AUTOMATA ’15

About the event

From time immemorial, intelligent robotics has been intriguing humans. From when Aristotle speculated in his Politics (ca. 322 BC, book 1, part 4) that **automatons** could someday bring about human equality by making possible the abolition of slavery, humongous advancements have been made in this exciting field. With the computational abilities available to us today, imaginations have no bound. Thus, we at ENGINEER present a string of robot building competitions which need imagination and perseverance. **AUTOMATA** is one such event where the participants have to build an image processing Robot.

Problem Statement: WIZARD CHESS!!!

Build an Image processing Robot which traverses on a giant Chess board similar to a KNIGHT to reach the destination square in minimum number of MOVES

Arena Specifications

- The arena will be a non-reflective surface.
- An overhead camera is positioned on top of the arena so that it is completely visible. The position of the camera with respect to the arena will be fixed.
- The arena is a CHESS Board, consisting of white and black squares. There would be 64 squares with each square of size $1ft * 1ft$.

- One of the 64 squares would be RED in colour. The position of this square, known as the destination square would be made known to the participants only on the day of competition.
- A GREEN border (2 inch wide) would be present around the chess board.

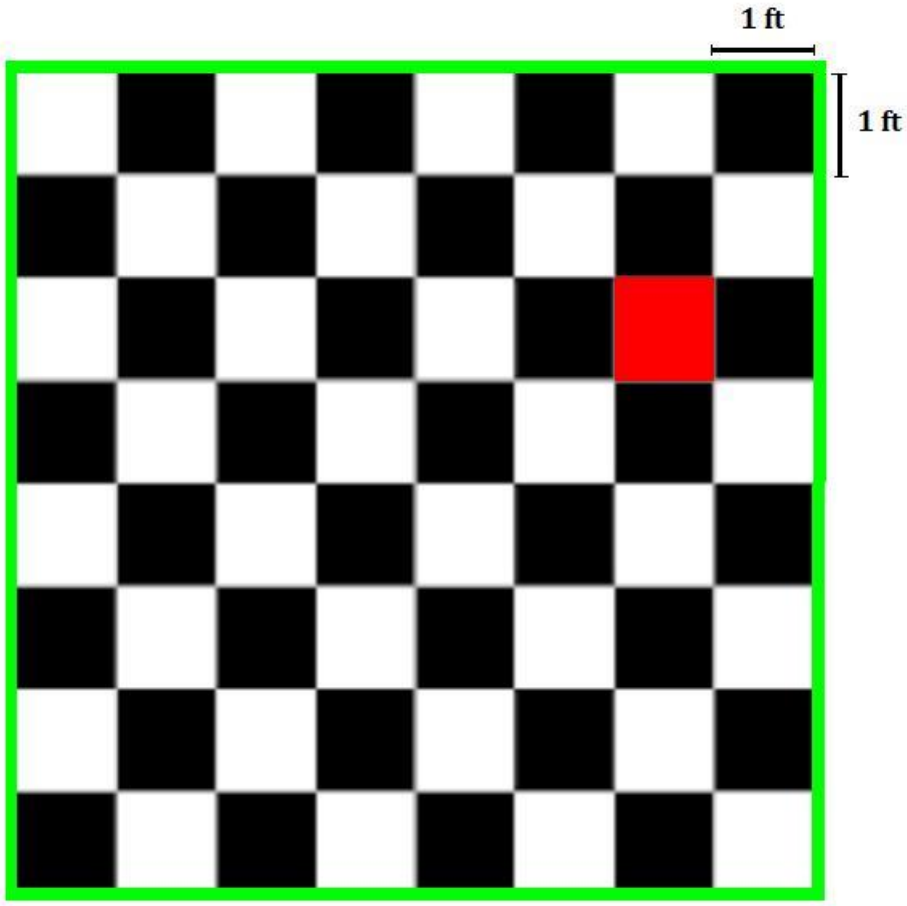

Figure 1: Sample Arena

The above figure is just representative. The position of the destination square may differ from the one shown in the figure.

Objectives

- The robot has to traverse through the arena, to reach the RED square, from a specified square, using the shortest path available. But the twist is that,

the robot has to traverse in a manner similar to that of a **knight(horse)**.

- Reaching the final square, without traversing the shortest path, may be considered for evaluation only if no robot ever moves ahead on the shortest available path.
- The only input to you will be the stream from the overhead camera feed.
- ONLY DC MOTORS are allowed. Steppers and wheel encoders will lead to disqualification of the team.
- There will be a maximum of 15 minutes for each team in which they can have as many trials as required. Teams will also be given 10 minutes for calibration.
- All teams must submit their bots, codes, laptops at the start of the competition.
- The starting position may be black or white which will be decided by the organizers on the spot.

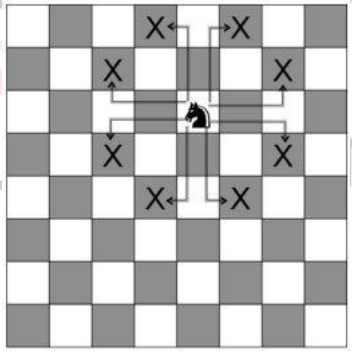

Figure 2: Knight Movements

As shown in the Figure 2, the robot is supposed to move in the shape of an 'L'. Each such traversal is defined as a MOVE. The robot which will reach the destination in minimum number of MOVES would receive the highest points.

Scoring Criteria

- The team that reaches the destination in minimum number of MOVES will be declared as the winner.

- In case multiple teams succeed the time taken is taken into consideration to decide the winner.
- Any deviation from path will lead to restart of trial.
- In case of no one completing the traversal of arena, the team who has gone the farthest will win.
- Illegal robot movements will result in a restart of the trial (Example: Deviation from the paths).
- The trial starts when the robot starts moving from the initial position.
- The trial ends when the robot reaches the destination or if the stipulated time ends.
- The team will be penalized every time the robot deviates from the path.

Robot Details

- The robot should be completely autonomous.
- The robot should fit into a box of dimensions $20(cm) * 18(cm)$ (length x width).
- The robot is required to have an onboard power source not based on combustion.
- The maximum voltage between any two points on the robot should not exceed 12 volts.
- The robots are NOT allowed to have stepper motors, sensors for a wheel encoder and any other sensors.
- The robots can communicate with a computer outside the arena either through wired or wireless connection.
- In case of a wired connection, the wire must be kept slack all the time and must emerge from the top of the robot.
- Use of on-board camera is not allowed.
- The following software for image processing are allowed:

- Open CV
- MATLAB
- Scilab / GNU Octave

- If any other software is used for image processing, please inform us.
- Software with ready-made image processing codes/GUIs is not allowed.
- Sharp objects on the robot which may damage the arena will lead to disqualification of the team.

Camera Details

- An overhead USB camera is placed such that the entire arena is just visible.
- The camera provided by us will support image acquisition in these modes: 640x480, 1600x1200 and in RGB/YUV formats.
- The teams will have to use the camera provided by us.

General Information

- A maximum of 4 members per team is allowed. We do not provide computers to the participating teams. It is expected that you arrange for your own.
- The robot will initially be placed in a square of our choice. The starting square may be different for different teams, but the level of complexity will remain the same.
- The decision of the organizers is final and binding.

Contact Details:

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