

CLIFFHANGER

The International Rope-Climbing Machine Design Contest at Techfest 2004

To scale heights has always been a challenge for the mankind ... be it the chilly heights of Mt. Everest or simply a few storeys of a building on fire! And every such situation urges mankind to look for newer options to tame the challenge. Machines have come long way in doing what was once thought to be impossible. Yet again, we look for machines that can scale heights and find application in day to day problems like fire-fighting, disaster management and rescue operations. Cliffhanger presents a simplified situation that addresses this issue as the problem statement of the contest.

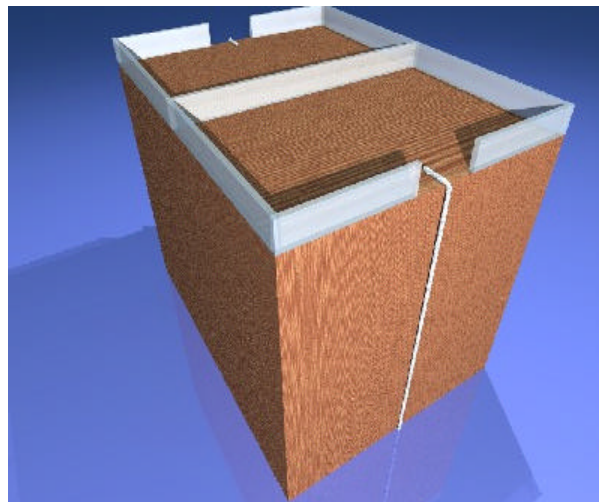
Entries for Cliffhanger are invited from any school student or undergraduate/postgraduate student from across the world. The participants would be classified into 2 categories - *India* and *Rest of the World* - for the qualifying round. The teams clearing this qualifying round shall attend the finals to be held in Mumbai, India during Techfest 2004 (24th- 26th January, 2004). A few select qualifying teams from the Rest of the World category will also receive to and fro airfare for the finals. The winning teams from both the categories combined would receive cash prizes of a total of US \$ 2500.

PROBLEM STATEMENT

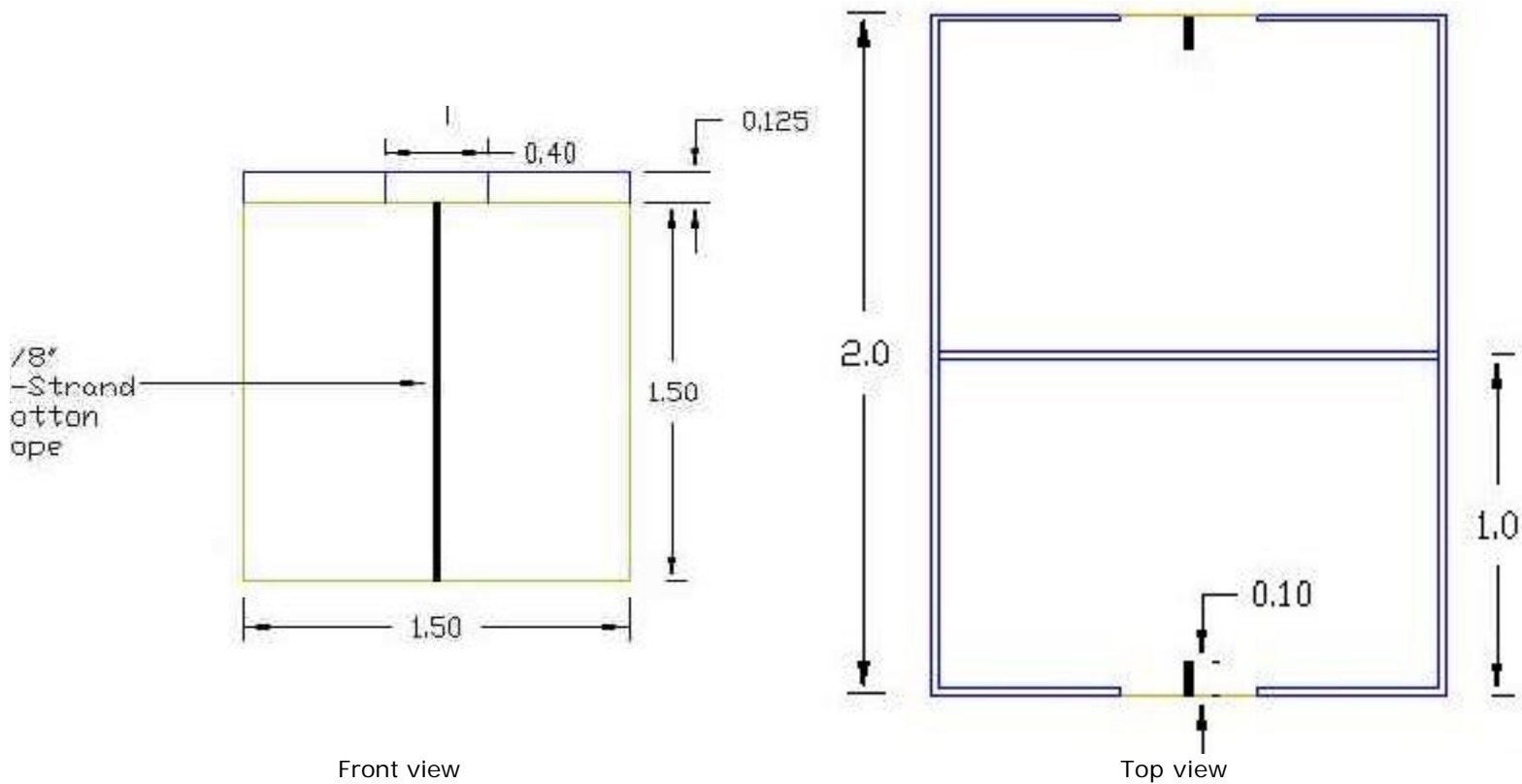
A rectangular plateau (2m x 1.5m) rests on a cliff 1.5m high. This plateau is divided into 2 regions by a boundary at the centre and has 10 balloons placed in each region (see figure below). Make a machine that climbs up the 1.5m high cliff with the help of freely hanging rope (see specifications) and bursts the balloons placed on the plateau. Two competing machines start on the task simultaneously and the one that bursts all balloons in the minimum time or maximum number of balloons in the allotted 5 minutes, whichever happens earlier, will be declared winner. In case, none of the machines competing are able to complete the task, the machine ahead in the game will be declared winner.

Game Board Description:

The plateau (2m x 1.5m) rests on a cliff (of height 1.5m) made up of plywood. The plateau is surrounded by a transparent acrylic sheet of height 12.5 cm having an opening of length 40cm on both sides for the machines to enter. It is divided into two equal open-top compartments by acrylic sheet.



The rope is hanging freely along the cliff from the center of the edge and is tied at a distance of 10 cm from the edge onto the plateau on both sides. Top view and front view of the game board are as shown:



All dimensions are in meters.

Download images in .dwg format (AutoCad 2002) from www.techfest.org/cliffhanger.
(Please note that balloons are not shown in the above figures.)

5/8" 4-strand cotton rope.

Please note that the dimensions of the rope are always subject to slight errors. The participants are advised to keep room for minor modifications in your machine accordingly.



More information for rope can be taken from
[http://www.barry.ca/barry/BarryCatalog/anglais/All Products/Twisted Ropes/Twisted Ropes.htm](http://www.barry.ca/barry/BarryCatalog/anglais/All%20Products/Twisted%20Ropes/Twisted%20Ropes.htm)

Description of balloon:

Average Diameter = $(D_1 + D_2)/2 = 7.5$ cms
Please note that this is only an approximate figure.



GAME RULES

Spirit of this game is what matters. But there are a few formal restrictions that need to be adhered to. Below mentioned are guidelines which every competitor should follow. In case of any ambiguity in design of machine or in understanding the rule/guidelines, please contact the organisers at the address mentioned below for clarifications.

1. All students enrolled in high school or undergraduate/postgraduate programme at their institute are eligible to participate in Cliffhanger at Techfest 2004.
2. A team can consist of a maximum of three students.
3. The machine should fit within a box of dimensions (10 x 10 x 10) inch at any and every given point of the game.
4. The machine must use only mechanical power or mechanical power converted from a source of electrical energy, chemicals, compressed gas and rockets. Pre-tensioned springs or combustion power method are strictly not allowed.
5. Lift assisting devices like balloons are not permitted. Before starting, the device must be demonstrated to be at full mechanical rest potential as far as the structure will allow.
6. The competitor will be allowed to engage the rope to his/her machine at the beginning of the game. You are not allowed to touch your machine once the game starts.
7. The machine should climb up using only the rope and the support of the wall.
8. After reaching the top, the machine should completely disengage itself from the rope before it starts bursting the balloons.
9. Ten balloons will be randomly placed inside each compartment. The machine which bursts more number of balloons wins.
10. You are not allowed to burst the balloons unless the machine reaches the plateau and completely disengages itself from the rope.
11. Use of chemicals, fire or similar harmful things to burst the balloons is prohibited.
12. During the game if a balloon goes outside the board or in the opposite compartment, it will be placed in its respective compartment by the judges only.
13. Duration of a game is 5 minutes. In case one of the machines completes its task (reaches the top and bursts all the 10 balloons in its compartment) before time, the game ends and that machine will be declared the winner.

14. If both the machines fail to complete the given task within the time limit, the machine which has burst a greater number of balloons will be declared the winner.
15. In case both machines fail to burst even one balloon after reaching the top, the machine that reached the top first shall be declared the winner.
16. In case both machines fail to reach the top, the machine which has climbed more distance shall be declared the winner.
17. If both machines have burst equal balloons or climbed an equal distance, the game ends in a tie. In the case of a tie, the game will restart.
18. If a machine gets stuck or falls down from the rope during the game, the competitors are not allowed to touch it till the game is over.
19. Gearbox and/or motor assembly of a toy car, or a base of a toy car with its gear box and/or motor as a machine part will disqualify the machine for the competition.

Structure of the Competition:

1. The tournament will be played on a knockout basis.
2. There shall be a preliminary qualification cum seeding round just before the competition for all the competing teams. The time limit to qualify will be three minutes.
3. In this seeding round, each team will have to climb the wall in a maximum time of three minutes. The time taken by the machine will decide its seeding for the first round of the competition. The first and the last teams will be paired, second and the second last and so on.
4. The teams will be paired similarly in the next round and so on till the finals.
5. If any team is disqualified for any reason, the opponent team will get a walkover to the next round.
6. The teams have to be ready for the contest within two minutes of the announcement for them to appear for their match, failing which, the judges can disqualify that team.
7. The teams must adhere to the spirit of healthy competition.
8. Judges reserve the right to modify the rules if they deem it necessary in order to preserve the spirit of healthy competition.

Grand Finale:

1. The Grand Finale shall consist of best-of-three rounds.
2. If the task is completed (i.e. machine climbs the cliff and at least one of the balloons is burst) in a round, then the winner of the round shall be awarded 1 point and the loser 0.
3. If both machines fail to complete the task in a given round, then the winner of this round will be awarded 0.5 and the loser 0. The winner in such a round will be decided on basis of 'machine being ahead in the games' (see Rules 15-16 in Game Rules)

4. If the scores are tied at the end of three rounds, a tie-breaker round will be played to decide the winner.
5. The team with maximum cumulative points after these 3 rounds (or 3 rounds plus tie-breaker) will be awarded 1st position. The runner-up team will be awarded 2nd position. A similar best-of-three round will be held amongst the runner-up teams of the semi-finals to decide the 3rd position.

GENERAL RULES

Sensors And Electronics:

The teams can use sensors (if they so desire) to sense any physical parameters but be sure that TV lights do not interfere with your sensors' activities. For the autonomous robot machine, you may/may not use sensors and microprocessors - the decision is yours. The organizers will not provide you with any system like microprocessor kits, computers and so on at the venue.

Power Supply:

Normal 230 V extension boards will be available at the venue. You should fetch your own eliminators/adaptors. No specialized demand shall be entertained. Please do not demand heavy equipment like compressors. Use of devices that can transfer manual power directly to machine (example: use of clutch wire) is not allowed. The power cords connecting a machine to the power supply must be slack at all times. Likewise the Control Cords must also be slack. So, please ensure that all cords are fairly long.

Safety:

The machines you build will be first checked for size and safety. The machine should not cause electric power breakdowns. The robots must not contain any combustible, corrosive, or otherwise dangerous materials for safety reasons. No explosive compression or decompression, either internal or external is permitted. There is a risk of compressed containers rupturing and creating shrapnel. Any robot whose strategy or operation is considered too dangerous shall be disqualified by the judges at their discretion.

Breakdowns/Timeouts:

There is no provision for breakdown or timeouts in this game. Your machine must be sturdy enough to participate in several matches.

Fouls/Penalties:

1. Team members are not permitted to touch either their machines or those of their opponents once a game begins. The penalty for doing so is disqualification.
2. The robots are not allowed to dismember themselves or leave parts on the platform.
3. Machines damaging the platform will be disqualified.

Machine Names:

The name of your machine must be prominently displayed on the machine.

Sportive and Friendly Games:

Intentional damage to the opponent's machine is not allowed. Goodwill and friendship between competitors may evaporate if, for example, one opponent uses lightening bolts to destroy the electronics of the competitor.

Scratching a team:

Any team that is not ready to play at the time specified will be scratched automatically. This applies to Eliminations, Prelims and Finals rounds.

Demonstration to Judges:

Machines will have to be demonstrated to judges (who will evaluate the machines for other prizes) at a time and date specified in the schedule which will be put up. Any team that does not turn up at the specified time will not be considered for the above special prizes.

Demonstration of Machines at Final:

The Finals will be conducted in front of a large audience. Teams which have lost in the Prelims will be required to demonstrate their machines (one minute per machine) to the audience at that time. A group photograph of all the machines/participants will be taken. The date, time and venue will be specified at the time of competition.

The organizers reserve all rights to change any or all of the above rules as they deem fit. The decision of the judges and the organizers will be final and binding.

QUALIFYING ROUND:

1. All teams have to register their machines at www.techfest.org as soon as they start making the machine.
2. The contest will comprise of a qualifying round based on Video eliminations for the finals to be held on the venue - Mumbai, India. For the qualifying round, all teams will be classified into 2 categories - India and Rest of the World.
3. For the video eliminations, the teams must send via post a parcel containing the following to the address mentioned below.

Contents of the parcel to be sent:

- a. An abstract of not more than two A4 sheets covering essentially the principle used by the machine, the approximate time taken to complete the task and the projected final cost of the machine.
- b. A Compact Disc (C.D.) containing the video of the machine in action. It should essentially contain the following:
 - i. A portion of this tape must be an uninterrupted and unedited recording showing the machine climbing the rope and over the edge twice. A video timer must be visible during this uninterrupted recording.
 - ii. The mechanism used to burst the balloons.
 - iii. A detailed look at and explanation of the machine, including close-up shots and shots from various directions.
 - iv. Participants are encouraged to have a narration (in English) also along with the video.
- c. A signed letter from the Dean/Head of your institute granting permission for you to participate at Cliffhanger at Techfest-2004.

Address:

Techfest 2004,
Student Gymkhana,
IIT Bombay, Powai,
Mumbai - 400076
INDIA
Tel-91-22 25764045/8947
Fax-91-22 25723480

4. The following will be the criterion for selection in elimination round.
 - a. Mechanism used by the machine to climb the rope and over the edge,
 - b. Approximate time taken to do the same,
 - c. Uniqueness and design of the machine.
5. The contents of the parcels (the description of your machine and the video) would be kept strictly confidential.
6. The last date for receipt of parcels from outside India is 15th December, 2003 and that from within India is 31st December, 2003.
7. The short-listed teams from outside India will receive a notification e-mail latest by 31st December, 2003 and those within India by 10 January, 2004. The lists of the same will also be available at www.techfest.org.
8. Few selected entries from the Rest of the World category who qualify for the finals to be held in Mumbai, India will be provided to and fro Airfare. Judges and organizers decision will be final and binding on this issue.
9. Other international teams who qualify for the finals but are not awarded the airfare are welcome to participate in the competition but at their own fare. Accommodation and other facilities will be provided by the organizers.
10. There will be no weightage of the elimination round towards the final competition to be held from 24th - 26th January 2004.

IMPORTANT DATES:

The following are the important deadlines for the contest:

1. The last date for receipt of parcels from outside India is 15th December, 2003 and that from within India is 31st December, 2003.
2. The short-listed teams from outside India will receive a notification e-mail latest by 31st December, 2003 and those within India by 10th January, 2004.
3. The final competition will held from 24th - 26th January, 2004

PRIZES

First Prize	:	US \$1000
Second Prize	:	US \$ 750
Third Prize	:	US \$ 500

Total cash prizes worth \$ 2500 to be won!