Design Competition 2001 – Updated 5/10/01

Objective
The objective of this competition is to score as many points as possible by maneuvering through the course to activate switches and collect balls.

Entry Requirements
1. Any Northwestern undergraduate is welcome to enter the competition.
2. There is a financial incentive to any team that includes at least one freshman.
3. Each team member must have an active e-mail account.
4. Team applications and preliminary proposals must be received by 11:59pm on November 14, 2000 (email dc@northwestern.edu).
5. Proposals will be returned by November 20, 2000.
6. All teams must submit their final proposals by Friday January 12, 2001.

Agent Specifications
1. One agent is allowed per team. The agent can break into a maximum of three components as described below.
2. The agent must be autonomous (e.g. no external controls).
3. Each agent must completely fit inside of a 14”x14”x14” measuring box at the start of each match.
4. Each component is allowed to expand (at most) to fit into a 48” x 48” x 48” box during a match ONLY AFTER THE ENTIRE AGENT HAS LEFT THE WHITE SAFETY BOX.
5. The weight of each agent must not exceed 25lbs.
6. Agents are allowed to break into a maximum of three components only after the start of a match, and ONLY AFTER THE ENTIRE AGENT HAS LEFT THE WHITE SAFETY BOX, provided that the following apply:
   • Only one master switch can activate the agent at the start of a race.
7. Any detachable element of the agent (like weights & props) counts as one of the three maximum units that the agent can separate into.
8. The agent will be checked, in terms of size and weight and etc., during the registration. After registration, additional modifications will be allowed only if the resulting agent does not violate any of the rules set down in this section.
9. No part of the agent is allowed to leave the confines of the course.
10. No emissions are allowed except those normally associated with electric motors.
11. No explosives are allowed.
12. No pressurized tanks are allowed.
13. No projectiles are allowed.
14. No live animals are allowed.
15. The course cannot be damaged in any way. This includes damaging switches, puncturing any surfaces of the course (screws, nails or staples) or gluing anything to any party of the course. Other forms of damage not specified here will be prohibited at discretion of the Executive Committee.
16. All designs are subject to a safety review by the Executive Committee.

Course Specifications – (Refer to diagrams for detailed illustration)
1. The course is approximately 16 feet long and 11 feet wide, constructed of wood.
2. The ramp of the incline to the bridge will be 30°.
3. The inside surfaces of the course are painted black.
4. The agent must start anywhere within the 14” x 14” x 14” white safety box.
5. There are two identical mazes on each side of the course.
6. The mazes are routed by tape that can be optically and magnetically sensed. Along the tape, there will be 9 balls in each maze: 8 white balls and 1 colored ball.
7. The ramp will have identical stop/go switches at each entrance that will activate a light. To trigger the stop/go switch, your robot must depress your switch for 5 seconds. The switch will be located directly in front of the entrance to the ramp. It will be ~ 2’ 8” long (the width of the ramp) and 4” wide.
8. You must completely trigger the stop/go switch before triggering the Sesqui-switch in order to get Sesqui-switch points.
9. Both stop/go switches may be triggered by the same team. However, a single stop/go switch cannot be triggered more than once.
10. Once the stop/go light is turned on, the agent can proceed to activate the Sesqui-switch. The Sesqui-switch will be a 5 inch-high panel, located on the top of the ramp.
11. The Sesqui-switch must be pushed over completely, until it is flush with the course, in order to be triggered. (See illustrations)
12. An agent must flip the Sesqui-switch away from its starting safety box in order to win 150 points. No points will be awarded for a partial flip.
13. The Sesqui-switch will return to its starting position if pressure is released.
14. At the end of the match, whichever team last flipped the panel to their advantage wins 150 points.

**Competition Format**
1. The competition will be a double-elimination tournament format.
2. Each agent will have a chance to run the course individually once before the tournament begins. The score and final distance from the start will be recorded and used to rank the teams before the tournament begins.
3. The teams will be seeded in the tournament bracket according to their practice-round scores. In the first round, the top seed will compete against the last seed, the second seed vs. the second-to-last, etc.
4. If there are an uneven number of teams, the top seed will be given a bye for the first round. More byes may have to be given if the number of teams is not a power of two.
5. Each match will last 3 minutes.
6. If a mechanical failure of the course occurs (e.g. the Sesqui-switch does not pop up after release) during a match, we will immediately stop the match. Both teams will have 5 minutes to regroup before the rematch starts. Both teams will start with zero points.

**Scoring**
Possession of each golf ball: **10 points**
Successful possession of colored golf balls: **20 points**
Successful activation of switch at entrance to ramp: **20 points**
Successful activation of switch at top of ramp: Sesqui-switch: **150 points**

The team with the greatest amount of points at the end of the competition wins. In the event that two teams are tied at the end of 3 minutes, the agent closest to its opponent’s safety box wins.

Possession is determined by manually moving the agent at least 4 inches in all directions on the floor of the course. The agent is said to be “in possession” of all those balls which move with the agent in every direction.

The balls are regular, white or colored golf balls.

**Contest Rules**
1. Each team will have 1 minute to set up its agent prior to the start of each match.
2. A pistol shot signals the start of each match.
3. Each team will be allowed one false start for each match. Two false starts in one match will result in disqualification from that match.
4. Team members are not allowed to touch their agent after activating it until the match is officially declared over by the judges.
5. **The agent may start anywhere in the white starting box.**
6. To obtain points for successful activation of the Sesqui-switch, the agent must first successfully activate the switch at the entrance to the ramp.
7. All judge’s decisions are final.

**Financial Matters**
1. Each team will be reimbursed up to $500*. This will be paid back in reimbursement installments at Milestones.
2. To complete the milestone, each team must show the exec board that it has made significant progress toward the completion of its goal. The three milestone dates and reimbursement amounts are as follows:
   • 1st Milestone: February 2001 == $100
   • 2nd Milestone: April 2001 == $150
   • 3rd Milestone (Competition Day): May 2001 == $200 (or $250)*
3. The actual receipts must be turned in to receive the reimbursements. No photocopies will be accepted.
4. Each receipt will be reviewed for its validity.
5. For each milestone, the teams will only receive reimbursements up to the amount indicated above (#2). For the 1st and 2nd milestone, if a team submits receipts that are over the reimbursement amount, the remaining amount (after deducting the reimbursement amount) will be reimbursed at the next milestone.
6. If a team wishes to make a purchase of more than the allowed milestone amount, and cannot wait to get reimbursed, they should contact the exec board and we will provide immediate assistance on a case-by-case basis.
7. Receipts that are over 90 days old CANNOT be reimbursed. If a team has receipts that will be 90 days old (or older) by the next milestone, the team should contact the exec board immediately.
8. For teams that will be using the machine shop, $120 will be automatically deducted from the team’s budget at the last milestone (Competition day).
9. * In order to encourage more freshman participation, we will offer as a bonus an additional $50 towards the 3rd milestone to any team that has at least one freshman member.
10. Prize money will be as follows:
    • 1st Prize: MINIMUM $3000 (depending on corporate sponsorship)
    • 2nd Prize: $1500
    • 3rd Prize: $750
    • Most Innovative Design: $50
    • Other consolation prizes to be announced.

Machine Shop Access
Machine shop access is neither guaranteed nor necessarily easy to come by. Access to the machine shop will be granted only to teams that have completed the standard machine shop training session (dates and times TBA). The cost to use the machine shop, $120/team, will be deducted from the team budget. The Design Competition Executive Board reserves the right to further deduct from the team budget for failure to comply with the machine shop rules and guidelines.

Course Credit Opportunity
It is possible to earn up to two 399 credits. Each team needs to find a professor who is willing to oversee this project and grant the 399 credit(s). Professors may require regular meetings and or reports, and a final report. Please see your department’s policies and regulations for using 399 credits towards your degree. Please see the Exec Board if you have any difficulties.