ROBO CARNIVAL 2019

Industrial Automation Challenge

RULEBOOK

discovering new degrees of freedom

BUET ROBOTICS SOCIETY

Industrial Automation Challenge (IAC) is a signature event of BRS. We have started the practice of making robotic events more related to practical applications. IAC is kind of product sorting robotic event where a robotic arm is used to collect the products, determine the type and then reserve each product to particular deposit zone. Our main objective of this event is to make students thinking about real life problems that can make a role to our industrial movement further.

TASK

- There will be 4 types of cube. 3 of them are of solid colors (RED, BLUE, YELLOW) and 1 is multicolored cube. They'll be moving on a conveyer belt at a constant speed.
- Only one cube will pass at a time and cube type will be random.
- You'll have to build an autonomous robot which will detect the color of the cube (for multicolored cube center color need to be detected) and deposit it in the corresponding zone.
- Participant(s) may use Color sensor or camera to detect the color.
- Participant may use their own light source.

GAME FIELD

- The dimension of conveyer belt will be 120 cm X 35 cm and it'll be painted black.
- The arena will contain 3 fixed deposit zones having a dimension of 20 cm X 20 cm **which is mentioned in the design section.**
- **The dimension of camera stand zone will be 30 cm X 30 cm and participants can place the supporting stand of the camera there (if necessary)**
- The dimension of robot zone is 30 cm X 30 cm. The autonomous robot must fit there.
- The participants can use the participant's zone to use computer for image processing.

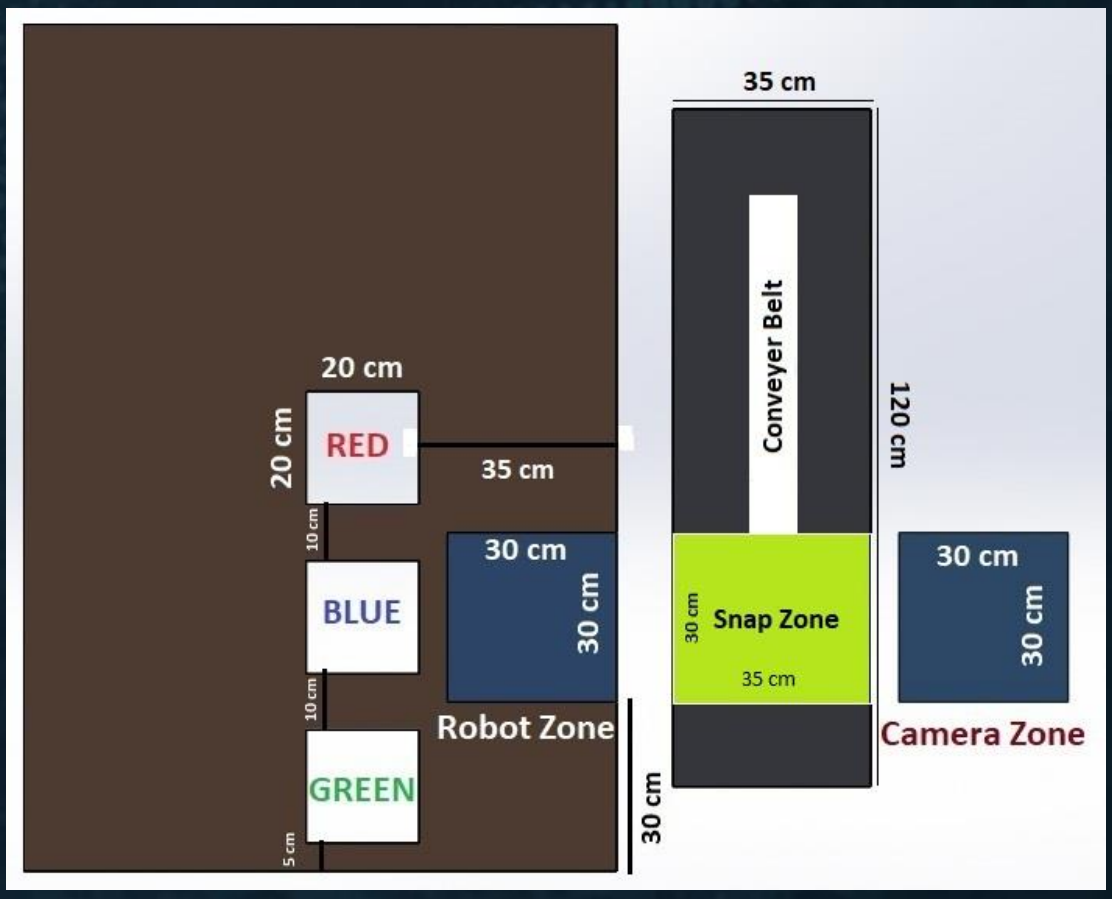


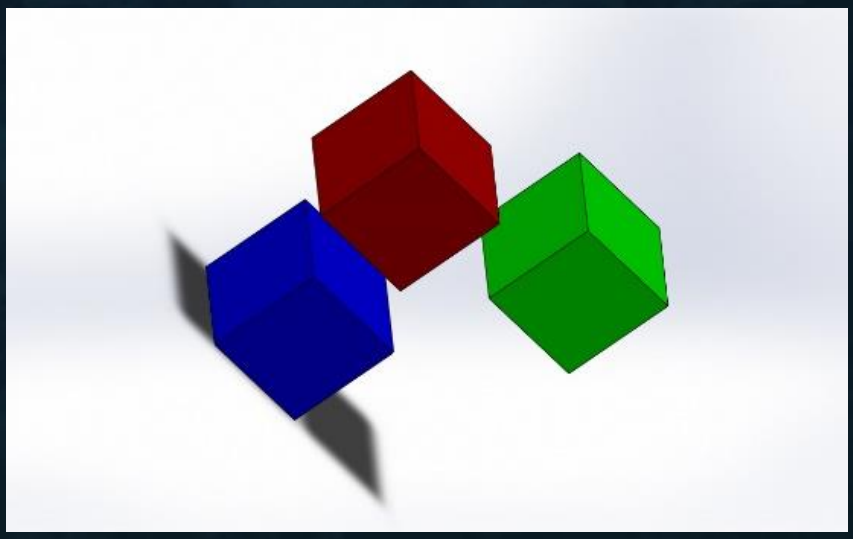
Fig. : Game Field

DEPOSIT ZONE SPECIFICATIONS

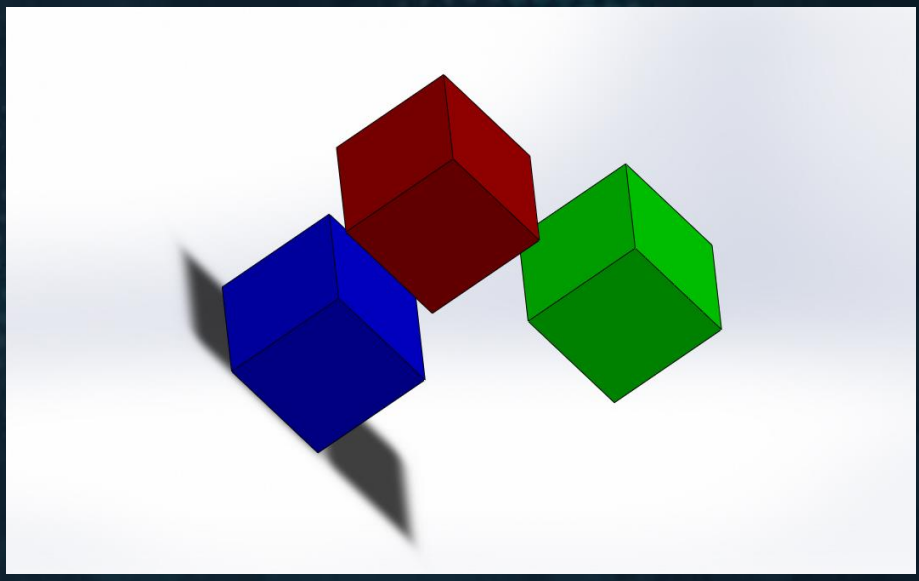
- The deposit zones are fixed.
- The “RED” labeled zone (20 cm X 20 cm) will be used to deposit the red cube.
- The “BLUE” labeled zone (20 cm X 20 cm) will be used to deposit the blue cube.
- The “GREEN” labeled zone (20 cm X 20 cm) will be used to deposit the green cube.
- The center color will define the deposit box of multicolored cube.
- For multicolored cube, proper placing of camera is required to detect actual color of cube.

CUBE SPECIFICATIONS

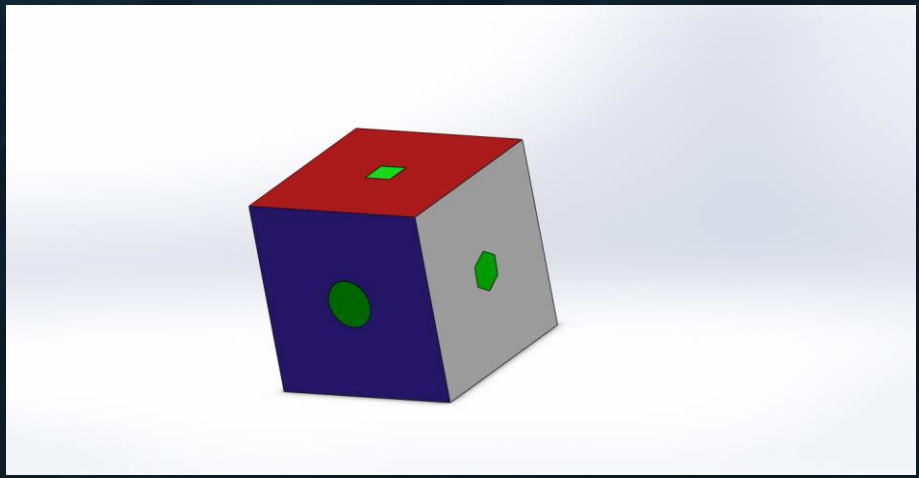
- Each cube will have a dimension of 8 cm X 8 cm X 8 cm. The weight of any cube will not exceed 250g.
- Cube will be made of PVC sheet.
- Chemical color will be used to color the cube.
- The diameter of the center portion of the multi-colored cube will be 1.5-2 cm.



SOLID CUBE



MULTICOLOURED CUBE



ROBOT SPECIFICATIONS

- The robot must fit in the robot zone. There is no restriction on height.
- Camera can be placed anywhere but its supporting stand (if needed) must be placed in the camera zone.
- No readymade arm, Lego kit or any such assemblies is allowed. 3D printed components are allowed but if 3D printed anything is used then the design files must be shown.
- The arm must be autonomous with single power on/off switch. For any extra switch, its function must be clarified.
- Power supply must be on board. No external power supply is allowed.
- Each team must bring its own power supply. Maximum on board voltage is 24V.

CONTROL

- The control of the robot must be fully autonomous.
- No wireless communication will be allowed.
- The setup can be standalone or computer controlled. No human interruption will be allowed.

GAMEPLAY

- Total time for is each team will be 16 minutes, 2 minutes for each cube.
- Total number of cube will be 8. 6 of them are solid colored and 2 multicolored.
- For one cube 2 minutes of time will be allotted. If failed to deposit within this time, points will not be added and next cube will come.
- The cubes will come at random sequence.
- The snap zone is the (35 cm X 30 cm) area between camera stand zone and robot zone. The cube will come at constant velocity and can stop anywhere within this region.
- Time counting will start after the cube starts moving at the first place before reaching snap zone.
- The cube will be steady for 40 seconds and after that the conveyer belt will move again.

GAMEPLAY (CONTINUED)

- The robot must pick the cube within this time and deposit it in the hole of corresponding color as the arena design follows.
- The time counting will be paused when the cube is deposited or at any restart.
- Restart means everything from the beginning of that cube.
- During restart, human intervention is allowed.
- Any human intervention (except restart), manual control, arena damaging will result in disqualification.
- Maximum 3 restarts are allowed.
- There will be only one round.

JUDGING

- For each successful deposit 100 points will be awarded.
- For each successful deposit, the saved time (in seconds) will be bonus point.
- For unsuccessful deposit no saved time bonus point will be awarded.
- For each restart there'll be a penalty of 50 points and maximum restart time is 1 minute. Code can't be altered during restart.
- Dragging the cube will result in restart and extra 20 points penalty.
- At least 3 cubes must be deposited to be considered for prize.

TEAM SPECIFICATIONS

- **Maximum 6 members in a team, but if any team has more than 4 members, then for each extra member, additional 600 TK has to be paid.**
- Students from different universities are allowed in one team.
- Only undergrad students are allowed in team.
- Students must bring their valid id card for inspection.