



SYSTEM CONTROL TECHNOLOGY

OVERVIEW

Participants work as part of a team on site to develop a computer-controlled model-solution to a problem, typically one from an industrial setting. Teams analyze the problem, build a computer-controlled mechanical model, program the model, explain the program and mechanical features of the model-solution, and leave instructions for evaluators to operate the device.

PURPOSE

Use a team approach to develop a computer-controlled model-solution to a given problem that is typically in an industrial setting. The constructed model must simulate the industrial problem given to teams on site.

ELIGIBILITY


Entries are limited to one (1) team of three (3) members per state. Team members must be from the same chapter.

TIME LIMITS

- A. There is a one (1)-hour set-up time for the team captain or team representative prior to the competition.
- B. Each team is allowed a fifteen (15)-minute session for problem analysis.
- C. Each team is provided two and one-half (2½) hours for model development and programming. Programs must be written completely on site. Use or modification of any programs written prior to the competition result in disqualification.

ATTIRE

Business Casual dress as described in Competitive Events Attire is the minimum requirement.

 This challenging event attracts a special kind of student—team players who are creative and who can perform under pressure.

PROCEDURE

- A. Each team selects a “team captain” prior to the orientation meeting.
- B. The captain checks in for the team during the set-up time meeting by submitting his/her ID # for identification of the written and model portions of the event.
- C. The problem and the inventor’s log are presented to the teams at the beginning of the fifteen (15)-minute problem analysis session prior to model building. Teams must complete their description or interpretation of the problem during this time.
- D. Each team is given a maximum of two and one-half (2½) hours to construct a model simulating realistic industrial processes, to program the model, to test the solution, to describe the program and mechanical features of the model-solution, and to complete directions for evaluators to actuate the model.
- E. When finished, teams save their programs and leave them on-screen in operable form, with the ability to be reset.
 1. Before leaving the event room, teams demonstrate the operation of the model with evaluators present. Evaluators may ask a question or two (2) during the demonstration.
 2. After all the evaluators have observed the operation of the model, teams may leave. The coordinator determines the time given for the team demonstration based on the number of teams and the complexity of the problem.
 3. Evaluation of the solutions takes place without the teams present.

REGULATIONS

- A. Each team provides its own materials kit and reference material; the reference material must be approved by the coordinator prior to the start of the event. No building cards may be used or placed out in the open at any time. Each team’s material kit must include:
 1. Two (2) optical sensors
 2. Two (2) lights
 3. Two (2) touch sensors
 4. Two (2) motors
 5. Rubber bands and tape
 6. Pencils and scratch paper
- B. Participants provide their own hardware and software systems.
- C. The following definitions are an integral part of the event regulations:

1. Repeatability—the device is programmed to reset automatically.
 2. Functional control—the device/model must accomplish the task in an efficient manner and be user friendly.
 3. Model-solution—the physical device must simulate the realistic processes used in industry.
- D. The example of a problem for this event that follows is provided to help students understand and interpret a typical issue common to industry that might be used at a national conference.

The small island of Ire Sri Lampur used to have a population of more than 35,000 people. Due to the tsunami that hit the island on December 26, 2004, the island's population is now fewer than 26,000.

A tsunami is a giant wave caused by an underwater disturbance such as seismic activity (earthquake) or a volcanic eruption. The wave or waves can be 100 miles long (from crest to crest) and can travel at 500 mph. Fortunately, as a tsunami hits the shallow sea around a coast, it loses some of its speed. However, as the speed decreases, the height increases.

The people of Ire Sri Lampur, with some help from foreign and neighboring countries, have started to rebuild destroyed towns with a wall that wraps around each town. The wall is cleverly disguised as a row of low two-story shops, with thick, reinforced concrete on the side facing the beach and open shops on the town side. Intermittently, there are openings in the wall to allow for beach access. Between the breaks in a wall, the town people want to create large doors to block the water from entering the town side of the wall. Your job is to design and prototype the automated door system.

New tsunami sensors have been placed out at sea. The sensors will give two signals to alert your system that a tsunami is in-bound. The first signal will denote that an earthquake or eruption has occurred. The second signal will signify that a wave of significant size has been detected. If these signals occur within five (5) minutes of each other, then a tsunami is coming and the alert sequence is not a false alarm. Scientific studies indicate that 100 miles is the closet point from which a tsunami (the result of an earthquake or volcanic activity) could originate and proceed on its path to a coastline. Knowing the maximum speed of a tsunami and this distance, the automated doors should close when the tsunami is halfway on its way to reaching the coast, thus allowing beachgoers time to get to safety and ensuring additional time for a manual closing, should there be an automated closing malfunction.

The automated system must sense that the doors have closed. The doors must be secured – absolutely closed and locked – by the

time a tsunami arrives. The doors will need an additional brace and lock that will move into place to further secure the door against the weight of water once the doors have been closed.

Each town has a small emergency team of paramedics who also act as lifeguards. These individuals comprise the town's first response team, and their valuable equipment is located on the beach all day. If a tsunami is detected, each team and the team's 4WD ambulances must be able to get inside the town wall for protection. Also, team members may need last minute access in and out of the protective wall prior to the tsunami striking. A "dead man" switch will open and hold open automated doors for as long as the switch is pressed or until time runs out. The teams must be able to manually open the automated doors during the last half of the tsunami travel time. (However, keep in mind that the system must also activate on its own to protect the town and its inhabitants, day or night.) The system must sound an alarm when doors are closing. It also must activate a flashing light when a quake has been detected, show a steady light when a quake and significant wave have been detected, and turn off when all is safe. Issues of general concern are safety when the doors are closing and a fear that someone might open a door while there still is high water on the beach side of the wall. When a threat is over, pressing a switch should allow the doors to open again.

(1 minute real time = 1 second prototype time)

EVALUATION

Teams are evaluated on their written work, model function, and programming structure and efficiency.



SYSTEM CONTROL TECHNOLOGY INVENTOR'S LOG

Team Captain ID #

Use only the space provided.

Description or interpretation of the given problem (3 points):

Description of the team solution (explain the unique features of the program and model) (10 points):

Directions to evaluators to start the system (2 points):

SYSTEM CONTROL TECHNOLOGY EVENT COORDINATOR INSTRUCTIONS

PERSONNEL

- A. Event coordinator
- B. Evaluators, three (3)
- C. Assistants, two (2)
- D. Event sponsors, two (2) to write the problem and direct evaluators

MATERIALS

- A. Coordinator's notebook, containing:
 - 1. Event guidelines, four (4) copies
 - 2. Official rating forms
 - 3. List of entries with finalist report
 - 4. List of evaluators/assistants
 - 5. Stopwatches
 - 6. Calculator
 - 7. Copies of the problem written collaboratively by sponsors
 - 8. Copies of the inventor's log
 - 9. Results envelope
 - 10. Power strips and extension cords
- B. Large room to accommodate a first place team from every state and affiliated country
- C. One (1) table and three (3) chairs per team

PROCEDURE

- A. Upon arrival at the conference, report to the CRC room and check the contents of the Coordinator's notebook. Review the event guidelines and check to see that enough evaluators/assistants have been scheduled.
- B. Inspect the area(s) in which the event is being held for appropriate set-up, including room size, chairs, tables, outlets, etc. Notify the event manager of any potential problems.
- C. One (1) hour before the event is scheduled to begin, meet with your evaluators/assistants to distribute materials and to review time limits, procedures, and regulations. If questions arise that

cannot be answered, speak to the event manager before the event begins.

- D. Begin the event at the scheduled time by closing the doors and checking the entry list. All participants and evaluators should be in the room at this time. Participants not present may be disqualified. In order to compete, participants must be on the entry list or must have approval of the CRC chairperson.
- E. Secure entrant equipment in the area designated.
- F. At the orientation meeting obtain the team/chapter identification numbers from team captains.
 - 1. Evaluators and sponsors must be present at the orientation meeting.
 - 2. Review the time limits, procedure, and regulations with team captains.
- G. Distribute the problem and Inventor's Log to teams at the beginning of the event. Teams have fifteen (15) minutes to complete their interpretation of the problem in the Inventor's Log.
- H. Each team is given two and one-half (2½) hours to complete the remaining portions of the event.
- I. Teams must demonstrate that their device/model is operable and has the ability to reset prior to leaving. Evaluators must observe this portion and may ask a few questions. Evaluators also may take notes, but evaluation occurs only after all teams have left the event room.
- J. The evaluators judge the entries without consulting one another.
- K. For participants who violate the rules, the decision either to deduct twenty points (20) or to disqualify the entry must be discussed and verified with the evaluators, event coordinator, and a CRC manager. Secure the initials of the coordinator and manager on the rating form.
- L. Ensure that all rating forms have been completed, tallied, and averaged before evaluators are dismissed.
- M. Complete and submit the finalist report and all related forms in the results envelope to the CRC room.
- N. If necessary, manage security and the removal of materials from the area.

SYSTEM CONTROL TECHNOLOGY

2007 & 2008 OFFICIAL RATING FORM

HIGH SCHOOL

TEAM/CHAPTER ID#													
EVALUATIVE CRITERIA													
Inventor's log sheet (15 pts.)													
Description of problem	3 pts.												
Description of final solution	10 pts.												
Clear directions to actuate solution	2 pts.												
Model function (45 pts.)													
Realistic, industrial simulation	20 pts.												
Dependable solution	10 pts.												
Conservation of materials (efficiency)	10 pts.												
Ingenuity	5 pts.												
Computer program (40 pts.)													
Program is in a logical order	10 pts.												
Program illustrates efficient use of software to accomplish task	10 pts.												
Program is user friendly	10 pts.												
Program automatically resets	10 pts.												
SUBTOTAL	100 pts.												
Rules violation (must be initialed by coordinator and manager)	minus 20 pts.												
TOTAL	100 pts.												
Comments:													
I certify these results to be true and accurate to the best of my knowledge.													
<u>Documentation and display evaluator</u>													
Printed name: _____							Signature: _____						
<u>Presentation/interview evaluator</u>													
Printed name: _____							Signature: _____						