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International Design Contest
8-20 August, 2016, Bangkok, Thailand

1. Concept

The percentage of world aging population has been rapidly increasing due to the advancement in medical science. One of the main issuesofthe aging populationis that their health problemsrequire them to take more medicines than younger population.

As a result, elderly people with many diseases tend to end up with taking multiple medicines at the same time. However, there are many physical effects of aging such as changing eyesight and memory disorder which are at greatest risk for taking medicines correctly.

One way to help solving this problem is to use a pillbox to make it easier for them to manage their medication lists. However, it might be inconvenience for them to fill up a pillbox with many types of medications and consequently the caregiver is need.

Thecontest's objective is to support contestants' creativity and engineering knowledge to build robotstaking care of elder people by maximally filling the correct pills into corresponding pillboxes within the time limit.

2. Objective

The main objective of this contest is to design and constructrobots to support elderly people by dropping in pillsinto corresponding pillboxes.

3. The Field

3.1 The robot contest is played on a 6 m x4.3 m square field, as shown in Figure 1. The field can be divided into 4 main parts, which include 1) medicine shelves(A1-A5), 2) slopes (B1-B5), dispensation area locating in the front (C1) and the two sides of the field (C2-C3), and 4)pillboxes (D1-D2).

3.2 Slopes which are B1 to B5 located on top of the 40 mm field height, as shown in Figure 2. The medicine shelves are located on the slopes which are1 m width and 1.5 m depth. There are three different heights of the slopes, including 1.1, 1.5, and 2 m for B1 and B5, B2 and B4, and B3, respectively.

3.3 The medicine shelves with 300 mm width, 170 mm height, and 188.5 mm depthare shown in Figure 3.

3.4 The C1 area has 0.3 m height, 6 m width, and 2.44 m depth. The starting points for the first robotsof the red team and the blue team are in the C1.2 and C1.3 areas, while the starting points for the second robots are in the C2.1 and C3.1 areas, respectively. Some of yellow pills are placed on the C2.2 and C3.2 areas. Slopes C4.1 and C4.2 which are 0.82mx 0.3 m x 0.1 m are located in front of the C2 and C3 areas.

3.5 Pillboxes D1 and D2 are located atC1.2 and C1.3 areas. Each box in the pillboxes has 0.5 m width, 0.3 m length, and 0.45 m height. There are 3 partitions separating C1.2 and C1.3 from 3 boxes of pillboxes D1 and D2.In Figure 4, the partitions are in different heights, which include 60, 90, and 120 mm, foroval pills, capsules, andherb ballsrespectively.

4. Marking

4.1 A black tape with 25.4 mm width and 700 mm long is laid on C1.1 area at the center of each medical shelf.

5. The Pills

5.1 There are 4 different pill shapes, which include tablets, oval pills, capsules,and herb balls.

5.2Pill sizes are shown in Figure 5. Atablet is 80 mm diameter and 40 mm thick. An oval pillis 70 mm width, 140 mm length, and 40 mm thick. A capsule is 70 mm diameter and 170 mm lengthand 70 mm thick. Anherb ballis 80 mm diameter.

5.3There are 60 pills coming in different shapes and each of the first three shapes has 8 pills in red and another 8 pills in blue color. For the herb balls, the total number of the pills is 12 in which there are 3pills located at zone C2.2, another 3pills located in the C3.2 area, 2 pills are located on the medicine shelves and the other 4 pills are placed on C1.1 area. Detail of the location of pills on the medicine shelves A1 – A5 is shown in Table 1.

6. Required Materials and Robot Rules

6.1 Each team will have to design and construct2 robots for completing the task. The robots can be remotely controlled, fully autonomous, or semi-autonomous.

6.2 Materials allowed for robot construction

6.2.1 Materials supplied from the host and given to each team

6.2.2 Materials provided in the workshop

6.2.3 Other materials requested by any teams. After being approved by the committee members, it is their team's responsibility to buy them within the budget provided.

6.3 Inappropriate and dangerous materials are prohibited in buildingthe two robots.

6.4There are many forms of energy resource that are allowed to be used, which include gravitational potential energy, elastic potential energy, and energy from provided battery and air tank.

6.5 Robots can be built without shape and weight limit.

6.6 Robots must have a starting size of no larger than 500mm x 500mm x 500 mm; however, they can expand to any sizes during the round.

6.7Two sets of radio control receivers and transmitters and control units supplied by the technical staff are required to be used for the two robots.

6.8 Each team must provide some kinds of protection, especially from impact, to the given devices (radio control receivers and transmitters and control units) so that they remain functionality. The team is responsible for the damage of the devices.

6.9 Teams can choose any control algorithms to be bested suited for their robots.

6.10Robots and other provided equipment cannot be moved out of the field without permission.

7. Competition Rules

7.1 Two members from each team will take control of the two robots. These members are not allowed to switch with other members in the team during a round.

7.2 Prior to the start of each round, each team will have 60 seconds to setup their robots intheir starting zones. For the red and blue teams, the first robot from each team will be locatedon the C2.1 and C3.1zones and the second robotswill be located on the C1.2 and C1.3 areas, respectively. Every parts of the robots must be inside the starting zones.

7.3 Robots can be moved out of their starting zones right after the starting signal.

7.4 The two robots are responsible to pick up the pillsand drop them off in their corresponding pillboxes. The red team will need to pick up red tablets, oval pills and capsules and also yellow herb balls and then drop themin pillboxesD1. On the other hand, the blue team will need to pick upblue tablets, oval pills and capsulesand yellow herb ballsand drop them in pillboxesD2.

7.5 Each round will be 120 seconds long.

7.6 Other competition rules

7.6.1 In case that any robots potentially damage the field and other robots, or pose a hazard to teams and other people within the competition area, the committee members

can request the robots to stop and maintain them in a safe condition. However, the competition is still ongoing.

7.6.2Any teams that not strictly respect the rules, the teams will be disqualified from that round.

7.6.3One representative from each team can inform to the committee members ifthe team is not satisfied with the results either during or after the competition. This is needed to be done before the next round is starting. The committee members will discuss and make the final decision together with representatives from the two teams. However, the request without any proper reasons can result in a penalty or a loss in that game.

7.6.4The competition rules are subject to change by the committee members to be best suited for the contest and the changes made will be informed to all the contestants.

8. Scoring

8.1The score will be counted at the end of each round.

8.2 Each of red and blue pills being dropped from medicine shelves will score 0.5 point to the red and blue team respectively.

8.3The team will score 1 point for each pill with the right shape and color dropped into its corresponding pillbox.

8.4If the pill with its color or shape is filled into the wrong pillbox, the team will suffer a -1 point penalty.

8.5The team with higher score points will win the game each round.

9. Prohibition

9.1 Robots are not allowed to enter the robots' starting points (C1.2 or C1.3) of the opposing team.

9.2Team members are only allowed to filled up the pills into their pillboxes.

9.3Robots must be controlled without any physical contact.

9.4Taking any items out of the field is not allowed for this contest.

9.5Damaging the field, robots, objects, or human is strictly forbidden.

9.6Team members are not allowed to attempt to interfere with the opposing team's robots.

10. Figures and Table (Sizes might be subjected to changedue to constructionprocess.)

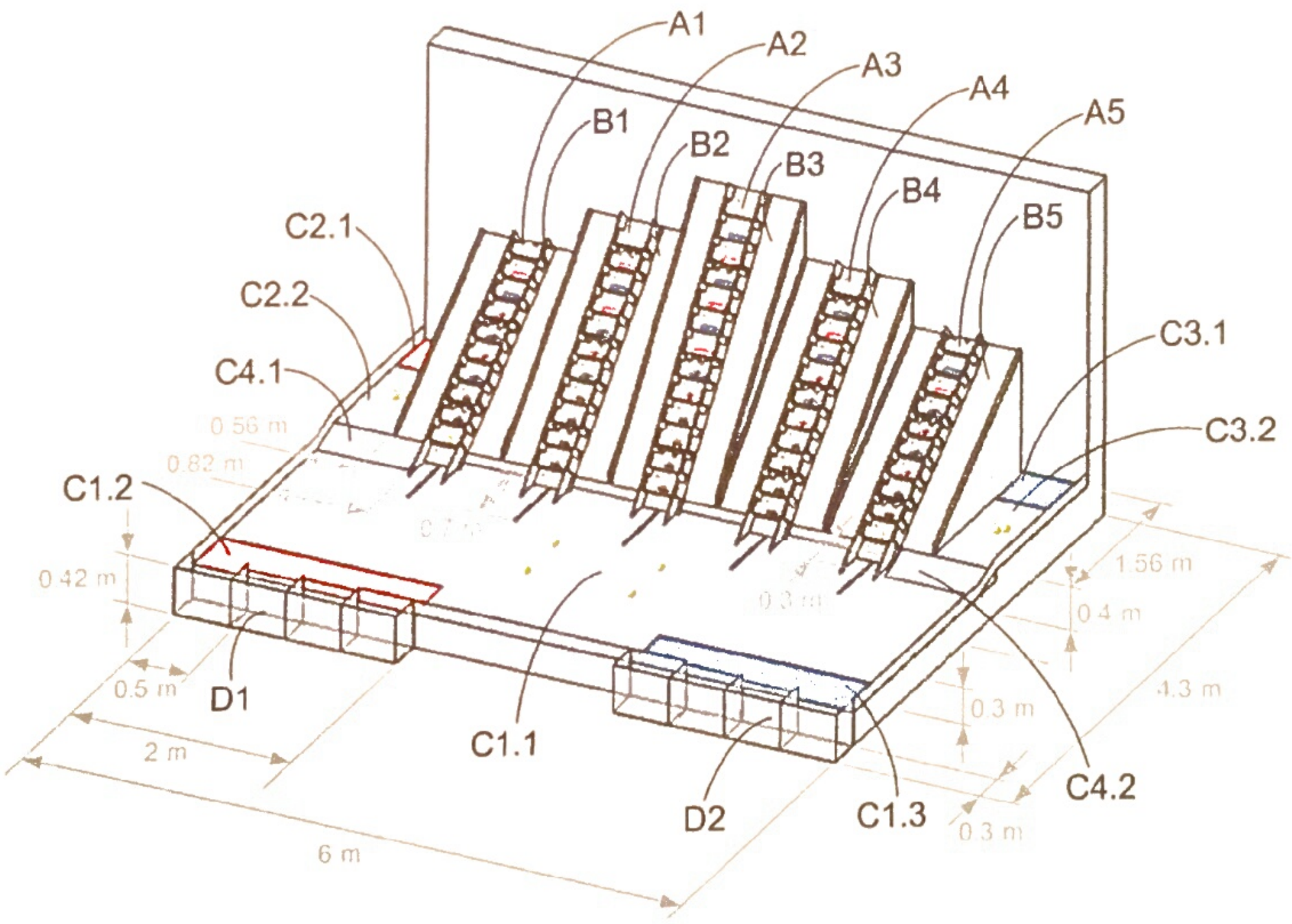

Figure 1: Field

A1 – A5	medicine shelves
B1 – B5	slopes
C1	dispensation area1
C2 – C3	dispensation area2 and 3
D1 – D2	pill boxes

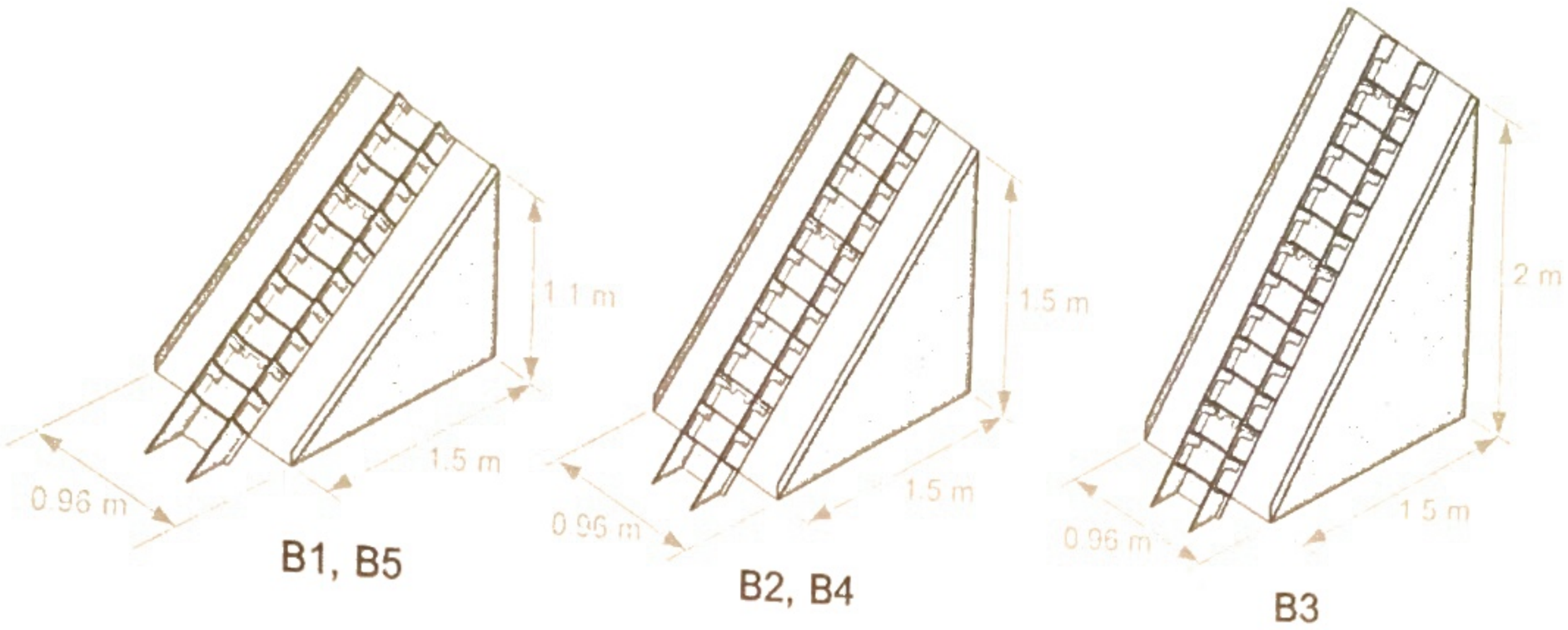

Figure 2: Slopes (B1-B5)

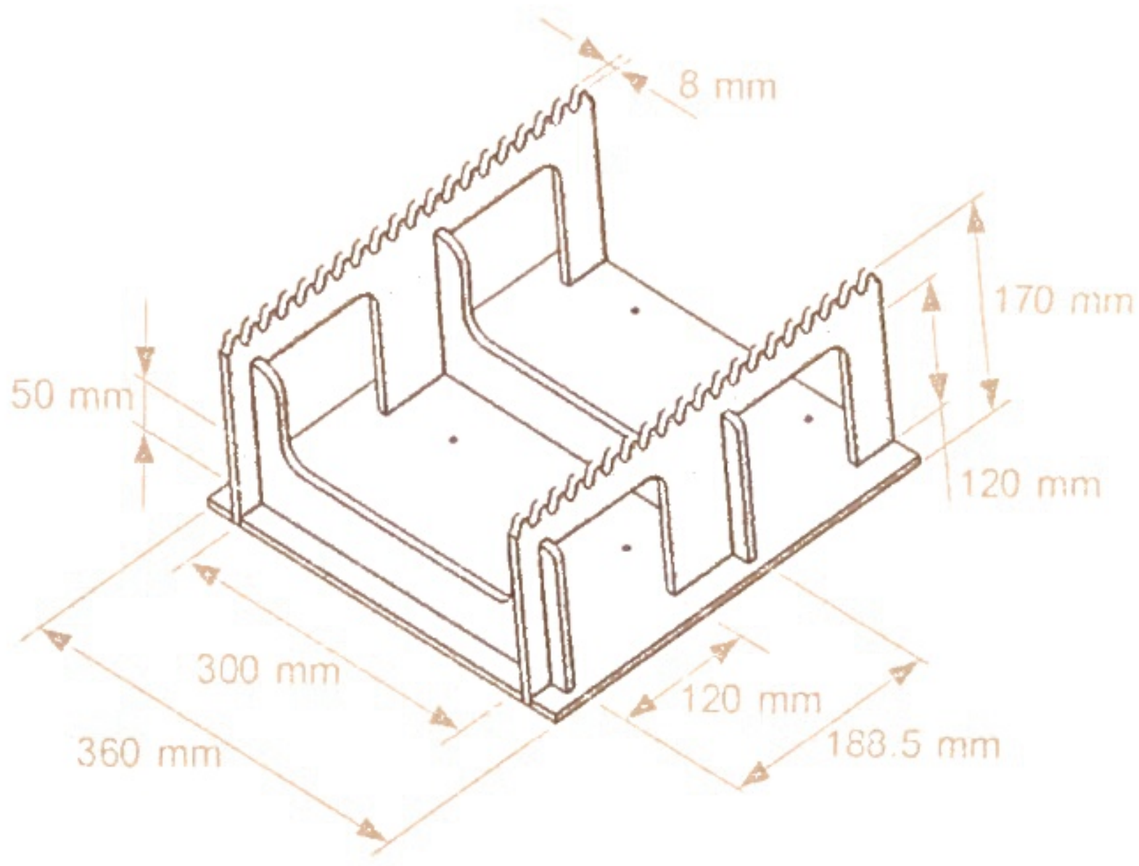

Figure 3: Example of medicine shelf

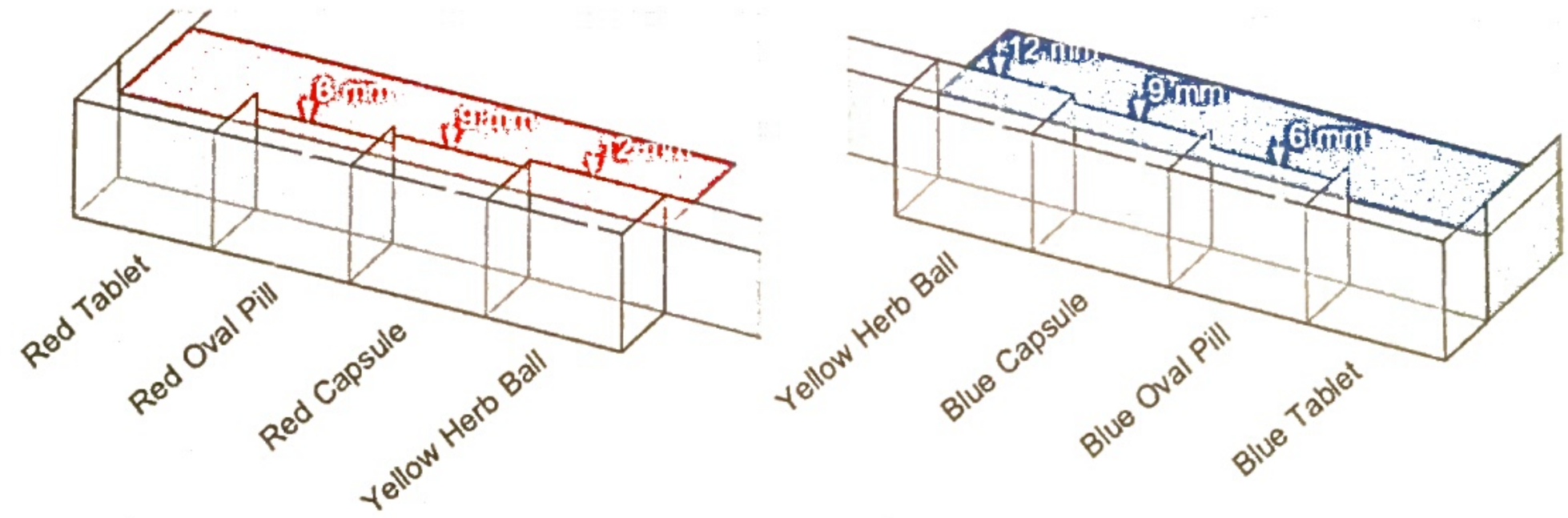

Figure 4: Pill boxes for the red team (D1) and the blue team (D2)

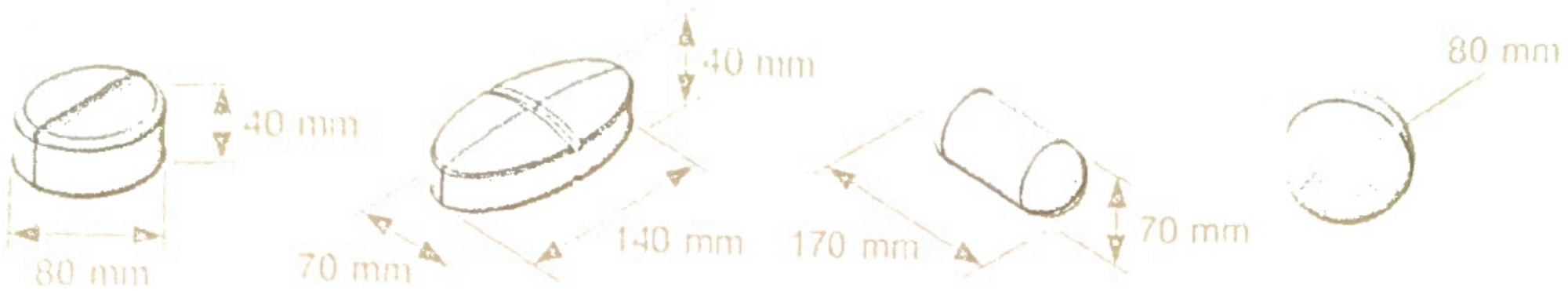

Figure 5: Different pill shapes including tablet, oval pill, capsule and herb ball

Table 1: Location of pills on the medicine shelves A1 – A5

	Shelf A1	Shelf A2	Shelf A3	Shelf A4	Shelf A5
12			Blue Capsule 		
11			Red Capsule 		
10		Red Capsule 	Blue Capsule 	Blue Capsule 	
9	Red Capsule 	Blue Capsule 	Red Capsule 	Red Capsule 	Blue Capsule 
8	Blue Capsule 	Red Capsule 	Blue Capsule 	Blue Capsule 	Red Capsule 
7	Red Oval Pill 	Blue Oval Pill 	Red Capsule 	Red Oval Pill 	Blue Oval Pill 
6	Blue Oval Pill 	Red Oval Pill 	Blue Oval Pill 	Blue Oval Pill 	Red Oval Pill 
5	Red Oval Pill 	Blue Oval Pill 	Red Oval Pill 	Red Oval Pill 	Blue Oval Pill 
4	Blue Oval Pill 	Red Tablet 	Blue Tablet 	Blue Tablet 	Red Oval Pill 
3	Red Tablet 	Blue Tablet 	Red Tablet 	Red Tablet 	Blue Tablet 
2	Blue Tablet	Red Tablet	Blue Tablet	Blue Tablet	Red Tablet
1	Yellow Herb Ball	Blue Tablet	Red Tablet	Red Tablet	Yellow Herb Ball

IDC 2016: Building Material

No.	Descriptions			Amount
1	DC Motor 12V	Ratio1:100	50 RPM	4
2	DC Motor 12V	Ratio1:33	150 RPM	2
3	Servo Motor	TowerPro	MG945	1
4	Pneumatics Cylinder			2
5	Pneumatics Soleniod Valve			2
6	2CH Relay for Soleniod Valve			1
7	Air Tank			1
8	Plug-in Terminal Block	2 Pins		8
9	Motor Flange			6
10	Wheel Flange			4
11	Aluminum Sheet	600x300mm.	3mm.	2
12	Aluminum L-Shape	1"x1"	1000mm.	2
13	Aluminum Rectangular Tube	1"x1"	600mm.	4
14	Aluminum Rectangular Tube	3"x1.5"	300mm.	2
15	Aluminum Round Tube	Φ3/4"	300mm.	2
16	Aluminum Rod	Φ10mm.	300mm.	2
17	Steel Wire	Φ4mm.	500mm.	4
18	Wood Sheet	600x300mm.	12mm.	2
19	Wood Sheet	1"x2"	1000mm.	2
20	Acrylic Sheet	600x300mm.	5mm.	4
21	Paper Tube Thick 12mm.	Φ100	150mm.	4
22	RGB Sensor			1
23	Infrared Line Tracking Sensor			1
24	3D Printer Coupon	200 g.		1
25	Paper Box Container			1
26				
27				
28				
29				
30				