Food Topping Challenge
Create Future Food Factory 2024 Rules

FTC Organizers

I. Preface

The Food Topping Challenge is designed to promote the development and evaluation of robotic systems with advanced capabilities applicable to real-world scenarios. The primary goal is to employ a diverse range of technologies for the precise serving of food within a controlled environment replicating a food factory.

Significant strides have been made in automating various aspects of food production, where routine tasks and mass production have been seamlessly integrated into daily operations. Nonetheless, several intricate tasks have resisted mechanization, posing persistent challenges. These include the delicate art of toppings and instances where frequent menu changes necessitate swift program adaptations, situations that traditional machinery struggles to address.

To address these challenges, the Food Topping Challenge is proposed. This competition invites teams of robots that employ innovative technologies to serve food products within a meticulously recreated real-world food factory setting. The ultimate aim is to cultivate pragmatic and sophisticated robotic behaviors that will steer the course of the future of food factories.

By entering the Food Topping Challenge, participants stand to gain the following benefits:

- Develop groundbreaking methodologies to automate the next generation of food factories.
- Compete alongside the most distinguished AI Robotics researchers in the field.
- Contribute to the technological advancement and the fulfillment of complex challenges for real ”AI and Robotics Solutions.”

Are you prepared to bring your innovative ideas and technical expertise to the forefront? The Food Topping Challenge awaits your participation.

A. Terms and Conditions for Team Participation

A minimum of three (3) team members must be able to participate in ICRA 2024 Yokohama. Each participant may participate in only one team. Members cannot be shared among teams or leagues. Members may not be shared among teams or leagues. Composition of team members is optional, but ICRA participation is a prerequisite.

B. Important Schedule

November to mid-January 2024 Declaration of participation April 30th, 2024 Technical Description Paper proposal May 14,15th 2024 Setup day May 16th, 2024 The contest day

C. Participating Leagues

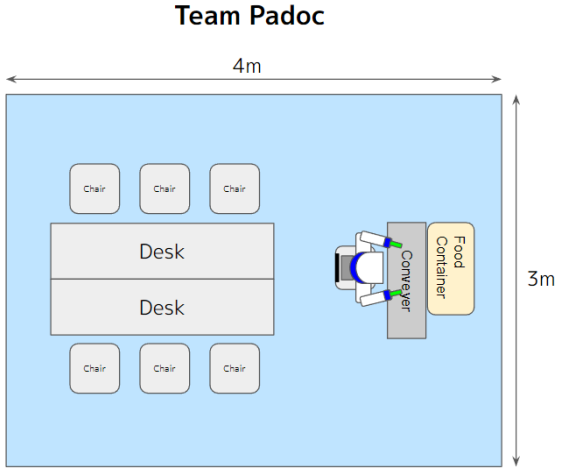
Leagues will be divided into those using RT’s Foodly and those using free style robots. If there is no more than one team registered in a league, that team will participate as an exhibition. (Exhibition means that no prizes will be awarded.)

Teams bringing robots to the venue will be responsible for the safe transport, installation and removal of their robots to the ICRA 2024 venue at their own risk and expense.

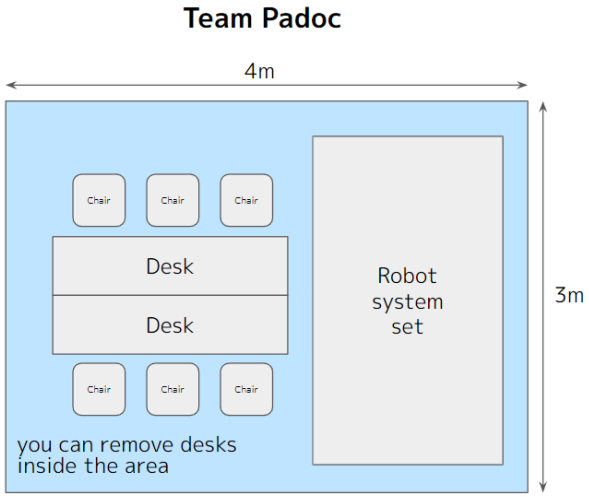
1) Foodly League: The Foodly League will feature Foodly Type R (hereafter referred to as ”Foodly”), a cooperative humanoid food robot manufactured by RT Corporation. Teams must bring their own Foodly or request rental one from RT Corp. For judging purposes, the Foodly itself must be unmodified, but the Foodly’s fingers may be made by the team. Peripheral equipment and tools such as conveyors, turnstiles, etc. may be brought in, as well as systems and equipment to assist the Foodly.

Foodly TypeR

The Padoc space intended for the Foodly League is shown in the following image.



2) RobotArm league: The RobotArm League will be registered with free-style robot arm(s) selected by the team. The robot arm that can be used is limited to two arms. The number of axes and hands is not limited. Peripheral equipment and tools such as conveyors, turntables, etc. may be brought in, as well as systems and equipment to assist the robot arm(s). However, the footprint of a set must be within 3 x 4 m, as shown in the following Padoc image.



II. Overview

All teams will be judged on their Technical Description Document (TDP), Technical Challenge, and Technical Demonstration. The goal is to demonstrate the integration of the selected features and how they contribute to improved performance.

The Technical Challenge should compete on speed of serve and accuracy, and should demonstrate the implementation and integration of the robot's features in a way that visually enhances or adds value and contributes to the theme or story being portrayed. Examples of functionality include human interaction, object avoidance, manipulation (grasp/grip), visual/voice recognition, localization, hand, pick and place, object/human recognition for tasks or safety, human, robot, tool and other peripheral interaction, object avoidance, and manipulation. It is also not limited to these areas.

Technical demonstrations will be performed by a robot serving a specified food item, taking into account that the robot can actually be used in a food factory. As for the contest, the number of completions and the time needed to complete them within the regulation time will be evaluated. In addition, the judges will evaluate the serving of the food to be served according to the rules. Specifically, the judges will look for missing or spilled ingredients, appearance, quantity, etc.

For the Technical Challenge, the Executive Committee will select one food item (food item that can be counted individually or measured by volume) to demonstrate the basic performance of the AI Robot System.

The technical demonstration will be arranged in a tray similar to the finished product, with the actual use in a food factory in mind. Therefore, several types of ingredients must be served.

The contest site will be in a place designated by the orgnizing committee or in each team's paddock.

Each team must provide in its Technical Description Document (TDP) a 4-6 page A4 paper description of both of the above, including the features to be used and the challenges from an AI/Robotics perspective.

III. Challenges on ICRA2024

A. Foods and Challenge

1) Technical Challenge:

A fried chicken pick and place to tray on conveyors

In Japan, we have a culture of Bento. According to servay of foods in bento, popular foods are fried chicken, humbergers and fried prawns. The contest is the operation of picking a fried chicken to serve out of a container filled with fried chicken.

a) Foods and equipment prepared by committee: The committee will lend one food container and 200 fried chicken samples to each team that wishes to participate on the first day of practice. On the day of the contest, the 200 pieces, counted by the committee, will be prepared at the contest site. These shall be used to participate in the Technical Challenge. However, in order for the committee to prepare a reserve, one designated staff member of the team may add more fried chicken to the container if more than 200 pieces can be served in 5 minutes. (These may not be taken home. Teams wishing to take them home must notify the committee. They shall be sold at actual cost).

b) The contest time and number of challenges: Time limit is 5 minutes (stopwatch or similar device will be used for measurement).

A team shall be allowed to challenge three times.

The evaluation criteria are as follows

1) How many trays were served? (counting is done at the end of the conveyor belt.)
2) How many fried chicken dropped? (Counting is checked around the robot.)
3) The total number of three challenges are counted. In case of a tie, the team with the lowest number of dropping will be ranked higher.

c) Technical Challenge of Foodly Reference:

2) Technical Demonstration:

Serving IKURA bowl meal

There are bowl meals all over the world. Japan also has bowl meals named "Donburi" or "Don." Additionally, ICRA 2024 is held in Japan. Japan has a sushi culture. In sushi varieties, IKURA is one of the sushi ingredients and shares the same pronunciation as ICRA.

Therefore, we'll challenge to serve IKURA Don in 2024.

”IKURA” is salmon roe. Gari is the pickled ginger used as an accent. IKURA is provided in small batches just prior to the contest. Each team must use a hand or end effector that is sanitary enough to handle the food.

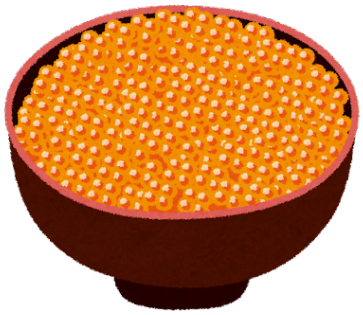
These are spherical or sliced aggregates to be weighed and served in specific quantities, making the task of serving them without spilling a challenging one. The rice can also be served using a SUZUMO rice serving machine. Weighing scales may also be used.

a) Foods and equipment prepared by committee: The committee will prepare foods for handling on the day of the contest. To maintain sanitation, this food will be served just before the contest begins.

- Bowl(small)
- Rice
- Ikura (salmon roe)
- Gari (sliced ginger pickles)

For hygiene reasons, these ingredients are not prepared for practice. Teams can prepare these items theirown. Teams are required to notify the committee in advance to dispose of any foodstuffs they bring in.

Ex. Foodly Type R with conveyor and container setting



IKURA Don (image illustration)

Gari (image illustration)

b) The contest time: Time limit is 20 minutes (stopwatch or similar device will be used for measurement).

c) Evaluation: The evaluation criteria are as follows

1) Speed of serving 10 dishes.
2) Accuracy weight of bowls.(Weight is also important factor because of food products.)
3) Visual of bowls（Judges want to eat the bowls, beautiful, no missing items）
4) Food loss, cost perspective. The team with the least amount of salmon roe spilled shall be rated higher.

Evaluation will be made by 5 judges plus up to 5 judges selected from the audience.

*From the perspective of food loss, the judges will decide whether the food can be eaten on the day of the event and whether the food will actually be eaten at the venue with permission from the health department. (If we can’t get permission, there is a possibility to use food samples are used for the contest.)

IV. FTC Organizers

Fumiya Iida (University of Cambridge) Kenichi Ohara (Meijo University) Kensuke Harada (Osaka University) Kazuyoshi Wada (Tokyo Metropolitan University) Shinichi Hirai (Ritsumeikan University) Yuki Nakagawa(RT Corporation) Zhongkui Wang (Ritsumeikan University)
Robot Sponser RT Corporation (tentative)

V. FAQ

A. *Can we buy the food sample of fried chicken?*

We plan to use the food sample of fried chicken as follows. You can buy all over the world.

Contact: sales@rt-net.jp

B. Who robot supply?

1) Foodly TypeR: Foodly TypeR is the product of RT Corporation (in Japan).

Contact: sales@rt-net.jp

C. How can we bring robots to the venue?

Organizers will show the information for transportation to the venue.

D. Contact about rules and others

Contact: Yuki Nakagawa (RT Corp.) E-mail: nakagawa@rt-net.jp