Cambridge Food Robotics Challenges

Food Robotics Challenge

Summary

Manipulation in an unstructured environment remains a significant challenge to roboticists. This challenge is aimed at developing robots to perform manipulation tasks which are considered trivial for humans to further the development of manipulation robots which can work in unstructured human environments.

The British sandwich market is worth over £8bn. The production of sandwiches remains a task which is hard to complete using robots and on a non-factory scale still requires much manual labour in the creation of sandwiches. *This task focuses on the development of robots to develop 'hand-made' cucumber and cheese sandwiches.*

Any questions or rule qualifications should be sent to the competition organisers.

Challenge and Scoring

The different elements of the task and the associated points are summarised below:

Task	**Max Points**
Select bread and place on chopping board	10 points (5 per slice)
Butter bread	10 points (5 per slice)
Slice cucumber • Place cucumber onto chopping board (10 points) • Pick up knife and approach cucumber (20 points) • Attempts to cut cucumber (25 points)	30 points
Slice cheese • Place cheese onto chopping board (10 points) • Pick up knife and approach cheese (20 points) • Attempts to cut cheese (25 points)	30 points
Place cucumber on bread	20 points
Place cheese on bread	
Cut sandwich in half • 5 points – pick up knife • 10 points – use knife to attempt to cut bread/partial cut • 15 points – full cutting of sandwich	15 points
Remove crusts from sandwich • 5 points for each crust	20 points
Place sandwich on plate to serve	10 points
Teams can include any additional condiments they want (e.g. lettuce, pepper, sauce etc. with up to an extra 50 points at the discretion of the judges!)	50 points

- Teams have 30 minutes to complete as much of the task as possible.
- Teams may reset each 'part' of the task 3 times.
- The different elements can be completed in any reasonable and sensible order
- Each of the tasks must be run autonomously, however there can be separate programs for the different tasks, such that each task can be attempted multiple times. Programs can not be changed once the competition has started.
- Teams can manually change the end manipulator once within the competition.
- If robots suffer a malfunction or parts fall of, teams are allowed to make minor repairs.

Table and Surfaces

- A table of minimum size 1.5m length x 1m depth will be provided. Items may not be screwed into this table.

- Teams may setup on the items on the table as they wish, with an example layout shown below:

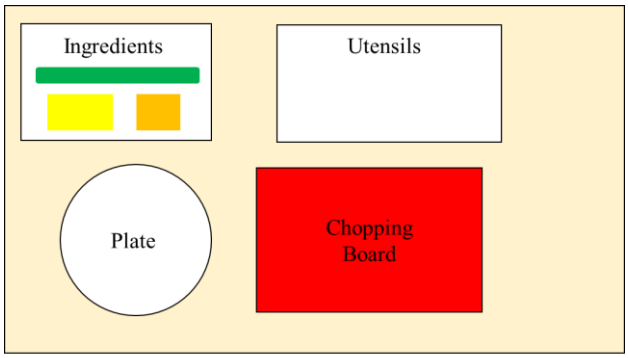

Table View

Equipment

Teams should bring their own equipment such that they can practise with their particular setup.

Plate	Round plate
Chopping board	Chopping board of at least 20 cm x 15 cm
Bread Knife/cutting knife (max 2)	Sharp knife for cutting break/Cucumber
Knife (max 2)	Standard knife for buttering bread etc.

Additional items will be allowed, however should be in the spirit of the competition, check with the organisers should you be in doubt.

Ingredients

The following ingredients are provided, with the description of the exact presentation given:

Cucumber	Placed without any film/packaging on the table
Cheese Block	Placed on the top without any wrapping/packaging
Bread	Pile (min 5 slices) of bread placed on the table
Butter	Butter pat placed on a saucer

Cameras

- Any number of cameras may be used; however teams must bring appropriate methods for mounting the cameras
- Calibration points may be added to fixed surfaces.

Power

- 240V, UK plug sockets will be provided

Robot

- The robots must be in a maximum volume of 3m (height)x 2m (width) x 2m (depth)
- Any number of robots may be used
- The robots may be mobile or may be static.