

WRS Future Convenience Store Challenge  
2020

Customer Interaction Task

Rulebook

2019/04/24

# Revision History

April 24, 2019

- First Draft

## 0. Terminology

Term	Definition
Mobile Robot	A robot that can move autonomously.
Infrastructure (Robot)	Unique infrastructure that can be installed inside convenience stores to assist in the robot's task. This equipment includes markings, IC tags, sensors, actuators, and auxiliary tools to attach to products, etc. Infrastructure made up of sensors and actuators can also be seen as stationary robots.
Manipulator	Robot arms, end effectors, and other equipment that execute operations which can be installed on a mobile robot or as part of the infrastructure.
Product	Products found at a convenience store.
Customer	Person who visits the store to purchase products.
Container	Container used to hold and transport multiple products. A container may also be called a "carton."
Product Display Area	Section of the convenience store with display cases or shelves installed.
Cashier Area	Section of the convenience store with the cashier counter installed.
Eat-in Area	Section of the convenience store where customers may consume food and drink they have purchased.
Restroom Area	Section of the convenience store with the toilet installed (Abbreviation: Restroom).
Aisle Area	Section of the convenience store for customers and mobile robots to come and go. (Abbreviation: Aisle).
Backyard Area	Area of the convenience store where customers are not allowed (Abbreviation: Backyard).
Playground	Area where children and others can play. Located outdoors.
Home Area	Standby station of the mobile robot. Located within the Backyard Area.
Display Case	Cases for displaying products and for collecting disposal items. Multiple products are mixed in this case initially.

Chief Judge	The judge who declares the start of the task and issues instructions to the participants.
Assistant Judge	The assistant to the judge who performs measurement scoring and watches for violations, etc.
Operator	The person who performs the starting operation in the competition field. After finishing the operation, the operator leaves the competition field.
Safety Observer	The person who manages the safety of the system within the competition field. Performs operations such as emergency stop. May double as the operator.

## 1. Overview

This challenge aims to develop technology to automate customer interaction, which is part of the job for employees at a convenience store. Participants of this competition task will develop a robot that autonomously moves and interacts with customers, as well as infrastructure to install inside of a simulated convenience store. In this challenge, participants will use the robots and infrastructure they develop to compete in terms of the innovation, viability, and feasibility of their systems when performing customer interaction demonstrations in a simulated convenience store space.

The layout of the convenience store interior consists of a product display area, cashier area, eat-in area, restroom area, aisles, backyard area, and a playground area.

Participants can freely choose a customer interaction challenge and perform a system demonstration within the time limit of the round.

In addition, the proposed system will be required to contribute to energy saving and an efficiency of work in convenience stores.

## 2. Flow of the Round

The time limit for this task will be 15 minutes. The task will proceed with three tasks in the following order:

- (1) Renovation time
- (2) Presentation
- (3) Customer interaction demonstrations

Participants can distribute the time to each phase as they prefer. Participants must indicate their progression to the judges when starting each phase and when completing the task.

Please note the presentations and the customer interaction demonstrations must be done in English, which is the official language of the competition.

### 2.1. Renovation Time

Participants will add or replace furniture such as shelves and other infrastructure, install their robot, and set products as necessary. For example:

- Installation of unique infrastructure inside the convenience store
- Replacement of existing furniture such as display cases and the cashier counter
- Arranging their robot and products in any initial positions inside the simulated convenience store.

Participants should inform the judges when their renovation has ended.

### 2.2. Presentation

Participants will explain the purpose and an overview of the system they developed. The presentation may be conducted at the same time as the demonstration. Participants must inform the judges when the presentation is over or if the presentation will be conducted at the same time as the demonstration.

### 2.3. Customer Interaction Demonstration

After the judges confirm that the preparations are finished, the demonstration will begin.

The participants will input the start command into the system.

After the system operation starts, the participants are not allowed to control the robot or take any actions that will influence the operation of the system. Any team that manipulates the operation of the system will be withdrawn from the task at that point.

However, if there is a system malfunction and continuing the task is deemed difficult, the participants can decide to retry the task as described hereafter.

## 3. Details of Challenge

### 3.1. Customer Interaction Challenge

Participants can freely choose a customer interaction challenge and perform a system demonstration within the time limit of the round. For example, the competition expects a demonstration similar to those below.

- Heating purchased products (lunch boxes, etc.) or bagging products
- Receiving orders and retrieving products ordered through a clerk such as hot snacks and cigarettes
- New services based on recognizing gender, age, and products customers are hesitant to purchase
- Recommendation of products
- Prevention of shoplifting
- Customer service for customers with special needs such as elderly, foreign nationals, or wheelchair-users.
- Assistance and other services

These are only a few examples of customer interaction. Not all of these services need to be implemented. However, the competition expects proposals and demonstrations that foresee a future of new services including the interaction between people (staff and customers) and robots. The competition also expects participants to generate appeal by illustrating the specific use prescribed to their system in their demonstration via role-playing and other means. The judging panel evaluates those customer interactions from the perspectives outlined below.

Judges score customer interaction by awarding points based on the following criteria:

- Innovation
- Viability
- Feasibility

Furthermore, role-playing customers for the demonstrations should be arranged by the participants.



## 3.2. Retry

Participants can ask the judges to terminate the demonstration to retry the task if the system malfunctions and continuing the demonstration is deemed difficult.

However, the clock will continue to run while the demonstration is stopped. The participants can decide in what state to resume the task.

## 4. Specifications and Restrictions

### 4.1. Simulated Convenience Store

The convenience store will be approximately 10m×10m space which consists of a product display area, cashier area, eat-in area, restroom area, aisles, and a backyard area. The cashier area will have a counter, and the product display area will include display case. Detailed information about the layout, counter, and display case inside the convenience store will be provided in a separate document.

Participants will not be allowed to make changes to the layout inside the convenience store during the renovation time such as rearranging the display case in the aisles.

### 4.2. Products

Participants shall prepare the products to use in the demonstration

### 4.3. Mobile Robot and Infrastructure Restrictions

#### 4.3.1. Hardware Restrictions

- There are no restrictions on the number of mobile robots
- Each mobile robot must occupy less than 1m x 1m of floor space and all of the mobile robots must fit into a 2m x 2m area.
- Infrastructure can be installed anywhere inside the convenience store, but different restrictions apply according to the area of the store. Please see the documents provided separately for more information.

#### 4.3.2. Software Restrictions

- The robots and infrastructure must operate autonomously after the start of the task. However, participants may monitor the internal status remotely in order to know the state of their system.
- Mobile robots are prohibited from moving outside of the convenience store.

#### 4.3.3. Energy Source Restrictions

- Participants should provide an energy source for their robots.
- A power supply within AC100V/1500W is planned as the energy source for participants to use.
- Any energy source deemed to be dangerous or inappropriate for use will not be allowed.

#### 4.3.4. Venue Restrictions

- Participants are prohibited from intentionally dirtying or damaging the convenience store.
- Infrastructure must be able to be removed immediately after the task ends to return the venue to its original state.
- The convenience store has no ceiling or walls

#### 4.3.5. Safety Restrictions

- Systems must all have an emergency stop switch in case of emergency.
- The emergency stop switch must be separate from the switch used to start the system
- The emergency stop switch must be installed at a location where it can be safely pressed while the system is in operation, or can be operated remotely.
- When initiating an emergency stop remotely, it must be a wired push-button emergency stop switch located at a distance of over 1.5m away.
- If the emergency stop switch is pressed, all of the movable parts included in the system must immediately stop operating.
- The design must prevent the system from tipping over at all times, including during an emergency stop.
- Measures must be taken to shield any area with a danger of pinching the arms and legs of people in the vicinity.
- Hot areas and sharp edges must not protrude.
- Energy sources utilizing fire or high temperatures are not permitted.
- Any laser used in the system must be class 1 or lower.
- Products and parts of robots must not inject anything.

## 5. Other

This rulebook is subject to change without notice.