ROBOT ARM

SCIENCE OLYMPIAD

Read the General Rules in the manuals and on www.soinc.org as they apply to every even

1. **DESCRIPTION:** Prior to the competition teams must design, build, document and test one robotic device to move scoreable items.
   A TEAM OF UP TO: 2 **IMPOUND:** No **EYE PROTECTION:** #5 **APPROX. TIME:** 10 min.
2. **EVENT PARAMETERS:** Teams must provide one Device. Teams without proper eye protection must be immediately informed of that and given a chance to obtain eye protection if time allows, otherwise not be allowed to compete and are scored as a no-show. The Supervisor provides the Competition Area and items.
3. **CONSTRUCTION PARAMETERS:** The Device includes the Arm(s), an optional permanently attached Base, remote control box(es) (e.g. radio control, infrared, connections (i.e., wires, tubes, hoses, etc.)).
   a. The Arm(s) may be attached to a Base. All parts (except the control box(es)/connections) in the ready to run position must fit inside a 30.0 cm x 30.0 cm square with no height restriction. The Arm(s) is not restricted to these dimensions during the run and must be attached to the floor only by the force of gravity.
   b. The Device may use modified kit parts and have any number of arms and joints.
   c. Competitors must not impart energy directly onto the Arm(s) (i.e., all end effector movements must be powered by stored energy in the device components).
   d. Commercial batteries, not exceeding 14.4 volts as labeled, may be used to energize each of the Device's electrical circuits. Multiple batteries may be connected in series or parallel as long as the expected voltage output across any points does not exceed 14.4 volts as calculated using their labeled voltage.
   e. Arm functions may have independent circuits, sources of electrical energy and/or control mechanisms.
   f. Radio control equipment used for this event must operate on frequencies designated by the FCC for surface devices. The frequency must be marked by the manufacturer on the transmitter. Allowable frequencies are: 75 MHz band (75.41 - 75.99 MHz), 27 MHz band (26.995 - 27.255 MHz), 49 MHz band (49.8302 - 49.890 MHz) or 2.4 GHz. Devices using other frequencies must not be allowed to compete.
4. **DOCUMENTS:** In addition to the Device, teams must develop and submit at check-in (or as announced by the tournament director) the following three technical documents-examples available at http://www.soinc.org
   a. Engineering Drawings (hand-drawings are acceptable), either as 3-views or projected views, of the basic structure of the Device that must show:
      i. All motors and/or actuators on the Arm(s)
      ii. All energy sources
      iii. All Arm(s) end effectors (parts that interact with the items on the Competition Area)
      iv. Controls the competitors are using to interact with the Arm(s)
   b. Individual Component List for every component of the Arm(s), except fasteners, with the following information. A preassembled component (one not assembled by the team) counts as one component:
      i. Name of each component
      ii. Location/vendor from which the component can be obtained
      iii. Two or more key properties of the component (e.g., weight, dimensions, voltage rating, etc.)
      iv. Energy source of the component (n/a is an acceptable entry if the component is a voltage/current source or if the component is not energized)
   c. Operating Description
      i. Device reaction to each control input
      ii. Tentative/Proposed plan of movement (i.e., which items in the Competition Area will be moved; how the Device will move each item)
5. **COMPETITION AREA:** The Competition Area is a taped 70.0 cm x 70.0 cm square using the inside edge of tape to mark the area. The Supervisor must designate each of the 4 sides as North, East, South, and West.
   a. A taped 30.0 cm x 30.0 cm square (the "Arm Square") is marked inside of, centered on, and touching the South edge of the Competition Area. The outside tape edge is used to mark the Arm Square.
   b. Goal Boxes are labeled W, N, & E and placed inside the Competition Area centered on the West, North, and East sides, touching the edges of the Competition Area. Goal boxes must be a bottom portion of a half-gallon milk jug, cut to a height between 9.5 and 10.5 cm with the opening facing up. They must not be secured to the surface. The Device may move them anywhere after Competition Time begins.
   c. The Competition Area is divided into North and South Zones along a 35.0 cm Center Line that is defined by the northern edge of a piece of tape running from the East to West edges of the Competition Area.
   d. At the beginning of each Competition Time, 5 "½ inch nominal size" PVC pipes (9.5 – 10.5 cm long), 5 ferromagnetic nails (9.5 – 10.5 cm long), and 5 unsharpened #2 pencils are spaced 7.5 cm apart and placed perpendicular to the edges of the Arm Square in a row. The head of each nail, the eraser end of each pencil, and an end of each pipe touches the edges of the Arm Square, and points away from it.
   e. The pencils are placed along the West edge, the nails along the North edge and the pipes along the East edge. 4 upright D batteries are centered between each pair of nails with the positive terminal (nub) up.