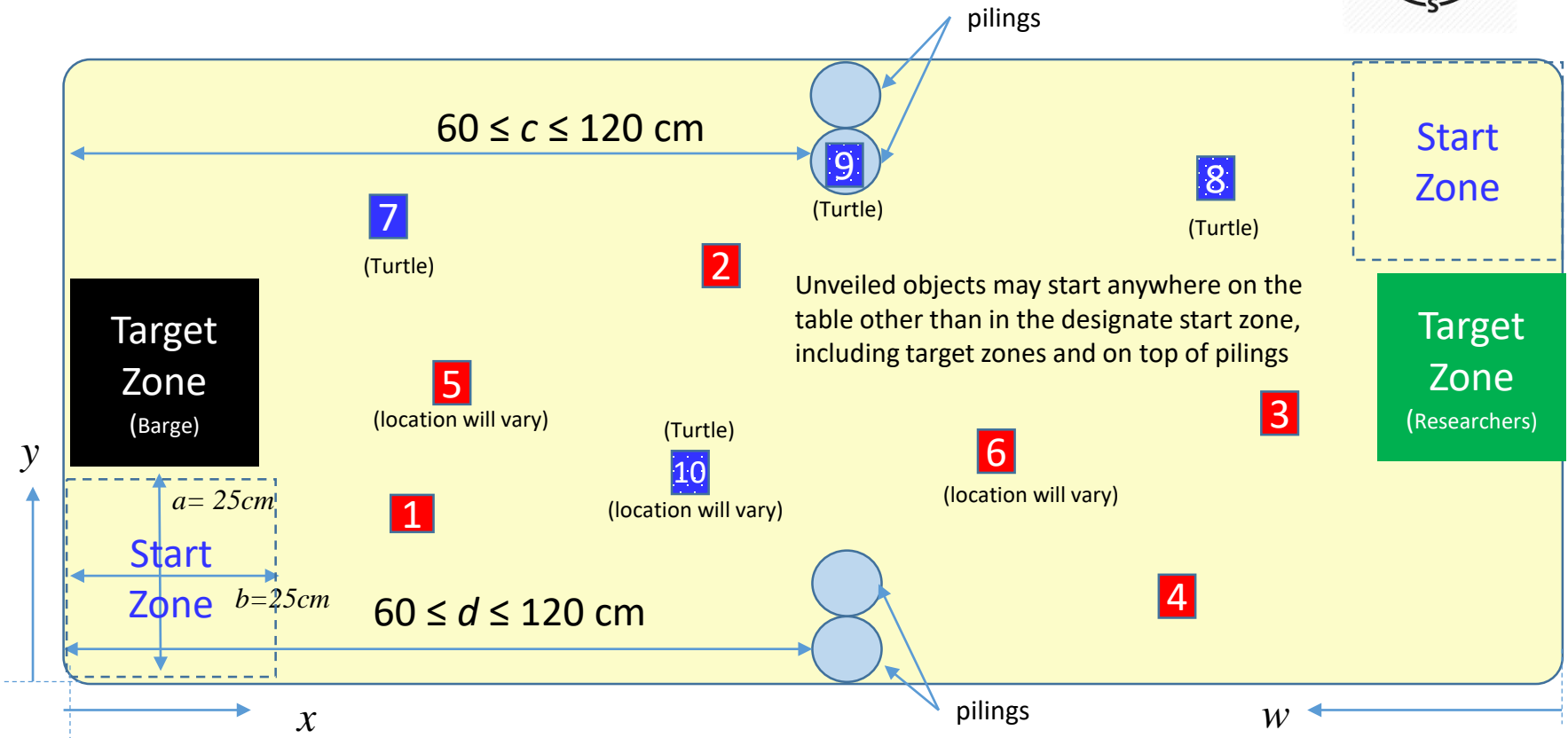
[Demo 1](#)

[Demo 2](#)

[Demo 3](#)

[Demo 4](#)

# 3. Playing Field (6ft table) Setup



Unveiled objects may start anywhere on the table other than in the designate start zone, including target zones and on top of pilings

# / color	x (cm)	y (cm)	w (cm)
1	40	20	
2	80	50	
3		35	30
4		10	45
5	unveiled		
6	unveiled		
7	35	55	
8		60	40
9	on piling (see diagram)		
10	unveiled		

- Start zone (black side or green side), robot location and robot orientation will be unveiled **before the work-time**
- Jr: c, d, and locations of **5, 6, and 10** will be unveiled **before the work-time**
- Sr: c, d, will be unveiled **before the work-time**, locations of **5, 6, and 10** will be unveiled **after impounding**



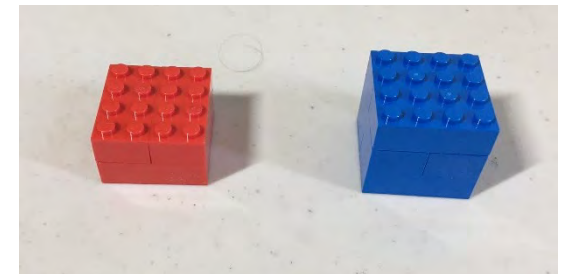
- Hole reinforcement stickers are used to mark the location of objects
- Object can be placed in any orientation/location as long as sticker is covered

# 4. Differences between Jr and Sr age divisions

	Junior (5 <sup>th</sup> ~ 8 <sup>th</sup> grades)	Senior (9 <sup>th</sup> ~ 12 <sup>th</sup> grades)
Game-Ending Task	Easier	Harder
Location of objects	Unveiled before worktime	Unveiled after worktime
Location of the bottle barriers	Unveiled before worktime	Unveiled before worktime
Number of Trash objects	6	
Number of Turtle objects	4	
Number of onboard computer controllers	One	No limit
Vision sensor	Not allowed	Allowed

# 5. List of Materials/Properties of the Field

- 6ft plastic folding table placed on the floor:
  - 30"x72" (*actual* size is about 75 x 182cm)
  - The recommended brand is "LifeTime". The 4 corners are rounded with a radius of 4cm ~ 7cm. Thickness is about 4.5cm. Thickness may impact how objects leave the table
  - The surface is light in color such as white, gray, or almond; however, the exact size, color, brightness, and edge shape of the table is unknown until the competition day
  - Fold-In-Half plastic tables can be used if the center seam is covered with tape similar to the table color. The color of the tape would also be an unknown factor in that case
  - Pieces of plywood cut similarly to the folding tables can be used if plastic folding tables are not available
- Floor color under tables may vary: unveiled at the beginning of competition day, possibly not homogeneous. However, all the colors should be noticeably darker than the table color
- 4 Water Bottles: 500ml (16.9 FL Oz) filled bottle. The height is about 20cm. Bottle diameter can be 5.5-7cm. Cap must be flat enough to support a Trash or Turtle object
- Bottle (Piling Zone) locator [template](#). Cut out templates and tape to table
- Green Target Zone: green paper ("Gamma Green" or similar, 21 cm x 21 cm), all the edges of the paper are scotch-taped to the table
- Black Target Zone: black paper (21 cm x 21 cm), all the edges of the paper are scotch-taped to the table
- 6 Trash objects, each made from (4) red Lego 2x4 bricks
- 4 Turtle objects, each made from (6) blue Lego 2x4 bricks
- Hole reinforcement stickers: used to mark the location of objects ([link](#))



Trash object

Turtle object

## 6. Violations, Full-Reset, End of Game Declaration

When any of the following violations occur, Judges shall stop the game play (and robot if still moving) immediately to avoid further disruption of the field:

- Human touch of the robot or playing field materials. Once the robot starts moving, the player cannot touch it
- Robot falls off the table (Any part of the robot touches the floor)
- Any other illegal activities that Judges determine

The team can request one-time full-reset (with penalty points) at any time **OR** declare the end of run. If reset is selected, time continues to run while Judges reset the table.

Players can call for the end of the run but should not move the robot until instructed by the judge.

If the robot still moving when team calls “end of run” (or at the time limit) then no points will be awarded for the end of task which will require stopping.



## 7. Procedure/Rules to Play 2 Rounds (1/2) for in-person competition

- 1) Only contestants are allowed to access the pit area, team tables, practice fields, and official game fields throughout the competition, including during the setup time before the opening ceremony, during work time and breaks
- 2) When Unknown Tasks and Factors (UTF) are unveiled, teams will be provided a hard-copy of the UTF or it will be projected/displayed on a screen. See 9.1 and 9.2 for UTF examples
- 3) Teams will be given a 30-minute work-time after UTFs are unveiled to work on their robots. Prior to the start of the work time, all people except contestants and authorized staff/volunteers will be **dismissed** from the competition area(s)
- 4) During the practice time, teams must share the playing fields
- 5) All teams must submit their robot to the impound area when the 30 min work-time has expired. Robots may be taken to be impounded early. Only one team member should deliver the robot to the impound table. Penalty may be applied if not impounded in time
- 6) During the impounding process, Judges will inspect the robots. (Size of the robot, Team ID & Name, “Front” label, number of computer controllers, etc.)

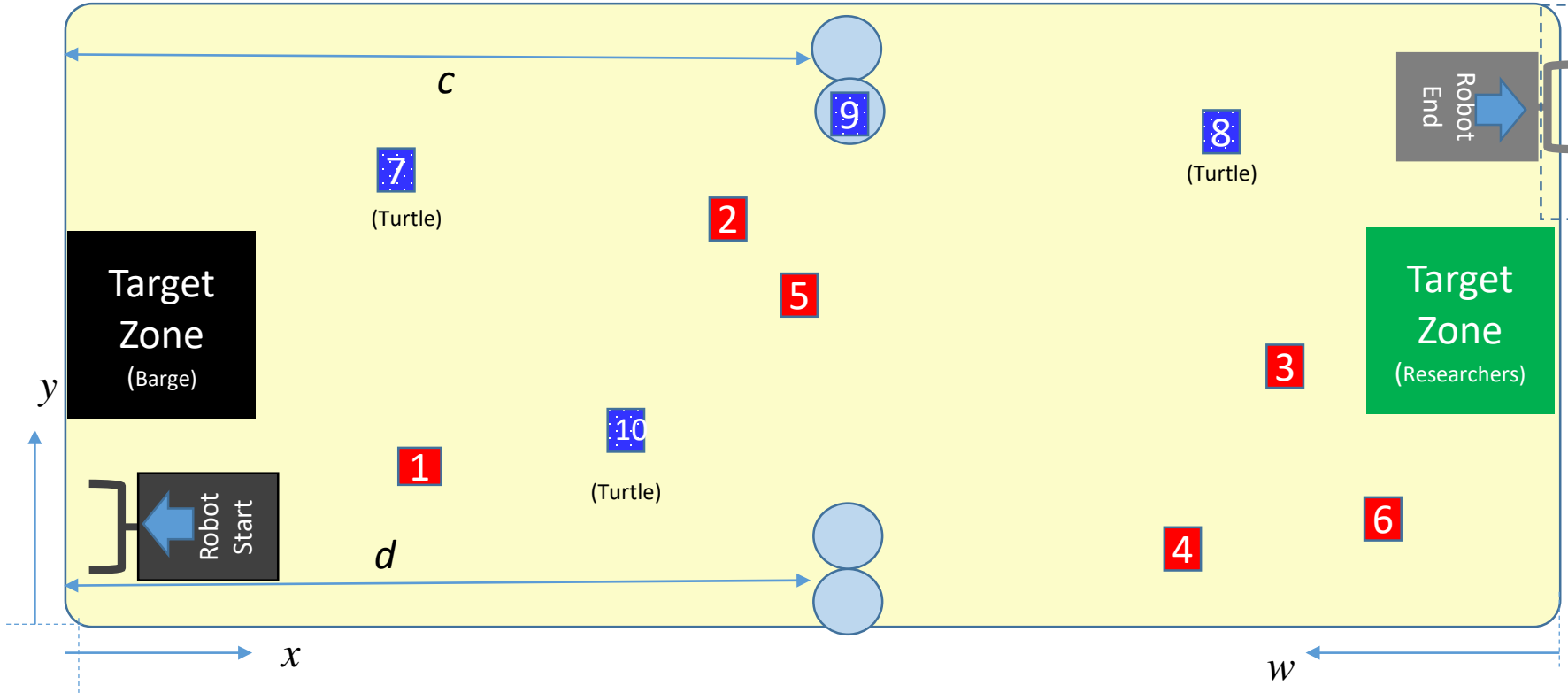
## 7. Procedure/Rules to Play 2 Rounds (2/2) for in-person competition

- 7) No power will be supplied at the impound table and the entire robot must be impounded, including rechargeable batteries
- 8) Teams will compete in a pre-determined order decided by the site host
- 9) During the Game Rounds, all team members must remain in the team spectator area – no pit access allowed
- 10) When a team is called to compete, a maximum of two contestants per team are allowed to retrieve the robot from the impound area and to be present at the playing field during the run
- 11) Judge (or Emcee) will check if (1) timer is ready (2) Judges' are ready, (3) teams are ready. Then count down "3-2-1 - Go" to start a Game Run
- 12) Contestants must stay near the Start Zone. They should not follow the robot. They can approach the robot only to end the run or when judge tells them
- 13) Final scoring is done after the run is over. A team member must sign the score sheet to confirm the team's score

# 8. Robot Specifications

- Robots must be created by students. If a team is identified to have a robot too similar to another robot (including robots from the same organization and both Jr and Sr divisions) or clearly not their own, team will be subject to investigation and possible disqualification
- Maximum size: 35 x 35 cm *including expansion (note: robots larger than 25x25 may have trouble fitting in the start zone)*
- All the wheels for driving must touch the table surface during inspection
- Height limitation: none
- Weight limitation: none
- Any number of sensors/sensor types (except vision for Jr Div and unless it is harmful to humans)
- Any number/type of motors/servo motors (multiplexor is OK to use)
- Any material/robot kit may be used to construct your robot including tape, glue, bolts and nuts, rubber bands, etc.
- A Robofest Team ID and Name tag on top of the robot is required
- A label identifying the “Front” end of the robot is required
- Must have a display screen for the Game-Ending Task that may require to display numbers

# 9.1 UTF Example (Jr)

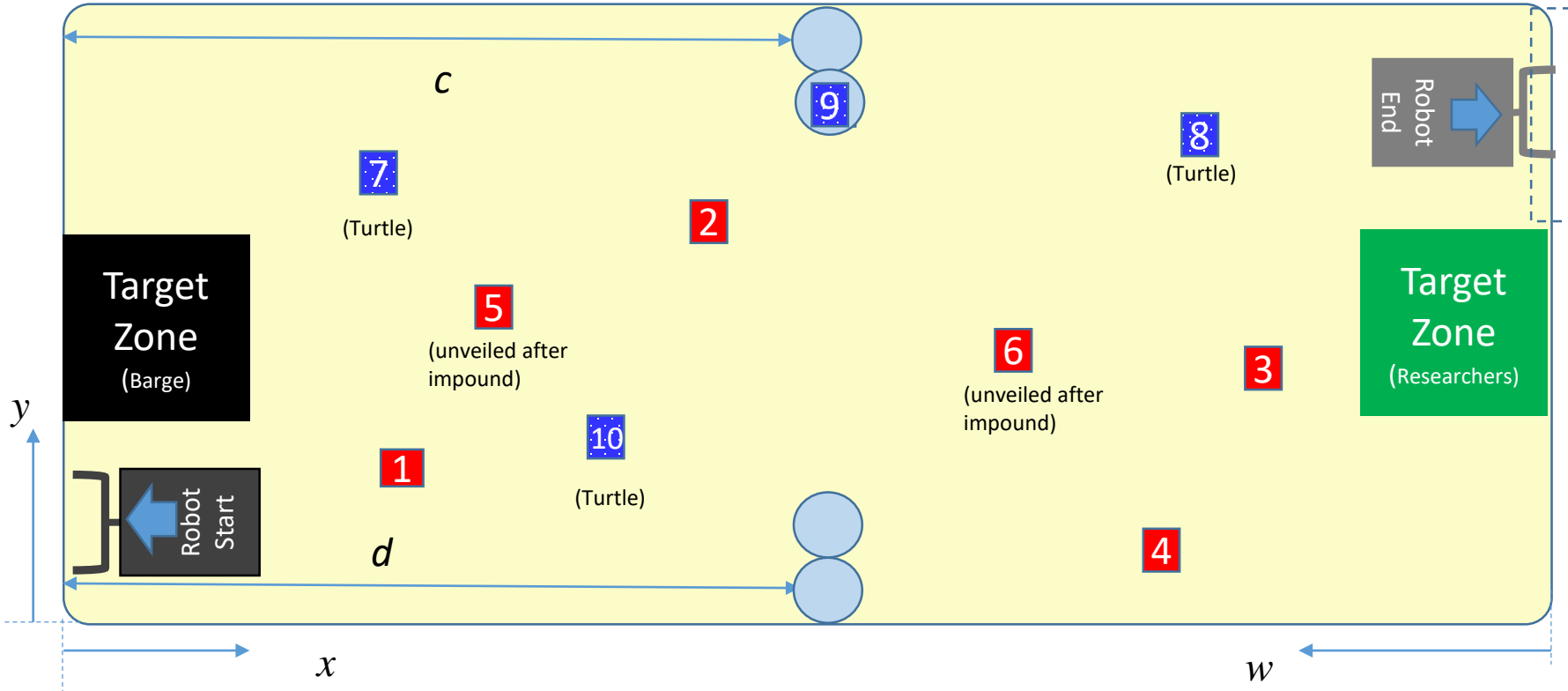


#/ color	x (cm)	y (cm)	w (cm)
5	80	40	
6		15	30
10	55	25	
<i>c</i>	90		
<i>d</i>	85		



- The starting location, orientation of the robot: black side Start Zone facing west table edge (see the “Robot Start” in the diagram above)
- Object locations: see table upper right
- Game-Ending Task: the robot must be stopped with a sensor positioned over the east edge north of the green target zone (see the “Robot End” in light gray color)

# 9.2 UTF Example (Sr)



	x (cm)	y (cm)	w (cm)
5	unveiled after impound		
6	unveiled after impound		
10	unveiled after impound		
<i>c</i>	90		
<i>d</i>	85		



- The starting location, orientation of the robot: black side Start Zone facing west table edge. (see the “Robot Start” in the diagram above)
- Object locations: see table upper right
- Game-Ending Task: the robot must be stopped with a sensor positioned over the east edge north of the green target zone (see the “Robot End” in light gray color)

# 10. Scoring Sheet

Scoring Sheet file can be found at:

[2022 Scoresheet \(robofest.net\)](http://2022.Scoresheet(robofest.net))

Judging Items (to be checked at the end of the run)		Count	Point Value	Score Earned/Lost	max	
#1	Turtles Total # of BLUE BLOCKS = 4  (*) any part of the location sticker is visible, includes objects on the table, on the robot, and on the floor. Do NOT count objects that are already scored onboard the robot or in a target zone	Onboard the robot, not touching ground (max 2)		10		20
		In the Green Zone, touching or airspace (max 2)		6		12
		In the Black Zone, touching or airspace (max 2)		3		6
		Moved from original location*		2		8
2	Trash Items Total # of RED BLOCKS = 6  (*) any part of the location sticker is visible, includes objects on the table, on the robot, and on the floor. Do NOT count objects that are already scored in a target zone	In the Black Zone, touching or airspace		8		48
		In the Green Zone, touching or airspace		4		24
		Moved from original location*		2		12
3	Piling Total # of Bottles = 4	Completely outside the Piling Zone OR Knocked Over		-6		
4	Game Ending Mission achieved	0 (no) 1 (yes)	10			
5	Robot Remained intact throughout the run	0 (no) 1 (yes)	10			
6	Reset was requested (reset penalty)	0 (no) 1 (yes)	-3			
			<b>TOTAL SCORE</b> Total maximum score = 100			
			<b>Time Left in Seconds</b> Record only if score is 100			

# 11. How to Score Objects

- Objects are considered in the target zone if any part of the object is touching the target zone or in the airspace above the target zone
- Objects are considered moved from their location if any part of the location sticker is visible (includes on the robot and on the floor)
- Pilings (water bottles) are considered moved if they are completely out of the bottle zone (boundary line on template) or knocked over
- A Turtle object is considered “onboard” if the object is touching the robot and not touching anything else other than another Turtle or Trash object
- An object can only get credit for one status, the one giving it the most points.

# 12. Rules to Determine Winners & Break Ties

- Winners in each age division will be decided by the **average** score of the 2 rounds
- Tie breakers will be: (1) best score of two rounds, (2) highest time left from best score, (3) rerun, if needed
- For example:

Team Name	Round 1 score	R1 time left	Round 2 score	R2 time left	Avg. Score	(1) Best score	(2) Time left best score	Rank
Team A	80		100	15	90	100	15	<b>1</b>
Team B	100	10	80		90	100	10	<b>2</b>
Team C	90		90		90	90		<b>3</b>



# 13. Reminders of General Rules and Restrictions

- Proctors are watching for the following violations:
  - Coaches or parents in the pit area during practice or work-time (except for initial transport of materials)
  - Coaches or parents accessing the practice or official game tables at any time
  - Verbal/electronic communication between the team and coach/parent while the team is setting up and practicing in the pit area and during work-time
  - Team members leave the pit unsupervised during work-time before their robot is impounded
  - Any team member alters his/her own robot after impounding
  - Team handles or interferes with another team's computer or robot, either in the pit or in the impound area
  - Destruction of property
  - Use of inappropriate words and/or behavior toward team members, other teams, audience, judges or staff
- Any violations can result in deduction of points or disqualification at the judges' discretion
- If anyone sees any suspicious activities, please notify the nearest volunteer immediately
- Spectators are welcome to take pictures or video, but please make sure your flash is off

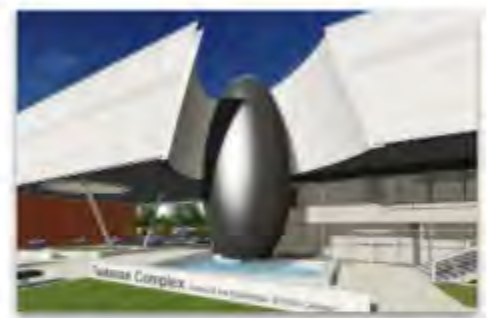
# 14. Notes

- Though every effort is made to be consistent and precise in all of the dimensions of the playing field and parts, Robofest assumes a tolerance of  $\pm 5$  mm, unless stated otherwise
- If there are multiple playing fields at in-person competition sites, the Chief Game Judge will check consistency between the playing fields. However, there is no guarantee to make them all identical
- Judges & contestants should maintain at least 1 m distance from the field when the robot is in action
- Final decisions are at the discretion of the Chief Game Judge
- Additional FAQs, Rule Clarifications, and Rule Change documents will be posted at [robofest.net](http://robofest.net)
- Robofest 2022 General Rules document can be accessed on the 2022 Main Page [robofest.net](http://robofest.net)
- Each team member, as well as the coach, must bring the signed [Robofest Consent and Release Form](#) on the day of the event, if not completed on-line
- Age Divisions: Junior (5<sup>th</sup>-8<sup>th</sup>) and Senior (9<sup>th</sup>-12<sup>th</sup>)
- Team Size: Max. 5
- Registration \$75 (international fee may vary)– See General Rules

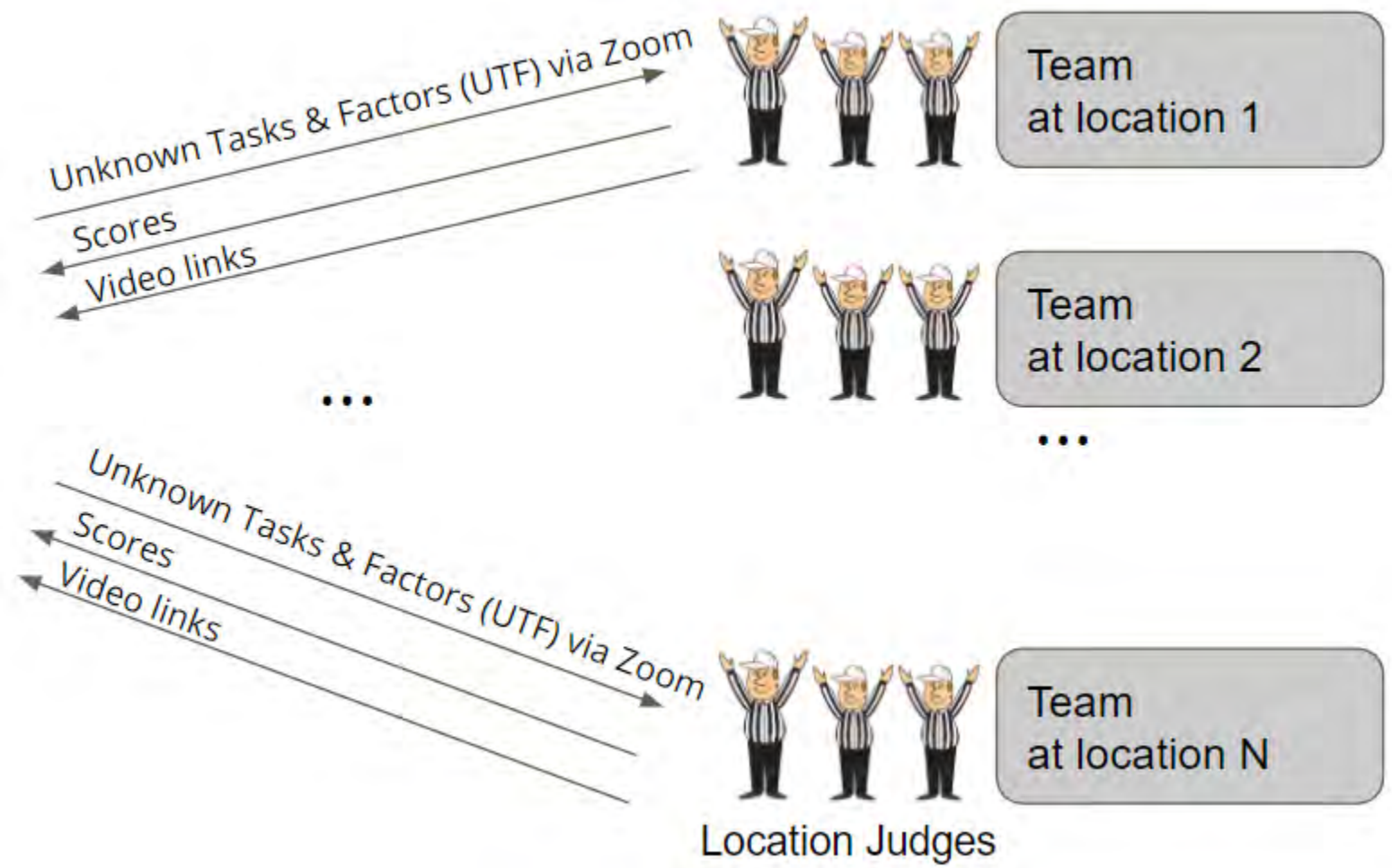
# 15.1 Online Competition Rules

- Team ID sign needed – Coach must print from “File Operations” menu on Coach Home Page
- Teams must use common online camera set up (view)
- Need to check playing field setup before the official runs
- Each location must have location judges to proctor & prevent unauthorized activities. See next slides
- Translators are allowed where needed

# 15.2 Online Competition Format



Robofest Office at LTU



# 15.3 Online Competition Location Setup



Coach

(Parents are encouraged to leave the location. They can join webinar as spectators or watch livestream on Facebook Live outside the location)



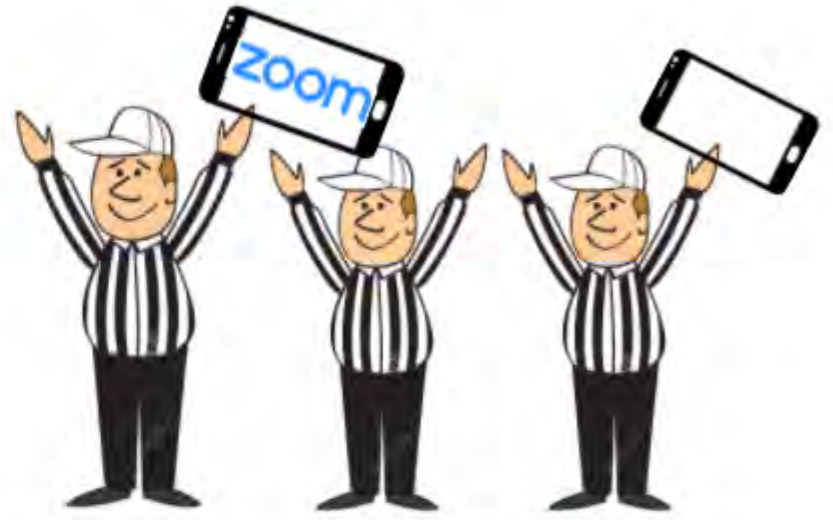
Team Table



Playing Field



Two devices with microphone & camera



Location Head Judge (LHJ)

Location Judge 1

Location Judge 2 - Video recording

## 15.4 Online Location Judges - Qualification & Roles

- Location Judges (LJ) must complete and sign the Pre-Event Checklist, show it during check-in and submit with the official scores
- LJ must sign a pledge document and recite the pledge during the opening ceremony
- LJ must attend online training
- LJs are to proctor & prevent unauthorized activities
- LJ will score each round and submit the official scores
- LJs are responsible for capturing a video of each run for score verification, uploading it to a video sharing platform and sending the link to Robofest
- The videos must be uploaded and links must be sent within 1 hour of the end of the competition
- The videos must show identifiable screen & sound in the beginning & the end for hosts to verify whether the video was taken during the official time

# 15.5 Online Pre-Event Checklist Example:




**2022 Game - Oceanbots**  
**Video Qualifier Submission Checklist**

**Prior to Recording Video:**

- └ Read and understand [2022 Game Rules](#) and Rules Updates
- └ Download and print the following items:
  - └ Printed Team Sign (in Coach Home Page/File Operations)
  - └ Paper Scoring Form (Optional - Print at least 2)
- └ Prepare Game Field (see section 2 of the rules), Check each item:
  - └ 1 Table on the floor
  - └ Target zones. All the edges are scotch-taped over the paper & the table
  - └ Water bottles
  - └ Bottle zone [templates](#)
  - └ Turtle objects
  - └ Trash objects
  - └ Roll Markers (Reinforcement stickers or tape)
  - └ Measuring tape (at least 100 cm)
  - └ Countdown Timer (30-minute work time and 2-minute round)
- └ Check Robot (see section 8 of rules):
  - └ Robot Size with maximum 35x35 cm including expansion
  - └ "Front" label visible
  - └ No illegal materials
- └ Prepare Video & audio recording device:
  - └ battery fully charged
  - └ enough memory storage
  - └ Orient camera to Game Field with Team Sign visible and Start Zone to the left as shown if possible
- └ Receive email with Unknown Tasks and Factors from Robofest Office:
  - └ Sent to Coach 10 days prior to Submission due date
  - └ Keep confidential - Share Unveiled Tasks and Factors and set up Game Field when team is ready to start 30 minute work time for each round
  - └ Senior teams have some unknown factors that are not shared with the team - Set these after the work-time has ended and the robot is impounded



**Record Video:**

- └ Record Team Introduction (Team Number, Team Name, Organization, Student's Names)
- └ Do not include the 30-minute work-time on the video
- └ 2-minute runs should not be edited
- └ Record Round 1 - Include "3-2-1 GO" countdown and add 3 seconds to the end after the robot stops OR team stops the run OR 2-minute timer expires
- └ Record Round 2 - Include "3-2-1 GO" countdown and add 3 seconds to the end after the robot stops OR team stops the run OR 2-minute timer expires
- └ Camera may be moved at the end of the run(s) to zoom in on any details that would assist with scoring (i.e. Rolls moved off of marks, rolls inside target zone, etc.)
- └ Optional - record image of Scoring Sheet with final score after each round- Robofest Office will validate scores

**Prepare and Upload Video:**

- └ Merge Introduction, Round 1 and Round 2 videos together using Video editing software
- └ Upload to Video Sharing Site (YouTube, Vimeo, etc.)
- └ Enter Link to video in Robofest.net - Coach Home Page/Team Management/Team Video Links
- └ Test Video Link to validate

10/20/21

Official forms can be accessed at [Game Page](#)

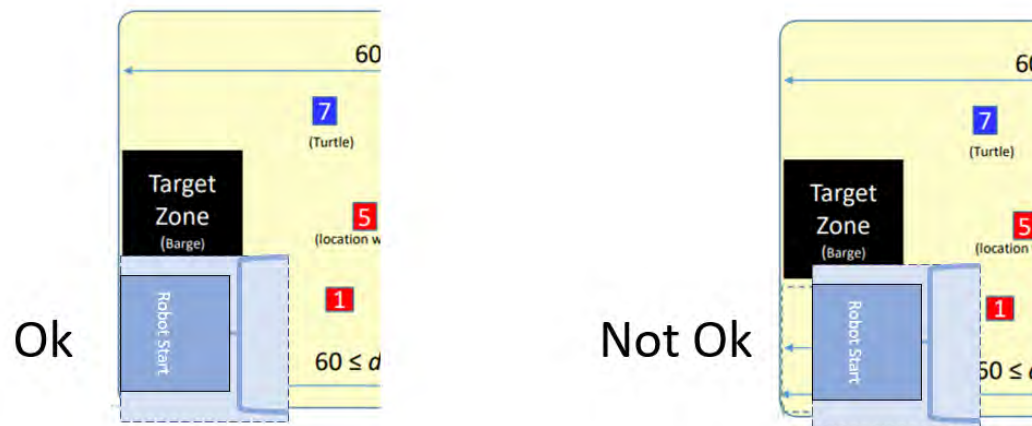
# 16 Online Competition Event Timing

- All teams will start simultaneously
- Site Host is the official timer
  - Local judges will use the Robofest start signal via online connection
  - Local judge will enter an estimated time on the scoresheet
  - Official times will be determined by the Site Host after the event
- No reruns
- Judge should not instruct team to pick up robot until either
  - Robot has fallen off the table
  - End of the run (as determined by the team or the timer)
- Robofest reserves the right to make judgements and score adjustments after review of team submissions



# 17 FAQs 1/3

- What if objects are on the robot when the run ends? **Up to two Turtle objects are considered “onboard” the robot, the rest are considered as scored in the target if the objects are in the air space above the target, considered moved otherwise.**
- A player failed in starting the robot. Can the player retouch the robot to start? **Yes (will not be considered a rerun)**
- Robot is touching objects at the end of run. Is this OK? **Yes. The object will be scored the same as if there was no contact with the robot.**
- How are robots positioned in the Start Zone if they are larger than 25cm x 25cm? **Parts of the robot may hang over the start zone, but the footprint of the robot must cover the corner of the table that is in the start zone. Teams may position robots within 25x25cm anywhere inside the Start Zone.**



# 17 FAQs 2/3

- Can Turtles and Trash start in the opposite target zone? **Yes. Unveiled objects may start anywhere on the table other than in the designate start zone, including on top of pilings. Objects may start in the opposite, or the correct, target zones.**
- What if an object is over the location sticker of another object at the end of the run? How is it scored? **Though unfortunate, the object is not considered as moved if the sticker is not visible.**
- Does it matter which Turtle (blue) objects are on the robot or in the target zone? **No. Can be any of the blue objects up to 2 on the robot and 2 in the Green (Researchers) base.**
- What if more than two Turtles are in a the target zone? **Two of them will be scored in the target zone and the rest will be scored as moved.**
- Is a color sensor needed to sort the Turtles and Trash? **No. Turtle objects are taller than Trash objects, so size can be used to sort**
- What happens if Turtle or Trash objects come apart? **A scoring object that is not in one piece at the end of the round will not receive credit other than “moved”**
- To get the maximum score for the “Turtles”, I should put two in the green zone and keep 2 on my robot? **Yes.**

# 17 FAQs 3/3

- Turtle "9" will always be on the "inner" north piling (but piling location will vary)? **Yes. Turtle 9 will always be on the inner north piling, The location will be unveiled before work time.**
- Can objects be glued together? **No. Objects should stay together in most game situations.**
- Is there a minimum distance from the edge of the table to a block (turtle or trash)? **No.**
- What happens if the turtle falls off the pilings during play? **This is ok. Play will continue and turtle will be scored based on its final position.**
- Is a "bucket" allowed to be dropped from a robot and left in an end zone with turtles or trash in it? **Yes. A robot may be designed with a bucket that can be dropped and will still receive full points for "remaining intact" since it is part of the design.**