Rounds
Problem Statements
Regional
Final
Prizes

Final

AIM

To design machines to solve classic snakes and ladders game in least possible time. This will be done using two robots one manually controlled and one autonomous. The role of the manual Bot would be similar to that of a dice and the autonomous Bot would act as the pawn on the board.

MANUAL BOT

1. The Role of the Manual Bot is that of a dice in a normal snakes and ladder game.
2. Manual Bot is supposed to pick the ring (**figure a**) and put it in the cylindrical posts (**figure d**) provided on the arena.
3. Once the object is placed on the numbered cylinder selected by the player, the autonomous robot is supposed to move the corresponding number of grids in the other arena.
4. The manual robot will be given two minutes in order to move cylindrical object onto the cylindrical post.
5. Mechanical Specification:

LENGTH: 25cm
WIDTH: 25cm
HEIGHT: No Restrictions
WEIGHT: No Restrictions

AUTONOMOUS BOT

1. The role of the Autonomous Bot is that of the pawn on the board, which will be placed in the adjoining arena (figure e). It has to autonomously traverse number of grid which would be the number received from the manual arena (i.e. the number cylindrical post on which the ring has been placed).
2. The number achieved from the manual arena would be transmitted to the autonomous Bot via wireless module from the Organizer's system, which means that the autonomous Bot should also have the provision of receiving data wirelessly. The organizer would be using CC2500 module to transmit data wirelessly.The robot should have a CC2500 module(owned by team) so as to communicate with organizers module.
3. The autonomous Bot must be self contained; external computers are not allowed.
4. The robot can be no larger than 6" in any dimension (i.e. it must fit

inside a 6" square box). There is no weight restriction. The robot cannot expand beyond these dimensions at any time during the event.
5. The robot is permitted to sense lines other than the one it is traveling on as long as those sensors do not extend beyond the allowed dimensions. In other words, a camera arrangement can be used (and it may telescope vertically) to glean information about the maze, as long as the camera is mounted wholly on the robot itself and within the 6" cube.

ARENA FOR MANUAL BOT (refer to figure d)

1. The maze will consist of black print on a white background.
2. The black line width will be 0.75”. The contrast between the line and the background will be such that the line will be easily discernible by people under the lighting conditions of the contest.
3. The cylindrical posts inside the arena will be placed in a triangular fashion as shown in figure d. The height of the post will be 20 cm.
4. Outer radius of cylindrical post is 3cm.
5. Each cylindrical cell is labeled with a number from 1-6 which specifies the number of moves autonomous bot has to take. The manual robot would be placed on the black box as depicted in the figure d.

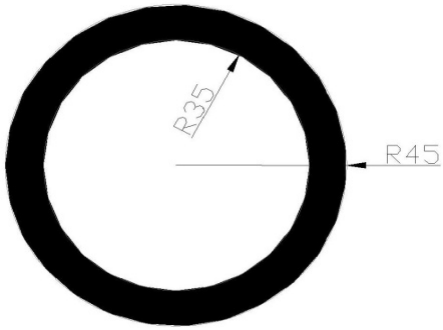
ARENA FOR AUTONOMOUS BOT (refer to figure f)

1. The maze will consist of black lines on a white background.
2. All lines will be straight, and all lines will be parallel or perpendicular to each other. No line will be closer than 8” to any other (parallel) line and there will be always a minimum of 8” between two intersections.
3. Reference lines and the snakes and ladders would be imprinted on acrylic sheet as shown in figure e. The imprint would be such that it does not hinder the movement of the autonomous bot.
4. All contestants will begin from the spot marked as 1.

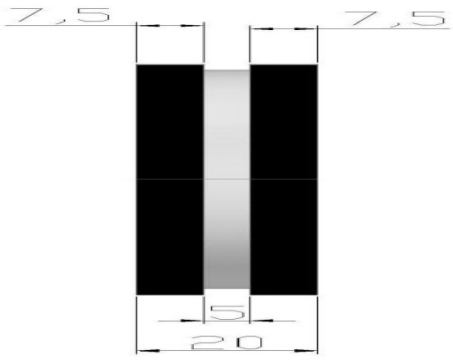
CYLINDRICAL OBJECTS SPECIFICATIONS:

The outer radius is 4.5cm and inner radius is 3.5cm. A taper of 0.5cm is given along the circumference of the cylinder so that it can be easily held by the manual Bot.The weight of the cylindrical object will not exceed 300gm and the material would be of wood/ply wood.

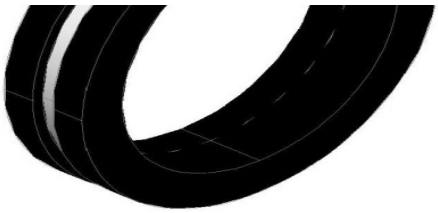
(Figure a)Front View



(Figure b)Side View



(Figure c)Isometric View



GAME PLAN

1. The manual bot, present on the start point of arena will pick the ring and(one at a time) place it on the numbered, cylindrical post.
2. The number of the respective post will be transmitted wirelessly in a specific protocol to the autonomous robot by the organizer's system. The Medium of communication will be TI's CC2500. The protocol will be published soon.
3. For testing purposes, you may use the following protocol:
The higher nibble will signify that the bot has to move forward or backward and the lower nibble signifies the number of move. For example, '0x04' signifies that bot has to move 4 cells in forward direction and '0x14' signifies that bot has to move 4 cells in backward direction.
4. The autonomous Bot does not have to take care whether it has arrived at the head of a ladder or snake. If it arrives at such a point the organizer's system would calculate the number of cells it has to go forward or backward. Hence the organizer's system would be transmitting the calculated number of moves. 5. The autonomous robot will then traverse those many cells.
6. The team which would be able to complete the snake ladder arena in least time would be declared the winner.

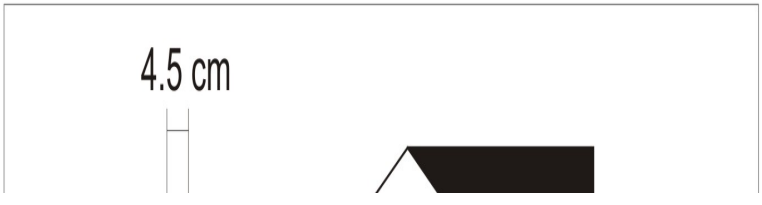
Protocol:

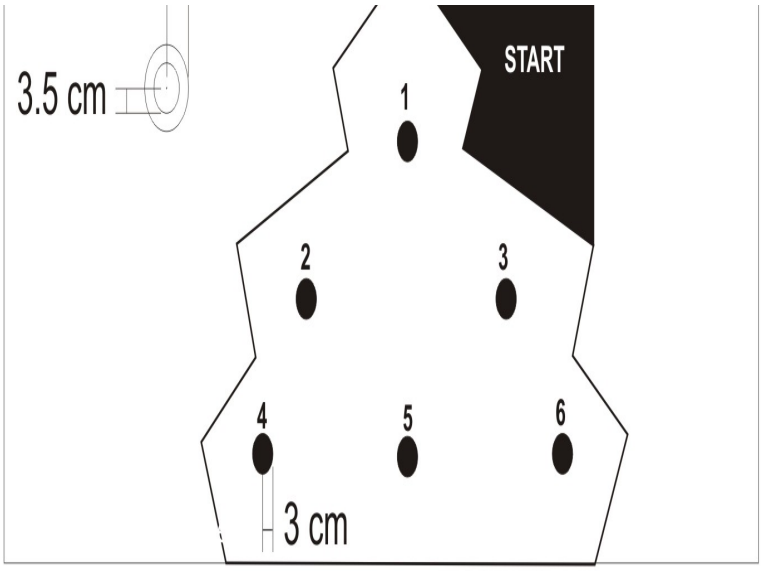
Step 1: The computer at the organizers end will send a character 'W' to establish a link with the bot.
Step 2: The bot has to transmit a character 'X' to acknowledge to the command sent by the computer, Now the communicatin link is established between the two.
Step 3: Now the computer will send 1 byte of data to the bot which will be the coordinates(e.g for (1,1) -> 0x11 for (6,6) -> 0x66)
Step 4: Before the bot starts to reach its destination, it should confirm whether it has received the correct data. For this, the bot will send back the co-ordiantes it has recieved. the PC will send a character 'Y' to acknowledge it if it is correct and if not, it will retransmit the co-ordinates.
Step 5: The bot has to reach the destination and then send a character 'Z' to indicate the task is completed.

*Note:All the characters like W,X,Y,... are in **capital.***
Baud rate for CC2500 module is a 38400 BPS (fixed).

organizers PC address : 0x32 (ascii value of 2)
CHANNEL address : 0x33 (ascii value of 3)

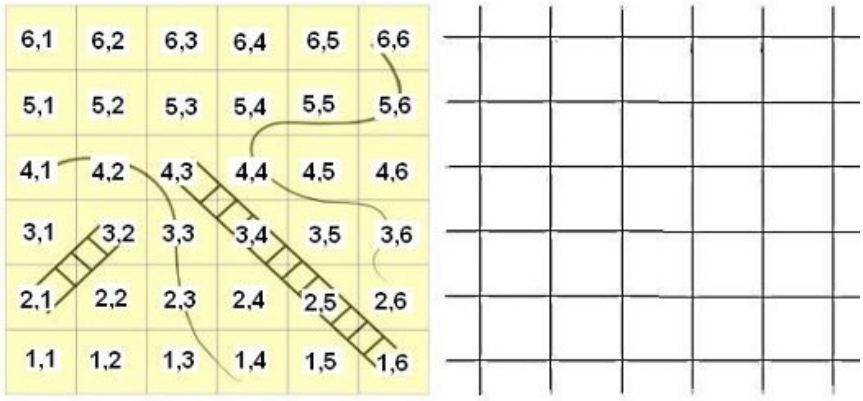
All the participant bots will be collected before the Competition starts and will be issued in just 10 minutes before their turn.





ARENA

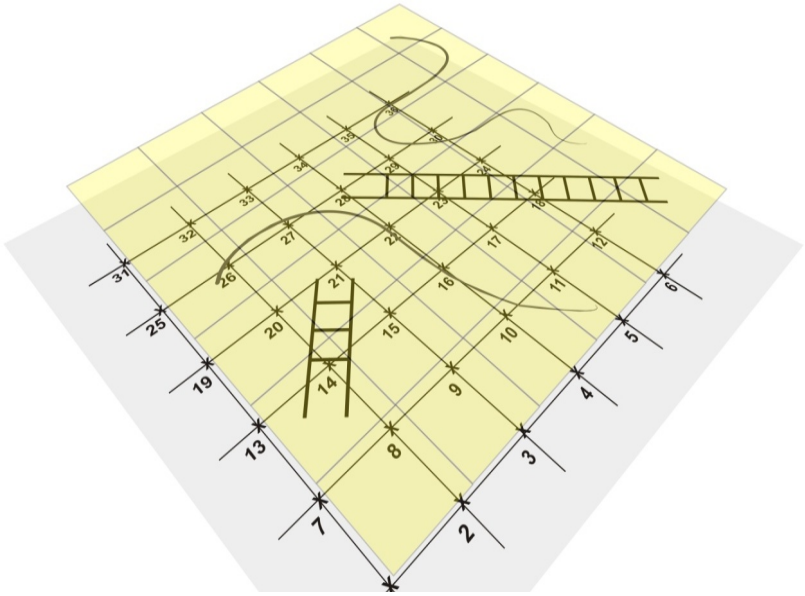
Arena for Autonomous Bot



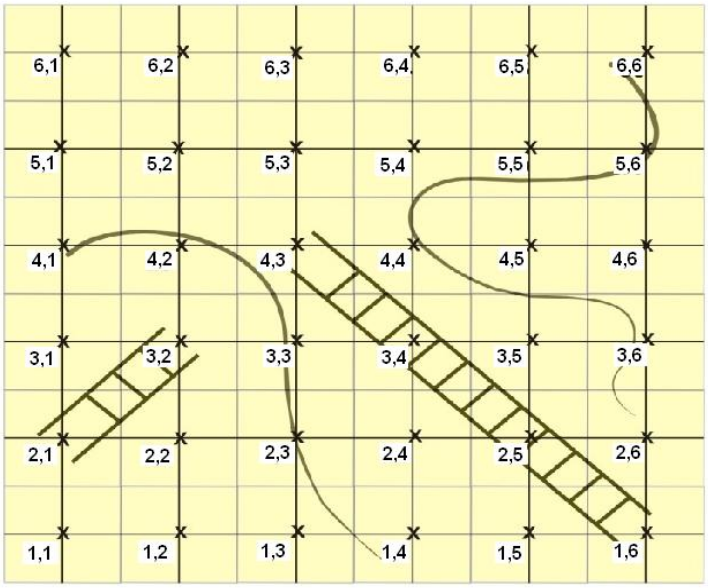
(Figure e)Acrylic sheet which would be placed on top of the maze

(Figure f)Arena for Autonomous Bot

Autonomous Arena Layout



Top View



Note: The arena for the autonomous bot will be just a grid and there will be no cross marks or numbers on it. The acrylic sheet will be placed above the arena of autonomous bot at some height so as there is no problem for the movement of the bot.