WRS Future Convenience Store Challenge 2020

Customer Interaction Task

Rulebook

2020/04/06

Revision History

April 6, 2020

- Excluded restroom from this task.
- Clarified the number of team members working in renovation time.
- Added description of the evaluation criteria.

April 24, 2019

- First draft

0. Terminology

Term	Definition
Mobile Robot	A robot that can move autonomously.
Infrastructure	Unique infrastructure that can be installed inside the convenience store to support the robot's tasks. This equipment includes markings, IC tags, sensors, actuators, and auxiliary tools attached to products, etc. Infrastructure consisting of sensors and actuators can also be considered as stationary robots.
Manipulator	Robot arms, end effectors, and other equipment for manipulation tasks which can be installed on a mobile robot or as part of the infrastructure.
Product(s) or Item(s)	Article(s) for sale in the convenience store.
Disposal Item(s) or Disposal Product(s)	Expired product(s) that should be removed from the Display Cases and discarded
Customer	Person who visits the store to purchase products.
Container	Box-like repository for holding and transporting multiple products.
Product Display Area	Section of the convenience store where display cases or shelves are installed.
Cashier Area	Section of the convenience store where the cashier counter is installed.
Eat-in Area	Section of the convenience store where customers can consume the purchased products.
Restroom	Section of the convenience store where the toilet is installed.
Aisle	Section of the convenience store for customers and robots to come and go.
Backyard	Section of the convenience store where customers are not allowed.
Playground	Area located outdoors where children and others can play.
Home Area	Area located in the Backyard and used as a standby

	area for the mobile robot before starting the task.
Display Cases	Shelves for displaying products. At the start, multiple products are mixed in these cases.
Chief Judge	Judge who declares the start of the task and issues instructions to the participants.
Assistant Judge	Judge who assists the Chief Judge by performing measurements for scoring, catching rule violations, etc.
Operator	Team member who starts the robot operation inside the competition field. After starting the robot, the operator leaves the competition field.
Safety Observer	Team member who manages the safety of the system inside the competition field and performs operations such as emergency stop. This team member may be the same as the Operator.

1. Overview

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

In this challenge, participants can use the entire layout except for the restroom. The layout of the store is provided in a separate document.

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 must contribute to energy saving in general, and/or to work efficiency.

2. Flow of the Competition Task

The flow of the task in the mandatory order is:

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

Each team will have a maximum of 15 minutes to complete (1), (2) and (3). Participants can allocate 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.
Up to 10 team members can participate in this work.

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 the 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 the following:

- 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 services that 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 intended for 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: how original the proposal is.
- Effectiveness: how valuable the proposal is as a new service in a convenience store.
- Feasibility: how practical is to implement the proposal in all convenience stores worldwide.

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 10 m x 10 m and include 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 cases. Detailed information about the layout, counter, and display cases inside the convenience store will be provided in a separate document.

Participants will not be allowed to make changes to the function of each area inside the convenience store during the renovation time such as rearranging the display cases 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 1 m x 1 m of floor space and all of the mobile robots must fit into a 2 m x 2 m 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 have an emergency stop switch.
- The emergency stop switch must be separate from the switch used to start the system.
- The emergency stop switch must be located in a place where it can be safely pressed while the system is in motion, or activated remotely.
- When activating the emergency stop remotely, only a wired push-button emergency stop switch may be used, and it must be located more than 1.5 m 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 prohibited.
- Any laser used in the system must be class 1 or lower.
- Products and parts of robots must not eject anything.

5. Other

This rulebook is subject to change without notice.