Industrial Automation Challenge V2.0

Task:

1. There will be 3 types of white cubes having black circle, tringle & square drawn on the top surface. They'll be moving on a conveyer belt at constant speed.
2. Only one cube will pass at a time and cube type will be random.
3. You'll have to build an autonomous robot which will detect the shape drawn on the cube and deposit it in the corresponding zone.

Game Field:

1. The dimension of conveyer belt will be 120 cm X 35 cm and it'll be painted black.
2. The arena will contain three fixed deposit zones of dimension 20 cm X 20 cm positioned as in the arena's design.
3. The dimension of camera stand zone will be 30 cm X 30 cm and the camera's supporting stand must be placed here if necessary.
4. The dimension of robot zone is 30 cm X 30 cm. The autonomous robot must fit there.
5. The participants can use the participant's zone to use computer for image processing purposes. It's dimension is 60 cm X 30 cm.

Deposit zone specifications:

The deposit zones are fixed.

1. The "circle" labeled zone (20cm X 20 cm) will be used to deposit the cube with circle shape drawn.

2. The "tringle" labeled zone (20cm X 20 cm) will be used to deposit the cube with triangle shape drawn.

3. The "square" labeled zone (20cm X 20 cm) will be used to deposit the cube with square shape drawn.

Cube specification:

Each cube will have a dimension of 12 cm X 12 cm X 12 cm. On the top of each cube, a shape (circle, triangle or square) will be drawn. The color of the cubes will be white and the color of the shapes will be black. The shapes will be drawn of medium size. The weight of any cube will not exceed 250g.

Camera specifications:

Any type of camera can be used. But cellphone, laptop's webcam etc. anything which can be programmed or can have built-in app to detect shapes is not permitted to use as camera.

Image processing restrictions:

Computer, raspberry pi etc. anything can be used for image processing purpose. But any readymade app for shape detection is not allowed.

Robot specifications:

1. The robot must fit in the robot zone. There is no restriction on height.
2. Camera can be placed anywhere accept restricted zone, but it's supporting stand (if needed) must be placed in the camera zone.
3. 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.
4. The arm must be autonomous with single power on/off switch. For any extra switch, it's function must be clearified.
5. Power supply must be on board. No external power supply is allowed. Each team must bring it's own power supply. Maximum on board voltage is 24V.

Control:

1. The control of the robot must be fully autonomous.
2. No wireless communication will be allowed.
3. The setup can be standalone or computer controlled. No human intervention will be allowed.

Gameplay:

1. Total time for is each team will be 12 minutes, 2 mins for each cube. Total number of cube will be 6, 2 from each shape.
2. 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.
3. The cubes will come at random sequence from restriction zone end.
4. The snap zone is the (35cm X 30cm) area between camera stand zone and robot zone. The cube will come at constant velocity and can stop anywhere within this region.
5. Time counting starts after the cube starts moving at the first place before reaching snap zone.
6. The cube will be steady for 40 seconds and after that the conveyer belt will move again.
7. The robot must pick the cube within this time and deposit it in the hole of corresponding shape as the arena design follows.
8. The time counting will be paused when the cube is deposited or at any restart.
9. Restart means everything from the beginning of that cube.
10. Any human intervention (accept restart), manual control, arena damaging will result in disqualification.
11. During restart, human intervention is allowed.
12. Maximum 3 restarts are allowed.

Judging:

1. For each successful deposit 100 points will be awarded.
2. For each successful deposit, the saved time (in seconds) will be bonus point.
3. For unsuccessful deposit no saved time bonus point will be awarded.
4. For each restart there'll be a penalty of 50 points and maximum restart time is 1 minutes. Code can't be altered during restart.
5. Dragging the cube will result in restart and extra 20 points penalty.

There will be only one round.

Point calculation:

S=100 for successful deposit and 0 for unsuccessful one.

s= No. of successful deposit.

T= Total time bonus (if deposited successfully).

D= Dragging penalty = 20

d= No. of dragging.

R= Restart penalty = 50

r= No. of restart

Total point= $\sum_{n=1}^{6}(\boldsymbol{s} * \boldsymbol{S}) + \boldsymbol{T} - \boldsymbol{d} * \boldsymbol{D} - \boldsymbol{r} * \boldsymbol{R}$

Team Specifications:

1. Each team can contain max 6 members.
2. Students from different universities allowed in one team.
3. Only undergrad students are allowed in team.
4. Students must bring their valid id card for inspection.

Certificate policy:

1. Certificate of excellence will be awarded to top 3 teams.
2. Other participants will get certificate of participation.
3. Disqualified teams will not be given any certificate of participation.

The authority has the right to change any rule if necessary.

Arena

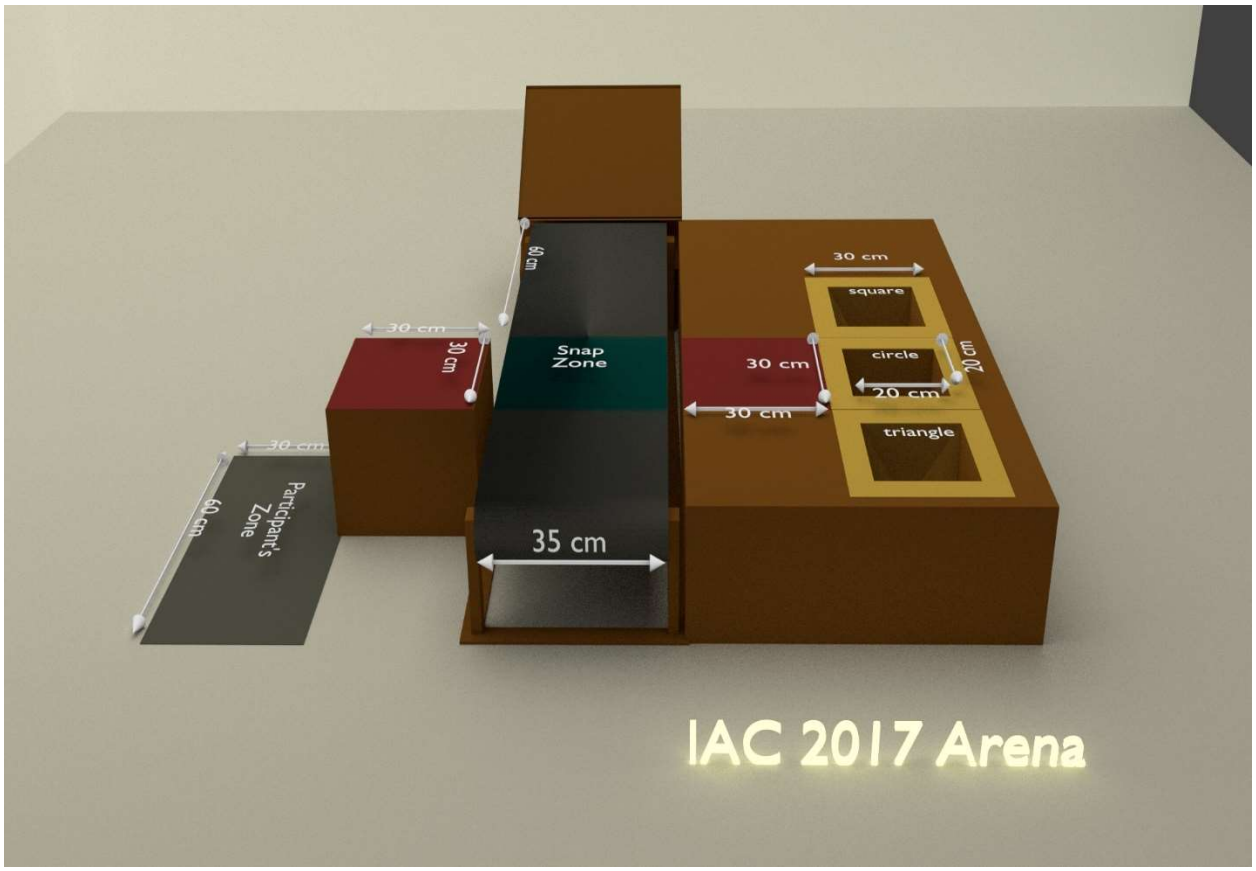

Figure 1 Front view

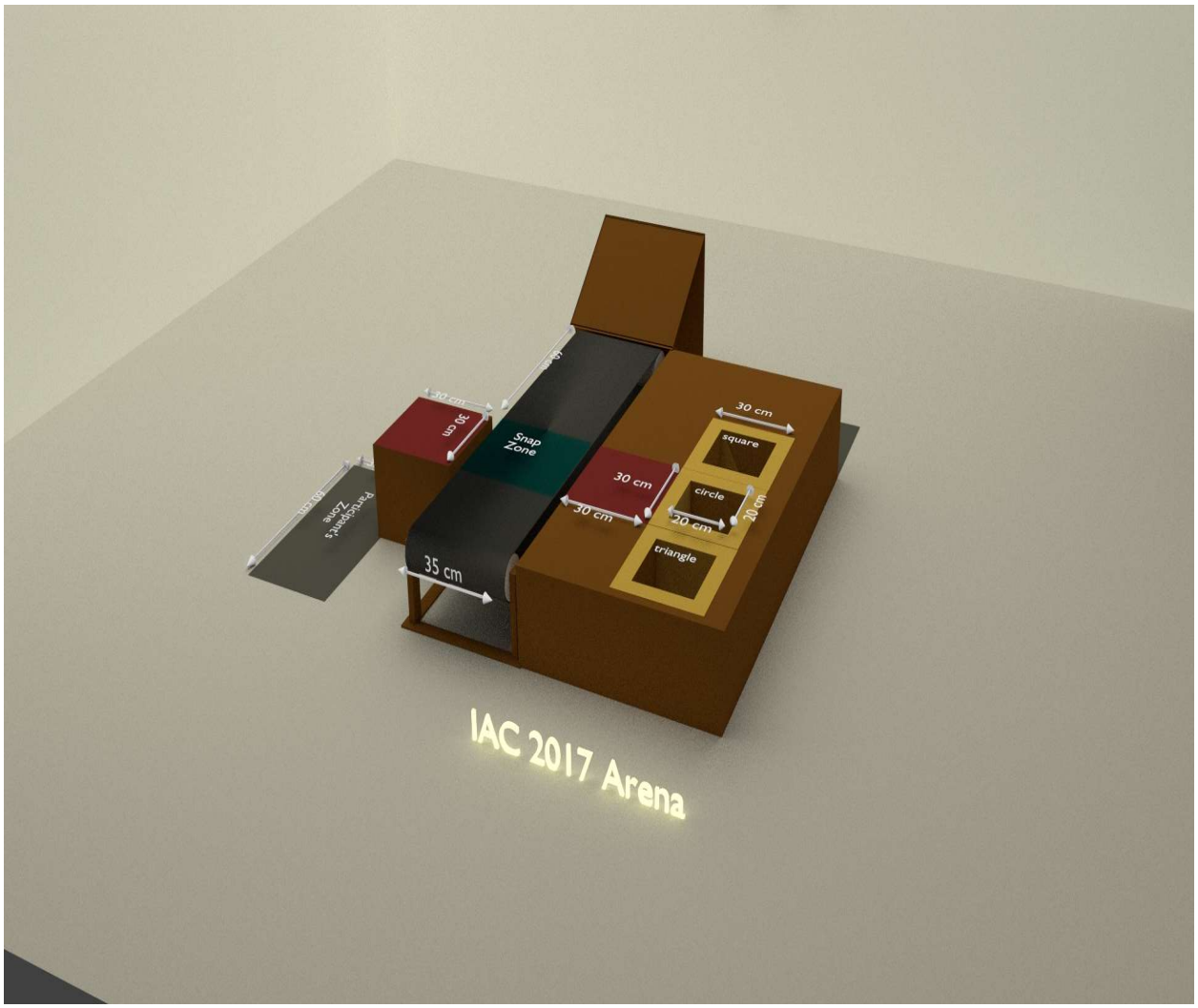

Figure 2 isometric view

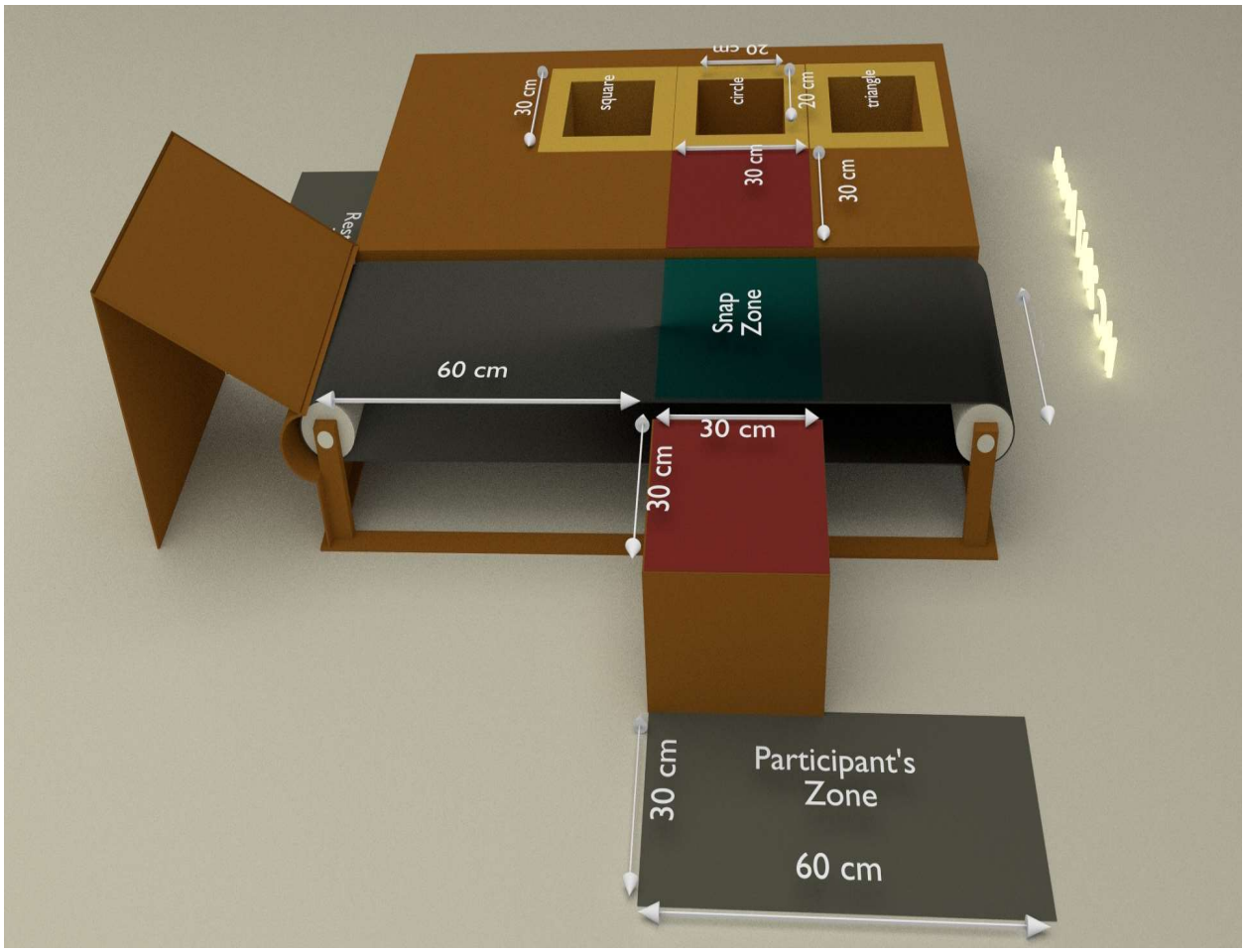

Figure 3 side view 1

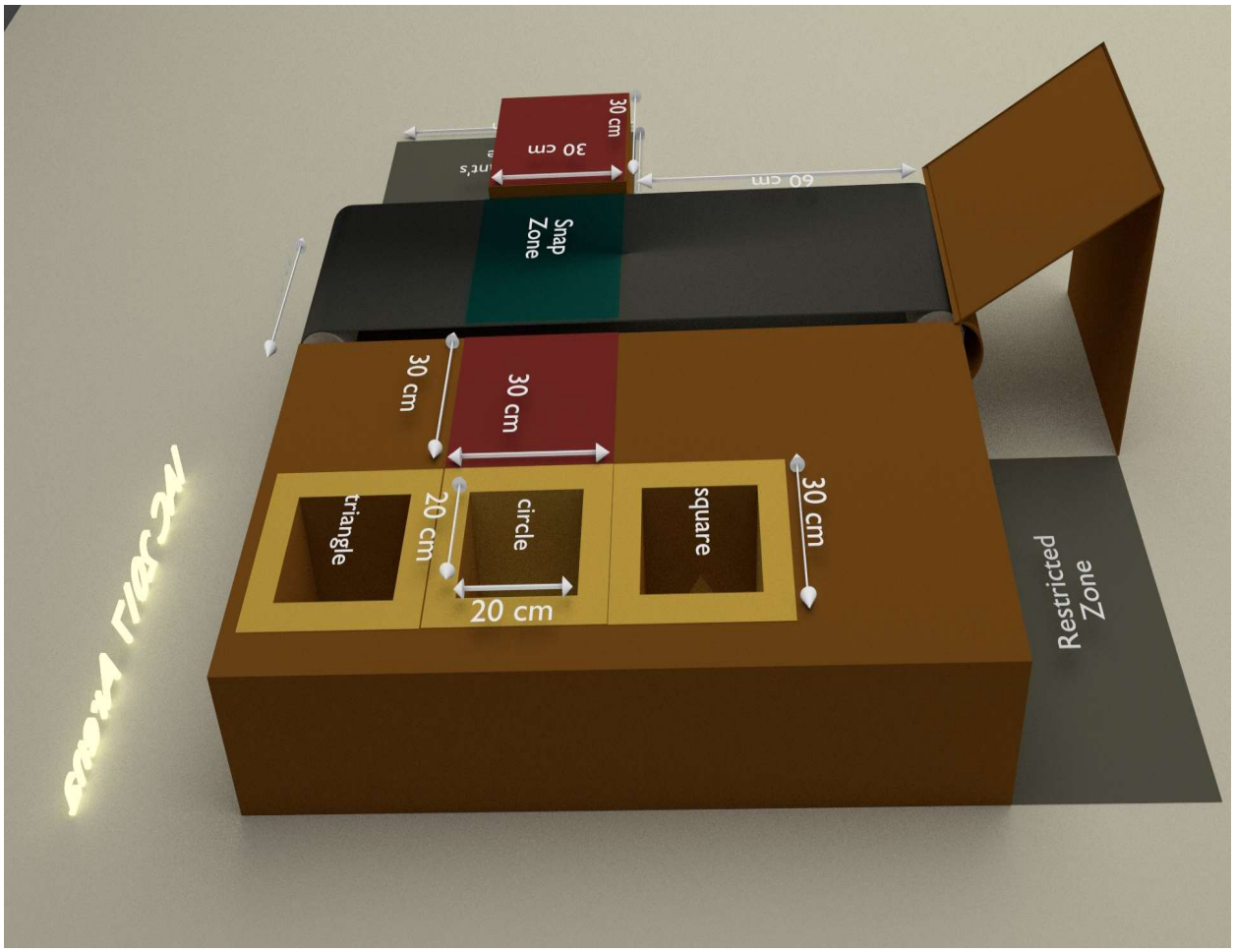

Figure 4 side view 2

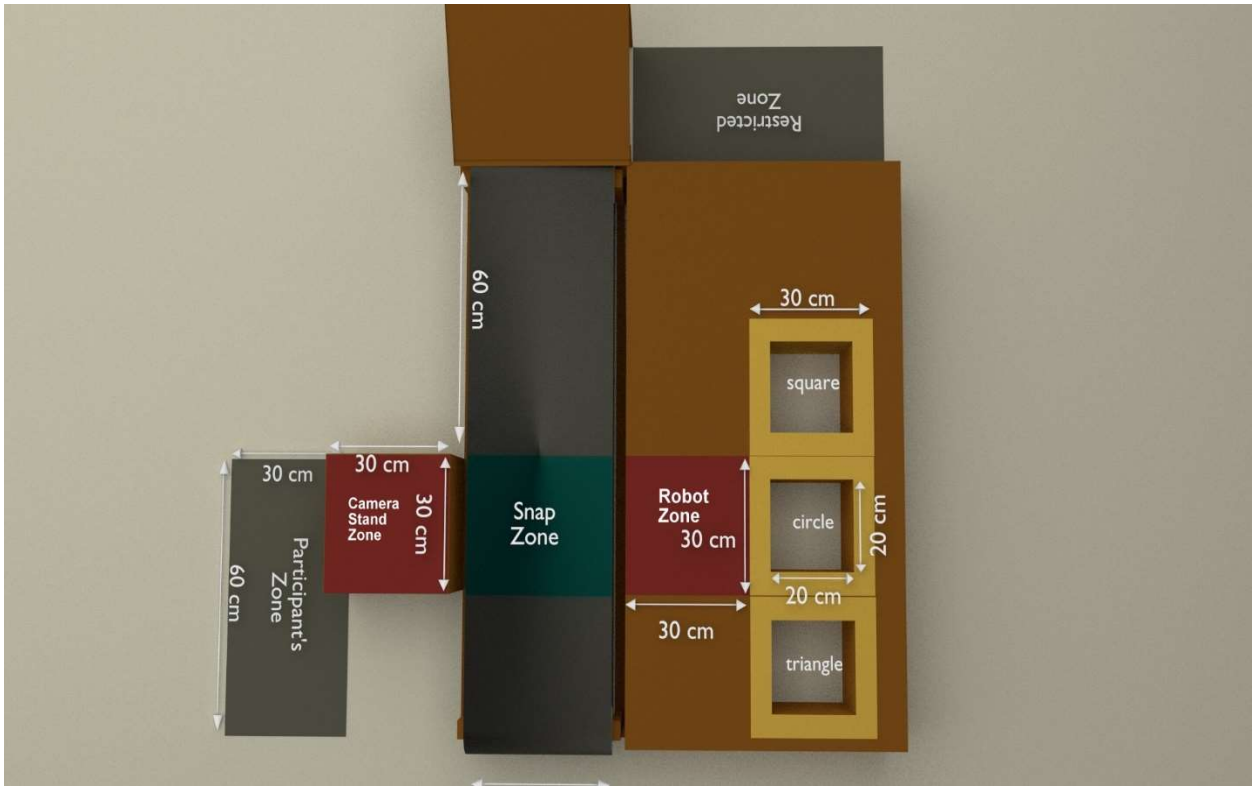

Figure 5 top view