ENPH 253 – Introduction to Instrument Design - Summer 2024

DRAFT Competition Rules – July 16, 2024

Link to Onshape CAD model

Overcooked!

Your task is to build not one, but two robots to cooperatively tackle rapid cooking challenges. Follow the recipes to make salads, burgers and French fries as fast as possible.

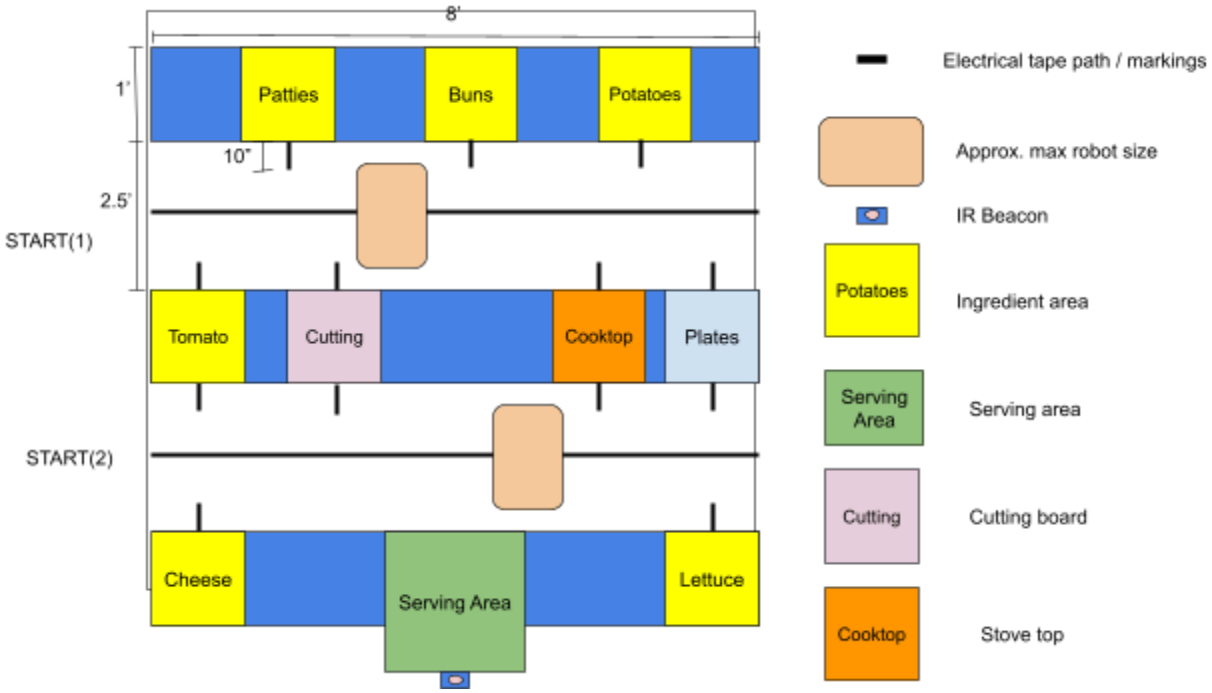
You robots will need to pick up ingredients, chop them, cook them if necessary, and then assemble and plate them to satisfy your hungry customers. The winning robots will almost certainly cooperate well in handing things off to each other to be the fastest kitchen crew of summer 2024!

Good luck!!

Revision History:

1.0 AM initial draft
2.0 AM edits - added lettuce and tomatoes
3.0 AM edits - plate and serving area details
4.0 AM edits - significant edits to cooking, serving and other clarifications (June 6)
5.0 AM - clarifications in various places, adjustment to points awarded for fries
6.0 AM - restart rules edited
7.0 AM - beacon height defined

Competition Surface (Approximate! Will evolve during construction)



COMPETITION RULES

1) **Track surface** - The competition surface is approximately 8 feet x 8 feet, containing multiple countertops that are 6” from the surface. The serving area is at the same level as the countertops and is joined to the countertop.

   Robots must be designed to accommodate for imperfections and irregularities in the surface. The diagram above shows the most likely configuration of the surface (The final surface may not be identical to the diagram as shown).

2) **Path** – There are black electrical tape paths and markers as shown to help the robots find food and cooking stations. **Tape markers will be 10” long. The main tape is centered between the counters.**

3) **Start Areas** - The robots will start at the marked end of each tape track, **fully inside** a 1’ x 18” start area that is centered on the tape. Robots can start in either orientation (18” longitudinal or 18” transverse).

4) **Beacons** - An infrared beacon identifies the service area, where plates with completed food must be delivered. This beacon will emit 1kHz infrared as a sine wave and will be centered in the service area about 7.5” above the service area surface.

5) **Recipes** – Robots will need to make one or more of the following:
   1) Salad: Pick up lettuce and tomato, put on plate, serve
   2) Cheese plate: Pick-up cheese, put on plate, serve
   2) French fries: Pick up potato, cut, cook, plate, serve (cut must proceed cooking)
   3) Burger: Pick up meat, cook, put on bun, cover with bun, plate, serve
   4) Cheeseburger: Same as burger but add cheese to meat after cooking
   5) Deluxe Burger/Cheeseburger: Add tomato and lettuce.
   5) Burger/Cheeseburger and Fries: Plate fries alongside a burger or cheeseburger.
   6) Burger/Cheeseburger and Salad: Plate salad alongside a burger or cheeseburger.
   7) Cheeseburger and Fries and Salad: Plate fries, salad and cheeseburger.

   Each recipe must be served on its own (i.e you cannot serve two burgers or two salads on the same plate).

Recipes table summary:

. Actions / Recipe	Pick lettuce (5)	Pick tomato (5)	Pick potato (1*)	Pick meat (4)	Pick bun (4)	Pick cheese (4)	Cut potato	Cook (potatoes/ meat)	Put on bun	Put on plate (many)	Score	Deluxe
Cheese plate						+				+	1	
Salad	+	+								+	2	
French fries			+				+	+		+	5	
Burger				+	+			+	+	+	7	
Cheeseburger				+	+	+		+	+	+	9	
Deluxe Burger	+	+		+	+			+	+	+	10	
Deluxe CheeseBurger	+	+		+	+	+		+	+	+	12	
Burger + Fries			+	+	+		+	+	+	+	14	+3
Burger + Salad	+			+	+			+	+	+	10	+3
Cheeseburger + Fries			+	+	+	+	+	+	+	+	16	+3
Cheeseburger + Salad	+			+	+	+		+	+	+	12	+3
Cheeseburger + Fries + Salad	+		+	+	+	+	+	+	+	+	19	+3

*1 potato is 4 sticks stuck together that need to be cut apart to make 4 fries (each stick counts as one serving of fries)

6) **Plates** - Teams may choose which plate will be available on the plate area, choosing between 7”and 9” (approx) plastic or paper plates (To be supplied).

7) **Scoring** - Scoring is as shown in the table above. In general, combination foods are worth more than the foods served separately.

8) **Tips** – well assembled burgers (i.e. the burger patties are inside the bun) will score the points above (which include tips). Burgers that have fallen apart will be deducted between 2 and 10 pts from the above totals. If no attempt is made to assemble a burger it receives the biggest penalty compared to an assembled burger that has partly fallen apart. The minimum score for each plate will be the highest score of the non-assembled components. (i.e a fully deconstructed deluxe burger will count as a salad, a fully deconstructed cheeseburger will count as a cheese plate). Teams intentionally and systematically assembling burgers incorrectly can expect bigger penalties.

9) **Ingredients and plates** – Raw ingredients and plates will be provided to each team in the positions indicated and in quantities shown in the table. Ingredient areas are 1’ by 1’. Food and plates must be **fully inside** the marked ingredient areas when initially placed. Area boundaries will be marked with green tape or pencil/marker.

   Plates: 6 plates to be chosen from the available “Chinet” plates by the team.

   Teams may use plates that have been made by gluing two Chinet plates together (stacked vertically) for rigidity.

   Teams may manually place the ingredients in their serving area immediately after the previous ingredient has been picked up. They may not be touching the ingredients or serving area when the robot approaches that area. Once an ingredient has been placed on the surface it can no longer be touched by the team.

   Teams may choose to put all of any ingredient in the serving area at once.

10) **Cooking:** There will be a flat cooking surface on which food must be placed for cooking. Cooking times will be approximately 5-10 seconds. Cooking less than 5 seconds will make that food unusable for serving as part of a recipe. Overcooking is permitted but food left on the cooking surface for more than 20 seconds will be removed and discarded.

    Multiple food items may be cooked at the same time but arranged as would be reasonable in real life. You cannot cook burgers pre-assembled, you cannot cook all the patties in a stack, etc. Buns may be cooked but it will not increase points for the recipe.

French fries must be cut from the potato before they can be cooked.

No pans or other extraneous items may be left on the cooking surface while the food is cooking.

11) **Serving Food -** Individual recipes must be served on each plate, and an attempt must be made to stack food like burgers. Parts of the robot or other extraneous items not listed on the recipe will not be served with the food.

12) **Restarting Robots** - Robots may be rescued by the team and restarted as many times as desired during the heat, for any reason.

    Time during the Heat does not stop for a restart. Points gained until the restart are reset to zero. The highest scoring single attempt during the 2 minute heat will count for points.

13) **Time Limit** – Heats are a maximum of 2 minutes. Additional time may be allowed in the finals at the judges' discretion to resolve close heats. Judges may choose to end a heat early if there is a clear winner during the heat or robots are not performing.

General Rules

A) **Autonomy:** Robots must be completely autonomous – no form of remote control is allowed.

B) **Size:** The Robot must be small enough to pass through the kitchen and may not extend at any time to reach past the far edges of each counter. Robots must not exceed 12" x 18" with any arms retracted, and such retraction must be possible autonomously during a run even if the robot chooses not to enact it. Any lateral reach may not exceed the reach limitation in total distance as listed above. (i.e. if the robot was turned 90deg. it still couldn't reach past the counter)

C) **Power:** Robots may only be powered by batteries and stored elastic energy.

D) **Components:** All components outside of those provided by the course instructors or listed at the end of this document must be approved by course instructors. Teams that choose to purchase their own items will not be reimbursed and are limited to a maximum of $200 per team.

E) **Damage to the Surface:** Robots may not permanently modify or damage the competition surface or any individual competition piece including the bonuses and coins. No glues, nails, screws or similar "rough measures" are allowed to pick up objects.

F) **Start Mechanism:** Robots will initiate motion only when the START button on their controller is pressed by a team member at the start of the run (signalled by a Judge).

G) **Competition Surface Variations:** The surface is made of wood and will have some warp and slight bumps all over. Robots must be designed to accommodate for imperfections and irregularities, as well as variation between practice and final surfaces. The surface will be painted at the beginning of the course but will not be repainted before competition day to avoid sudden changes in reflectivity. The surface will be fragile. NO STANDING OR SITTING ON THE SURFACE! Don't use tools or work on your robot while on the surface. Design your robot in such a way that it won't damage any parts of the surface while navigating it.

H) **Rules Finalization:** Rules and dimensions may change between now and the competition. Finalized rules will be issued as early as possible. Qualifying heats ("Time Trials", with no opponent) will take place 2 weeks prior to the competition on a final version of the surface.

I) **Sportsmanship Rules:** Strategies or designs that obviate the design elements of the course or that do not follow the intent of the competition will be disallowed whether or not they explicitly break these rules. All strategies which have been designed specifically to come as "close to" violating any of the posted rules as possible must be presented to the course instructors during the design stage of robot building. All decisions are at the discretion of the course instructors.

ALLOWED AND RESTRICTED MATERIALS

Approved

1. Solenoids (when used with mechanical constraints).
2. Elastic bands.
3. Wheels and hubs from existing RC or other small vehicles.

Must be Reviewed By Course Instructors

1. Springs are generally allowed, but must be reviewed individually for safety.
2. Compressed air may be allowed, but all valves and fittings must be reviewed for safety and a maximum pressure limit will be imposed.
3. Usage of existing CAD models. If not reviewed and approved by an instructor, usage of these will be considered plagiarism.

Banned:

1. Discrete H-bridge driver chips.
2. Any components other than wheels and hubs from existing RC or other small vehicle chassis, including (but not limited to) suspensions, differentials, steering mechanisms.