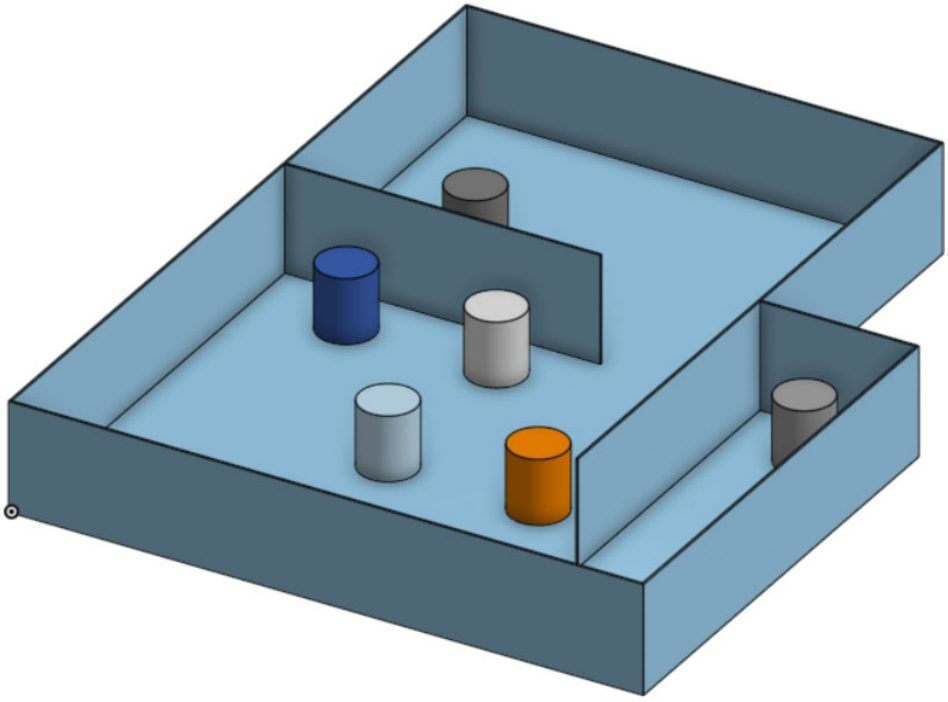
National University of Singapore

Food Delivery

EG2310 - Fundamentals of Systems Design



Version 1.0	09/02/2023	Aurelien C.

Innovation and Design Programme

NUS National University of Singapore

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2 INTRODUCTION

The overall mission for the team is to develop a system that can be efficiently operated by anyone. The system will comprise of two parts, a dispenser and a robot, which must demonstrate that they can work together to deliver drinks inside a restaurant. The dispenser has to be able to be loaded with a can of soda at any time and the user must be able to set the destination table for delivery. Then, the robot will deliver the drink autonomously to the table and come back when the task is accomplished.

There are six tables to deliver drinks to, and each group will have exactly 25 minutes to set up the materials and deliver the drinks each table. Five of the tables have a fixed position and one table (table 6) will be randomly placed inside a separate room.

3 THE STEPS

The final examination will be divide in few steps, a Setup Period to install the equipment, 6 Missions (one for each table) and an End Phase to clean the arena. The team will have exactly 25 minutes to set up the materials and deliver the drinks.

3.1 THE SETUP PERIOD

During the Setup Period, the team is to:

- place the dispenser in the dispenser zone
- place the robot inside the restaurant
- set up the computer on the table near the dispenser
- start all the software.

During this time, the TA will read the user manual to be familiar with the functioning of the system and may ask for some clarifications from the team.

When the team is ready, they have to stay at least one metre from the arena and tell the TA that they are ready to start the missions. After this, the team will not be authorized to teleoperate the robot.

Finally, the TA will place table 6 in the random zone and start the first mission.

3.2 THE MISSIONS :

There will be 6 different missions, which will consist of delivering a can of soda to each table. The TA will operate the system to deliver the can of soda according to the information in the user manual.

The TA may catch and power off the robot if necessary to prevent any damage to the arena, the robot or the dispenser. In this case, the mission will end.

During the missions, the TA will constantly fill the scoring form (in appendix 1, one for each mission). When he is finishes filling in the form after each mission, the team will have two possibilities:

- The team agrees with the final score and signs the form. The team will not be allowed to re-attempt this mission, and the TA will start the next mission.
- The team disagrees with the final score or want to do a re-attempt it to obtain a better score. If so, the team will have access to the arena to adjust the robot, dispenser and make modifications to the software. The team must inform the TA if there they make any major changes. When the members are ready and leave the arena, the TA will change the position of table 6 before the mission is re-attempted. The team can have as many attempts as they want for each mission.

3.3 END PHASE

If the 6 missions are not completed at the end of the 25 minutes, the current mission will stop immediately. The TA will stop filling in the Scoring Form and calculate the score for that attempt. This score will be automatically validated for this mission.

The team will have 2 minutes to remove all their material from the arena. During this time, the TA will calculate the final score for the team and share it with them.

4 THE USER MANUAL

The user manual has to include all the information necessary to help the TA to operate the robot and the dispenser. The TA will quickly read the manual during the Setup Period and may read it during the mission if he thinks it is relevant.

The team must not communicate with the TA. If some information is missing and the TA does not know how to proceed at any step, he will do what he thinks best.

5 SCORING

For each mission, teams can score up to 10 points. Refer to the Scoring Form (Appendix 1).

After all teams have completed the missions, they will be ranked based on the time required to setup the material and finish all the missions. The first team will obtain 12 points, the second 11 points… and the last one 1 point.

The final score will be the sum of all points the team will obtain (i.e., points from each mission and points from the time ranking).

6 ROBOT REQUIREMENTS

6.1 THE ROBOT

No requirements for the robot.

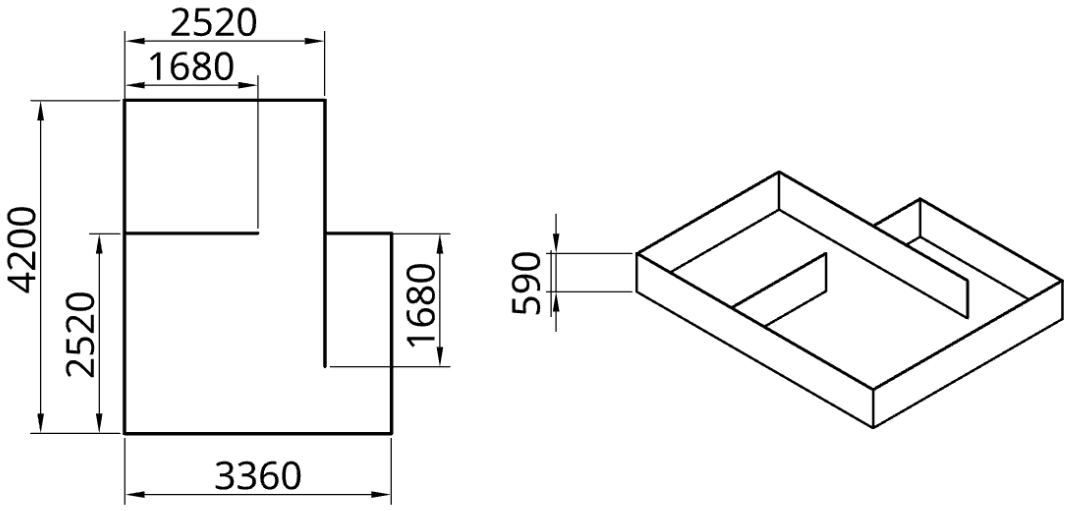
6.2 THE DISPENSER

The dispenser must fit inside the Dispenser Zone and must not be taller than 100cm. It can be powered by a battery or plugged into a power socket (located outside the arena).

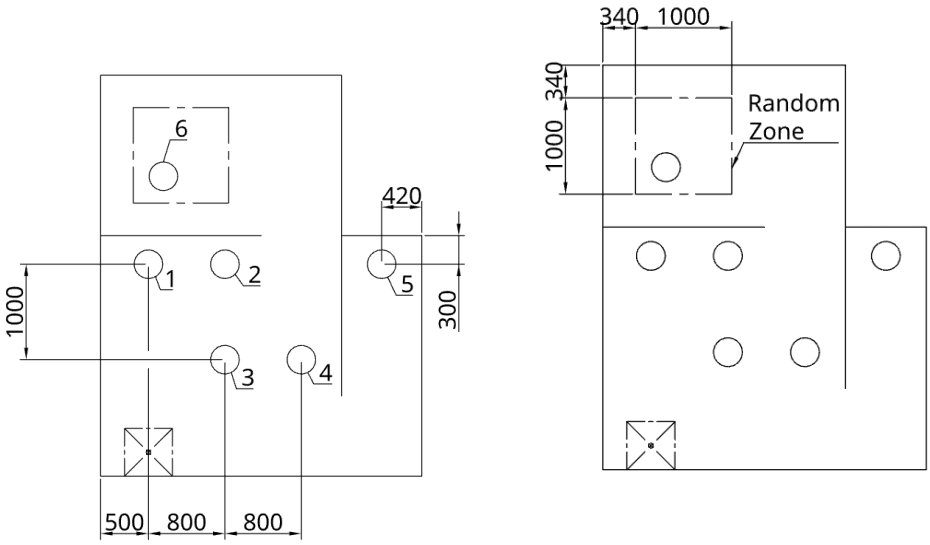
7 THE RESTAURANT

All size are given in mm.

The restaurant has three sections. The main hall contains tables 1 to 4, a side corridor with the table 5 at the end and a separate room with table 6. The positions of the tables 1 to 5 are fixed, but table 6 can be anywhere in the Random Zone of 1x1m of the separate room.

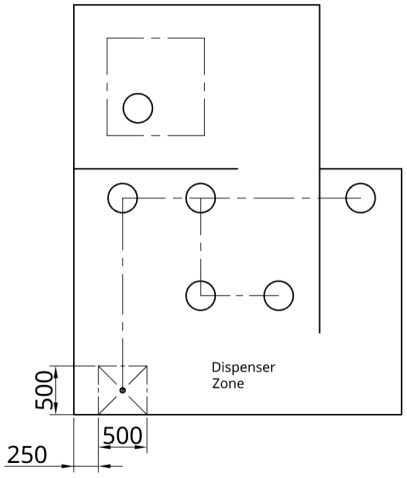


Drawing 1: Layout and general dimensions of the restaurant



Drawing 2: Position of the tables 1 to 5 (left);
Position of the Random Zone (right)

The dispenser must be placed inside the dispenser zone (50x50cm).

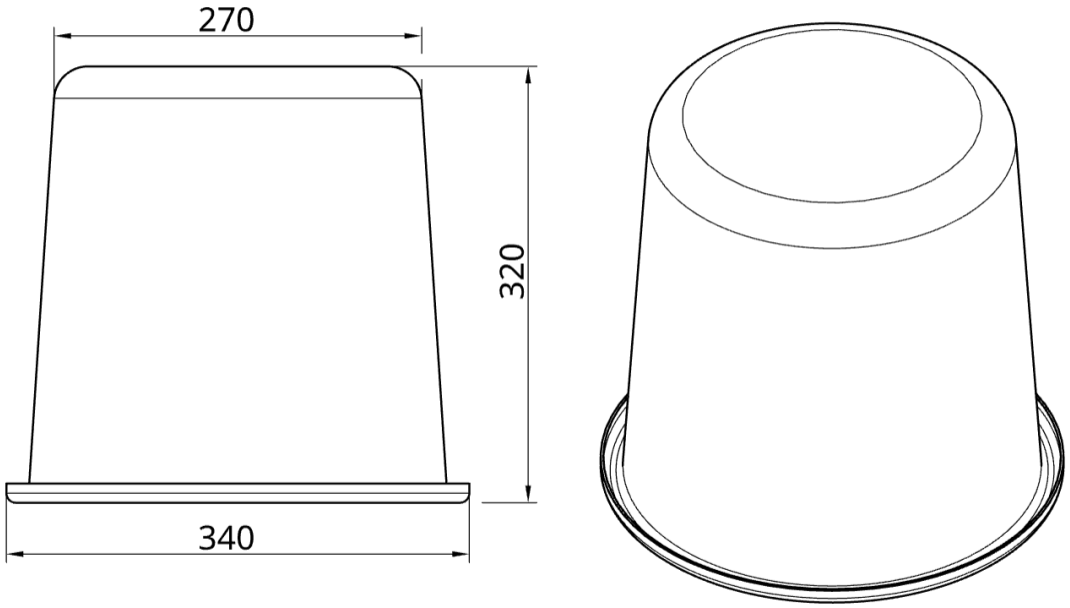


Drawing 3: Position of the Dispenser Zone

8 THE MATERIALS :

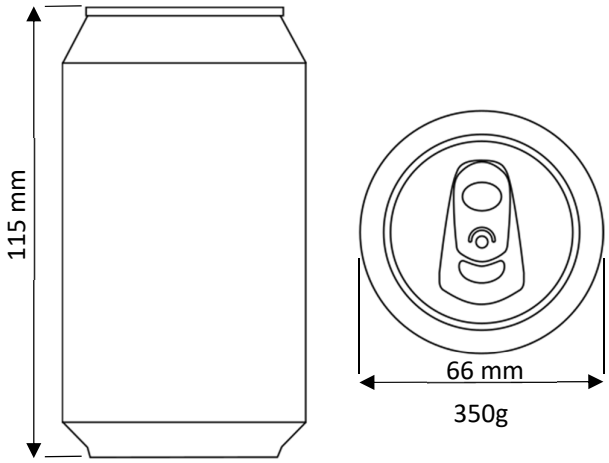
8.1 THE TABLES :

Tables are represented with bucket placed upside down.



Drawing 3: Size of tables

8.2 THE CANS :



9 APPENDIX 1: SCORING FORM

Group								
Starting time								
Table								
1	*2*	*3*	*4*	*5*	*6*	*7*	*9*	←Attempt
								Load the can and set the destination on the dispenser without any problems
								The can leaves the dispenser correctly (according to the manual)
								The robot receives the can correctly (according to the manual)
								The robot move to the correct table
								The robot stop at less than 15 cm of the correct table
								The robot move back after the can is collected
								The can has not been dropped, shaken or damaged
								The robot had no contact with any part of the restaurant
								Nobody and for any reasons has touched the robot, the mechanism of the dispenser or the software during or before the start of the mission. (Not including for above steps and dispenser interface)
								First attempt to deliver this table
Score : /10								Signature :