

**2016 IEEE UAE Students Day  
Common Design Project (CDP) Competition  
Intelligent Shopping Cart**

---

**General:**

1. Two teams from each institution can participate in the Common Design Project (CDP) competition.
2. Each team shall comprise a maximum of 5 IEEE student members.
3. Project cost must not exceed AED 3000.

**Project Description:**

Develop a shopping cart that can automatically identify its content without human intervention. A collection of items will be placed in the cart. The process of this item placement will emulate the randomness of the typical behavior of a shopper doing grocery shopping. Upon passing through a dedicated check point, the cart is required to report the list of its content and their prices.

This project consists of three parts: (1) The point-of-sale (POS) terminal, (2) The sale items, and (2) The shopping cart.

**Requirements:**

1. You are required to develop a POS terminal that allows users to program and read some electronic tags. The information in the tags includes item name (character strings) and price (real value numbers).
2. You are required to prepare 15 dummy sale items. All items must be in white color, to make sure that colors are not used to distinguish the items. Each item has physical size of approximately 5cm × 5cm × 5cm. Each item will be attached with an electronic tag.
3. You are required to acquire a shopping cart and equip it such that it is able to collect information (name and price) of the items that are placed in it. The shopping cart is also required to transmit the collected information wirelessly to the POS at the check point. The installation of your equipment must not reduce the original internal volume of the cart.
4. The reading of information by the shopping cart must happen after the items are placed in the cart. The information reading must not be performed by manually scanning the items one-by-one.
5. You will be requested to program the tags with specific names and prices. The name and price will be different from team to team. You will be informed of the name and price only at the competition.

**Competition Procedure:**

1. You will be given a list of 15 item names and prices. You will program the 15 dummy items according to the list.
2. A judge will randomly pick a random number (between 8 to 14) of items from all the 15 items with programmed tags, and place the picked items in the shopping cart.

3. You will push the shopping cart to a specific location (check point) 0.5 m away from the POS.
4. Your POS is required to report the list of picked items and their prices. The time taken from the moment the cart is stationed at the dedicated location until the time the information is reported is recorded. To be considered successful, the report must be completed within 45 seconds.
5. Your score is calculated as follows:

$$\frac{\text{no of items with correct name and price} - \text{no of item with incorrect name or price}}{\text{no of items in cart}}$$

For unsuccessful reporting ( $\geq 45$  seconds), the score is 0.

6. Steps 1 to 5 will be repeated three times, and your final score is the average of the three scores.
7. The overall score from competition procedures is calculated as follows:  
*average score*  $\times$  *score allocated for competition procedure.*
8. After all teams finish the competition procedure, each team will have five minutes Q/A by the judges.

### **Project Evaluation and Scoring:**

The IEEE UAE Students Day Steering Committee will select a panel of judges to evaluate each project based on the following criteria:

1. Demonstration of the functionality of the POS and shopping cart in programming and reading the item names and prices.
2. Interview of the team members concerning design and implementation aspects of the system.
3. Display of an A1 size poster describing the design, implementation and operation of the intelligent shopping cart system its salient features.

The scoring is in accordance with the criteria listed in the following table.

No.	Evaluation Criteria	Score (%)
1	Ability to program the sale items for their names and prices, and verify correctness.	15
2.	Ability to read the name and price for 1 item placed in the shopping cart.	10
3.	Overall score from competition procedures	35
4.	Design aspects	20
5.	Theoretical knowledge	10
6.	Poster describing the design, construction, and operation.	10
	Total	100

When two teams have a same score, the one that has a shorter reporting time recorded from the competition procedure will be awarded a higher ranking.

### **Shopping cart:**

Use a foldable shopping cart similar to the one shown in the figure below. It should be available at a hypermarket.



Fig. 1. Examples of foldable shopping cart.

Instead of using an existing shopping cart, you may also customize your design by mounting a basket onto a luggage trolley as illustrated in Fig. 2.

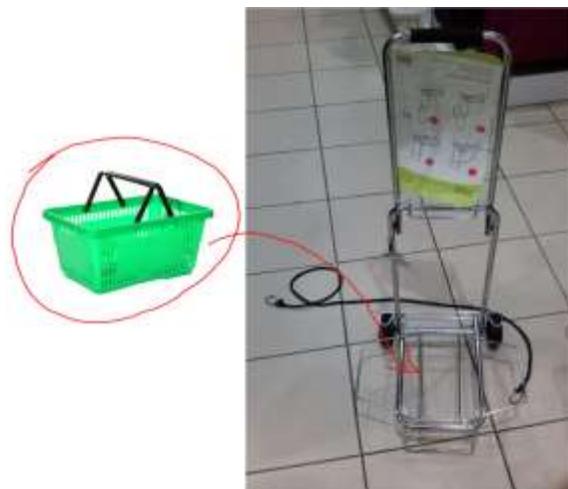


Fig. 2. Customized shopping cart using a luggage trolley.

### **Additional Q/A**

1. Do the tags themselves have to be programmed with the names and prices of products?  
We do not specify the technology used. Dependent on the design and choice of technology, the solution may differ.
2. Does a device capable for reading products have to be attached to the cart, even if the same can be done by the POS?  
The cart will be some distance away from the POS. There is time limit in readings. These requirements have implications. When the project was proposed, the vision was to have the

reader installed on the cart, and so it is intelligent. However, the project description does not dictate that. I suggest we specify clearly that the reader is on the cart.

3. Is the time taken for programing the items counted in the scoring?

Time limit was not specified as a requirement. Yes, we need to set a time limit for this. Says, a few minutes (e.g., 5 minutes) for all the 15 items.

4. Does the cart have to automatically know that it is 0.5m away from the POS and start reporting, or can the user be allowed to actuate some device on the cart for beginning reporting?

Yes, we need to specify that the user will trigger the reporting process.

5. A judge will randomly pick a random number (between 8 to 14) of items from all the 15 items with programmed tags, and place the picked items in the shopping cart. Are we allowed to touch the rest of the items (the unchosen ones)? (For example hiding them?)

No. Just like in a normal shopping experience, the shopper and the merchandiser cannot hide things. The purpose of this test is to prevent hard-coding.

6. How to report the bill (items)? is it by printing out the bill?

The items and their prices, together with the total price will show up on the screen of the POS terminal. There is no hardcopy printing expected.

7. Once the cart reaches to the POS terminal should the list be automatically transferred to the POS terminal or manually by a push button?

The transfer will be triggered manually.