

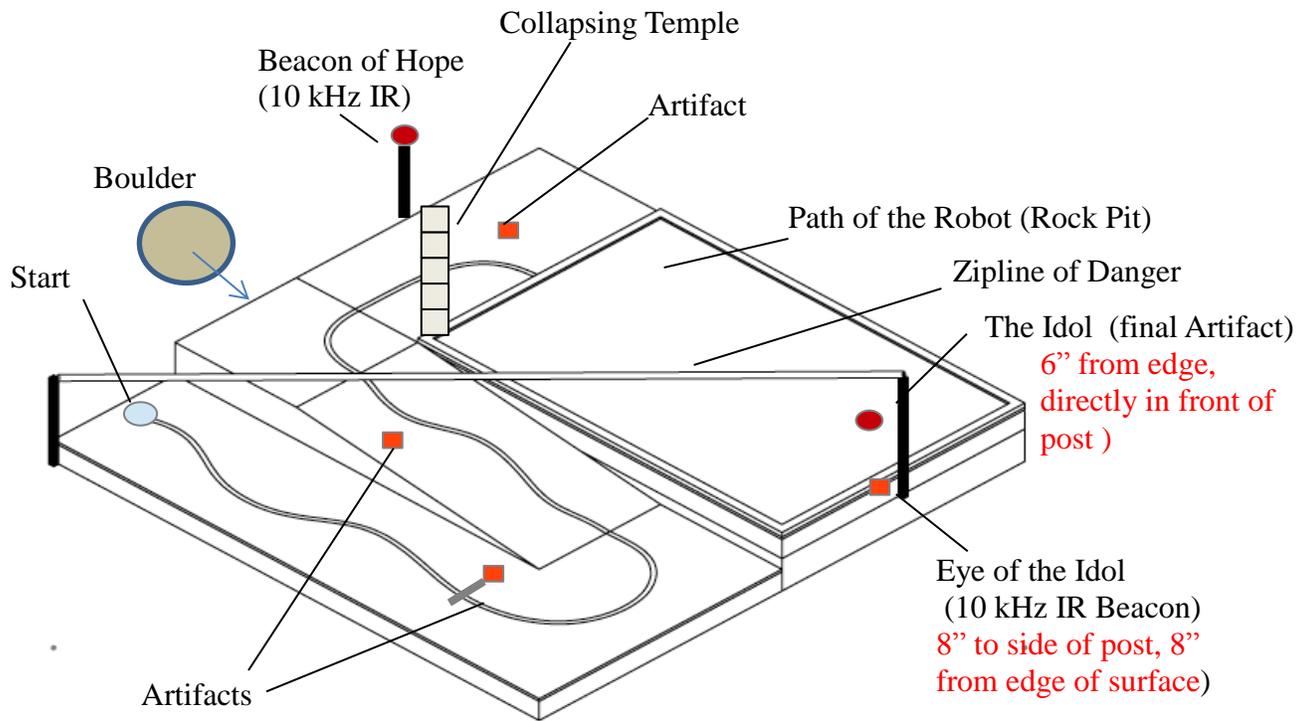
Indiana Robot!



Revision History

- 4.0 (2014 June 16) – revised positions of Idols, height requirements. **Changes in Red.**
 - 3.1 (2014 May 13) - Released to the class. Added Collapsing Temple, Beacon of Hope
 - 2.0 (2014 May 6) - Second draft. Added Very Large Boulder
 - 1.0 (2014 May 6) - First draft.
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Figure 1 – Playing Surface



COMPETITION RULES

1. **Playing Surfaces** - The Playing Surface is approximately 8 foot x 8 foot, divided into an upper and lower level and connected by a ramp. The Playing Surface is made of wood and will have some warp and slight bumps at the joints and at the ramps. Robots must be designed to accommodate for imperfections and irregularities in the surface.

There are two Playing Surfaces, one for each robot, in order to compete head-to-head during each heat. Although the surfaces will follow the same guidelines and landmarks, there is no guarantee that the surfaces will be made to match identically to each other.

2. **Road** - The Road is made from of black electrical tape. There is a minimum 3" radius of curvature for the Road. The two tracks are not guaranteed to be identical or exactly as shown. The tape is not guaranteed to be straight at ANY point.
3. **Home Base** – The Home Base area is a 1.5foot x 2foot area on the Playing Surface.

4. **The Path of the Robot** - The final section of the course will be the “Path of the Robot”, an area partly covered with loose stones of varying heights, on the size scale of 1/2”, making for a VERY uneven surface.
5. **The Eye of the Idol** – The Eye of the Idol is an IR beacon will emit a 10 kHz sine wave at the far end of the Path of the Robot. The Beacon is mounted so that the emitters are 8” above the plateau surface (measured from the base, not the top of the Path tiles, **8” to the left of the post supporting the Zipline, and 8” beyond the edge of the surface.** There may be other sources of IR interference during the competition which cannot necessarily be eliminated.
6. **The Zipline of Danger** – The Zipline is made of a 1” steel extrusion elevated to a height of **16” 19”** above the surface at the Centre of the far end of the Path, and 16” above the far corner of the surface at the Start Area. There will be no cushioning or padding allowed at the Home Base to accommodate for Robots using the Zipline.
7. **Artifacts** - Four Artifacts will be placed near the Road and the Path. These Artifacts will fit **within a cube of dimensions 3” x 3” x 3” approximately in a cylinder 4” tall and 3” in diameter** and will be made of plastic with a strong magnet embedded in the top of each Artifact. The material and weight of the Artifact is to be decided. The last Artifact (the Idol) will be positioned at the end of the path, directly in front of the **Beacon post supporting the Zipline.**
8. **Artifact Placement** – Four Artifacts will be placed on the surface.
 1. The position of Artifact 1 will be marked with an 8inch long piece of black tape extending evenly across the main Road. Artifact 1 will be placed **6 inches 8 inches** to the LEFT of the tape.
 2. The positions of Artifacts 2 and 3 will not be marked on the main Black Tape. Artifacts 2 and 3 will be placed **6 inches 8 inches** to the LEFT of the tape.
 3. The positions of the Idol (Artifact 4) will be in the Rock Pit, spaced directly in front of the **IR-beacon post supporting the Zipline** and approximately 6inches away from the edge of the Rock Pit.
9. **Collapsing Temple and the Beacon of Hope** - Once the robot comes into contact with the Idol, two actions will take place on the surface:
 1. A Collapsing Temple will be actuated (a stack of five 4” wooden cube blocks), being tipped and falling into the Road close to the ramp.
 2. The Eye of the Idol will be turned off, and the Beacon of Hope (at the back of the Path of the Robot, close to the Road) will be turned on. The Beacon of Hope is set to emit a 10kHz sine wave.
10. **Very Large Boulder** - If the robot attempts to return to Home Base using the ramp, a Very Large Boulder (likely a 8” diameter dollar store foam ball + paper mache, ~200g) will be released once the robot is halfway back down the ramp. The halfway point of the ramp will be marked on the outside edge of the ramp with tape.

11. **Scoring** - Robots will be scored by the number of Artifacts being held by the robot when the Robot successfully returns to Home Base in a single run. All Artifact count for one point, except the Idol which counts for three points. In the event of a tie, the winning robot will be the one which completed its highest-scoring run first during the heat (i.e not necessarily the fastest individual run).

12. **Returning to Home Base** – A Robot has successfully returned to Home Base if any part of the robot crosses into the Home Base area while the robot is in physical contact with the Artifacts. The robot does not need to release the Artifacts into the Home Base area. **The one exception is if the Robot attempts to leave Home Base to pick up further items for score during the same run - if so, all or part of the Artifacts must be left behind in Home Base.**

13. **Multiple Runs During One Heat, and Restarting Robots** - A Robot which success completes a run for a score can be restarted to attempt a higher score. Scoring is not cumulative during the heat, only the single-highest scoring run during the heat will count.

Robots may also be rescued by the team and restarted as many times as desired during the heat, including:

1. Falling off the Playing Surface.
2. Getting lost or stuck on the Playing Surface.
3. Missing one or more of the Artifacts during the run.

Time during the heat does not stop during a restart. During a restart, Artifacts will be set up by the judges at the start locations, but no effort will be made to reset the Rock Pit.

14. **Time Limit** – Heats are a maximum of 2 minutes. Additional time may be allowed for heats in the finals. Judges may choose to end a heat early if there is a clear winner during the heat.

GENERAL RULES

- A. **Autonomy:** Robots must be completely autonomous – no form of remote control is allowed.
- B. **Size:**
- At the start of the run, the Robot must fit inside a ~~12" x 12" x 12" cube~~, 12" by 12" base with a 16" height, defined by a box given to the team.
 - Once the race begins, Robots may expand in any direction, with the robot not exceeding ~~24" 26"~~ along any dimension at any time.
 - During any re-start, the robot must be returned to its original start size.
 - The Robot may not intentionally leave any part of itself on the surface.
 - If the robot cannot meet these size restrictions, the Judges may choose to allow the Robot to run individual Rounds but not compete in the overall competition.
- C. **Power:** Robots may only be powered by one large battery pack (nominally 16V) provided, plus two low-voltage (nominally 9V) batteries intended for use for sensor circuits. The large battery pack is the only electrical power which may be used to drive any motors (DC or servo) on the Robot (cannot use the low-voltage packs in series).
- D. **Components:** All components outside of those provided by the course instructors or listed at the end of this document must be approved by course instructors. Teams that choose to purchase their own items will not be reimbursed, and are limited to a maximum of \$100 per team.
- E. **Damage to Surface:** Robots may not permanently modify or damage to the competition surface or any individual playing piece.
- F. **Start Mechanism:** Robots will initiate motion only when the START button on their controller is pressed by a team member at the start of the match (signalled by a Judge).
- G. **Playing Surface Variations:** The surface is made of wood and will have some warp and slight bumps at the joints. Robots must be designed to accommodate for imperfections and irregularities in the surface and variation between practice and final surfaces.
- H. **Rules Finalization:** Rules and dimensions will change slightly between now and the competition. Finalized rules will be issued after completion of the competition surface construction in Hebb 42. Qualifying heats (with no opponent) will take place 2 weeks prior to the competition in Hebb 42.
- I. **Sportsmanship Rule:** Strategies or designs that obviate the design elements of the course or that do not follow the intent of the competition will be disallowed whether or not they explicitly break these rules. All strategies which have been designed specifically to come as "close to" violating any of the posted rules as possible must be presented to the course instructors during the design stage of robot building. **All decisions are at the discretion of the course instructors.**

ALLOWED AND RESTRICTED MATERIALS

Approved:

1. Solenoids (when used with mechanical constraints)
2. Elastic bands
3. Wheels and hubs from existing RC or other small vehicles.

Must be Reviewed By Course Instructors

1. Springs are generally allowed, but must be reviewed individually for safety.
2. Compressed air may be allowed, but all valves and fittings must be reviewed for safety.

Restricted or Banned:

1. Discrete H-bridge driver chips.
2. Any components other than wheels from existing RC or other small vehicle chassis, including (but not limited to) suspensions, differentials, steering mechanisms.
3. Alternate battery power sources.