IEEE Southeastcon 2018

IEEE USF: Hardware Competition Rules

Manifest

Terminology

Pirate: Robot
Ship: Raised portion of the field
Island: The lower portion of the field not painted blue
Doubloons: Points
Gangplank: Ramp from the ship to the island
Treasure Map: The string of 3 binary bits transmitted by the infrared sensor
Destination A / Lowering the bridge: Push button that lowers the bridge
Destination B / Location of treasure key: Pressure plate
Destination C / Rising the bridge: Push button that rises the bridge

Avast, Me Hearties!

A pirate begins the journey by reading a treasure map, then lowers a gangplank onto the island. The pirate then crosses a narrow gangplank being careful to not fall into the shark infested waters. Once on the island the map shows the path to the treasure chest's key; then the chest can be claimed! While on the island, the pirate can raise a flag to claim it for the crew. The pirate picks up the treasure, returns to the ship, and sets sail on the high seas.

Overview

The major tasks to complete are: reading the treasure map, lowering the gangplank, recovering a key, loading the treasure, raising the flag, and returning to the ship. The route taken while completing these tasks depends on randomly selected treasure map coordinates. Pirates will have the option of completing all the tasks listed in the coordinates, or forgo some tasks in the interest of strategy. However, the key must be retrieved before the treasure can be collected. The end goal is to collect the maximum number of doubloons in the least amount of time.

The Treasure Map

At the start of a round, the robot will receive coordinates for the route that must be taken to retrieve the treasure. The coordinates will be received as an PWM IR signal beginning with a synchronization bit (duty cycle to be provided) and followed by a 3-bit binary code. A binary 0 and a binary 1 are to be distinguished by a duty cycle (to be provided). The signal will repeat for 1 minute at frequency (to be specified). Teams will have to receive, display, and use the code that will be randomly generated at the beginning of every round. Each binary bit represents one of the three destinations (Figure 1). Only destinations listed by the coordinates will earn Doubloons. All combinations of destination routes are symmetrical, making all possible combinations equal in length.

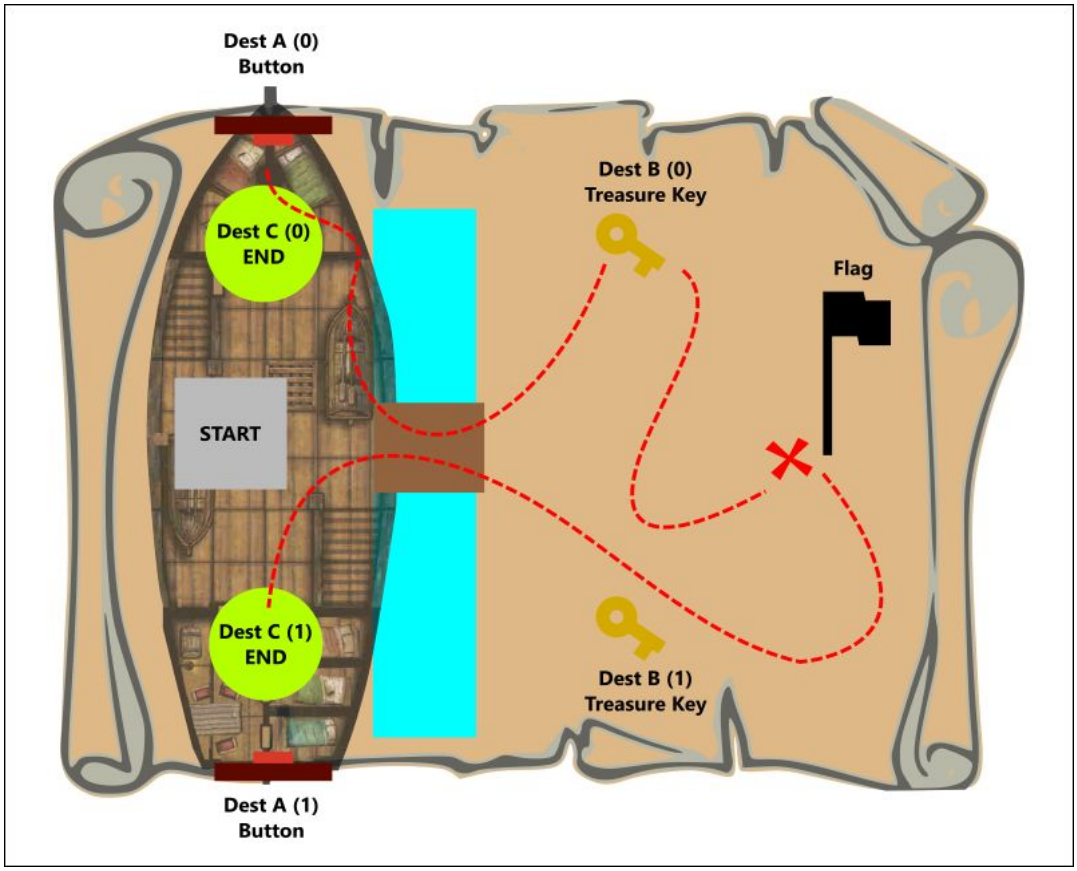

Figure 1: SoutheastCon18 Treasure Map

The Route:

The robot starts over an infrared LED (Figure 2) where it receives the 3-bit signal. The received signal must then be displayed on the robot. There are two possible locations: left (A0) and right (A1), for each destination (Figure 1). The route taken will depend on the bit the robot receives (see Table 1). The robot must go to each destination in alphabetical order, A-B-C. If a player accomplishes task at B first, they are no longer eligible to receive doubloons for Destination A.

At Destination A, the robot will press a limit switch to “lower the gangplank” and cross the water. A green light above the button will indicate whether a robot successfully pressed the correct station. Successful completion of Destination A will indicate it is safe to cross the gangplank. If the robot crosses the bridge without completing Destination A then no doubloons will be earned for this section.

At Destination B, the robot will find the key to unlock the treasure chest by maneuvering over a pressure pad. A green LED next to the pad will confirm successful pad activation, and robot may proceed to treasure chest if desired. For maximum doubloons the robot must retrieve the treasure chest, and deliver it to Destination C. For fewer doubloons, the robot will have the option to return to the ship at Destination C after completion of Destination B (even if chest is not retrieved). The treasure chest will also be located at the same position on the board.

Successfully raising a flag at the far end of the field will earn the team extra doubloons (this activity could be done at any time during the round).

Table 1: Coordinate Locations on Treasure Map

Route	Code	Destination A Location	Destination B Location	Destination C Location
1	0 0 0	A (0)	B (0)	C(0)
2	0 0 1	A (0)	B (0)	C(1)
3	0 1 0	A (0)	B (1)	C(0)
4	0 1 1	A (0)	B (1)	C(1)
5	1 0 0	A (1)	B (0)	C(0)
6	1 0 1	A (1)	B (0)	C(1)
7	1 1 0	A (1)	B (1)	C(0)
8	1 1 1	A (1)	B (1)	C(1)

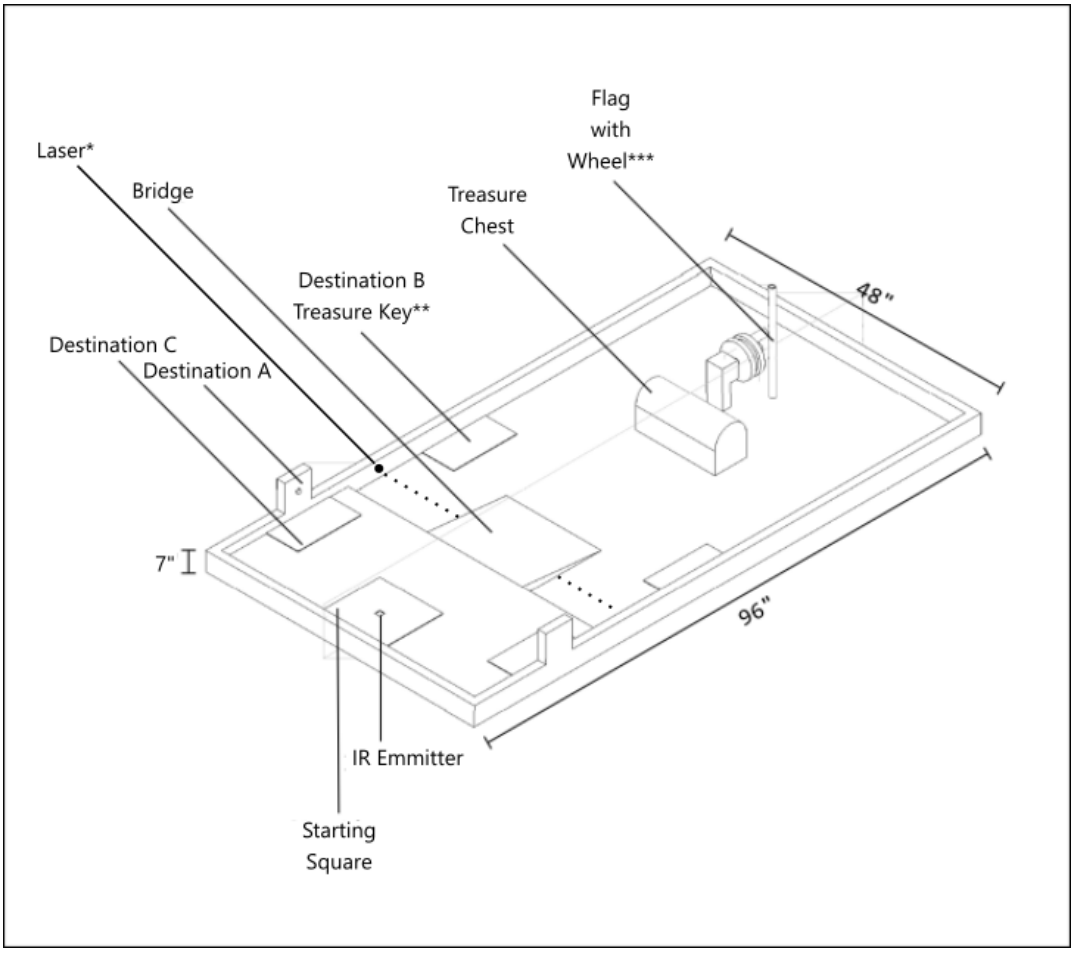

Figure 2: SoutheastCon18 Playing Field
Destination A: Button, Destination B: Treasure Key**, Destination C: End location

*The laser hits a LDR mounted on the bridge
**The treasure key is actually a pressure pad, and pressing the correct one opens the chest
***The robot needs to turn the wheel to raise the flag

Playing Rules:

The game is about earning doubloons (see Table 3 for doubloons breakdown) by completing objectives. Scores can also be influenced by how a team wants to play the game. Teams can earn a basic number of doubloons by doing the bare minimum of objectives; they can earn more doubloons by completing more tasks.

- Doubloon ties will be broken by shortest completion time.
- Robot must be autonomous - No wired or wireless communications during competition other than IR receiver mounted on the bottom center location on robot to receive coordinate location.
- Robot must remain a single unit and can not be modular.

- Any contact the robot makes with the ‘water’ will result in the round ending. Any doubloons earned up to that time will be kept. Water contact will be determined by an automated process that takes input from a sensor detecting a laser.
- Team members may end the round at any time. This occurs when a team member makes contact with their robot.
- A team making contact with another team’s robot during play will result in the first teams’ disqualification and zero doubloons earned for the round. No two teams may occupy a playing field at the same time.
- A round ends when the robot presses the pushbutton (closest to Destination C) a second time or you reach the four minute time limit.
- Each team competes in two rounds before a final round on the Saturday of the conference.
- The final round with the top four teams will be held on Saturday night during the awards banquet.
- Team will be able to view “active” locations and final scores on a displays located in proximity to playing fields (final round scoring will be displayed within 10 min of round end).
- Teams can only activate or complete a stage or destination one time.
- Before each round, Teams will have a 15 minute window, after their score is displayed, to file an appeal with the judges/timekeepers if they believe a scoring error exists. If an appeal is declined, Teams will be deducted 50 doubloons from their round scores. After appeal judges/timekeepers decisions are final.
- Robots must be present at the Starting sequester location fifteen minutes before the beginning of a round. At the end of a round teams must place robots in the End sequester location. Robots will be released from sequestering within 15min of all teams completing Rounds 1 and 2. Being late for sequestering will result in 50 doubloons deduction for that round. If a team has not reported for sequestering before the first team of the round begins, that team will not be allowed to compete in round, and only earn doubloons collected outside of round (eg. team shirts, logo and flag).
- Teams must adhere to the the IEEE code of conduct or they will be disqualified from competition.
- Only 2 team members are allowed within the designated playing area at a time. Violations will result in a 50 doubloon deduction for the round. Team in playing area must wear team shirts to get t-shirt points.
- Tampering or contacting with another team's robot during a round will result in disqualification from that round.
- Team shirts used for hardware competition must display the Team Logo and must be entered in IEEE SoutheastCon 2018 T-Shirt competition in order to get doubloons credit.

Doubloon earning locations:

- Start Pad (when display shows correct sequence detected)
- Button (Destination A) - “lowers bridge”
- Crossing Bridge
- Key (Destination B) - “unlocks treasure chest”
- Treasure chest
- Flag being raised
- Return to Ship and raise the bridge (Destination C)

Doubloons earned outside of round:

- Team Shirts - Hardware Team handlers must wear Team Shirts throughout hardware competition. 75 doubloons will be issued for every round.
- Team Flag - Team must provide a flag to be placed on the ship section of the field during a team's run (must include IEEE logo and school logo/colors)
- Team Logo - Must match Team Flag and be visibly identifiable on the robot

Robot Specifications:

The robot must be no greater than 12”x12”x12” at the start. It cannot extend to more than 20”x20”x20” during the competition. The robot must not include any form of wireless communication, and the robot cannot fly. The robot must have school ID (sticker, flag, etc) Robot must display code

Field Specifications:

The field will be 8’x4’ area.
Flag - 3” equilateral triangle

Field Parts:

1x 4’ x 8’ plywood
2x 8’ 2by4
Treasure Chest:

- 4 in. 30.3 cu. in. Steel Square Electrical Box (Model # 521711-25R, Home Depot Store SKU #338834)
- 4 in. Square Blank Cover, Flat (Model # 8752, Home Depot Store SKU #876793)
- 4 - ounce pyramid sinker weights to be painted gold. Quantity 8, for total weight of 32 ounces. To be secured only by box cover. Weight will be allowed to move freely and shift the treasure chest’s center of gravity.

Table 2: Treasure building material		
Steel Square Electrical Box	Square Blank Cover	4 - ounce pyramid sinker weight (4 shown)
		

Scoring:

Teams will earn doubloons based on completing tasks and actions as specified in the Playing rules and Table 3. In the event of a tie, the team with the shorter completion time will have a higher placement. Destinations A, B, C must be completed in order.

Course scores and time will be visibly displayed for spectators, judges, and participants.

Two Qualifying Rounds: Round 1, and Round 2

1. Both qualifying rounds will be scored by same criteria.
2. There shall be 2 identical playing fields, Teams will compete 2 at a time (issue 3)
3. Length: 4 - 6min each.
4. Teach team will have different coordinates each qualifying round.
5. Doubloons (primary), time (secondary), combined score determines elimination round qualification

Elimination round: Round 3

1. Who: Top 4 teams with the best scores after qualifying rounds
2. Scoring: doubloons (primary), time (secondary):
3. Teams with the highest scores overall wins

Table 3: **Scoring (per round)**		
Action	**Doubloons**	**Notes**
Time remaining.	0 to 240	Doubloons will be issued based on the number of seconds the team has remaining after completing the round. Formula: Doubloons earned =240 - Completion time.
Display Correct Code	30	Correct 3 Bit binary code displayed on LCD Screen.
Activate Destination A	50	Maneuver robot to press correct button.
Cross Bridge from ship	200	Crossing the bridge while the indicator LED is green. (if correct stage A is selected)
Cross Bridge from ship without active Destination A	90	Crossing the bridge while the indicator LED is red
Activate Destination B	150	Maneuver robot onto correct pressure pad. Cannot proceed to pick up/ move treasure chest without completing this step (No doubloons will be awarded)
Pick up and store Treasure Chest	240	Successfully picking up and storing the treasure chest in or on the robot. Destination B must be completed first. If completed not eligible for treasure chest moving points(130).
Move Treasure Chest	130	Move the treasure chest out of its designated area without storing it (robot does not have to be back in end location with treasure chest to earn these doubloons). Not eligible if pick up and Store doubloons are claimed.
Raise Flag	220	Raise the flag to the top of the flagpole by turning the captain's wheel.
Finish on Destination C	50	Finish in the correct location without the treasure chest
Finish on ship with treasure chest.	240	Finish on the ship with the treasure chest and robot completely within the confines of the ship.

Team Shirts	75	Hardware Team handlers must wear Team Shirts throughout hardware competition. 75 doubloons will be issued for every round.
Team Flag	75	Team must provide a Team Flag with (school colors or mascot, IEEE logo, Round #). Total of 3 team flags will be required one for each round, assuming team qualifies for elimination round.
Team Logo	75	Must match Team Flag and be visibly identifiable on the robot. Must contain school colors or mascot, and IEEE logo. 75 doubloons will be issued for each round.

- Point values are subject to change