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Project 2

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Design Document.

The purpose of this project was to simulate a kitchen with bakers. Bakers will take turns grabbing ingredients from the pantry and refrigerator, and use the ingredients along with limited resources to cook each of 5 meals. The first step in the project was to define the ingredients and shared resources. Structures were used as seen below in figure 1.

Figure 1: Defining structures  
A screen shot of a computer program

Description automatically generated

An array of semaphores to handle the ingredients was also added later and is seen above. Each element of this array corresponds to a different ingredient for easy handling.

The next task was to define the recipe structure. This is a basic structure that just includes the name of each recipe as well as it’s ingredients. The structure is seen below in figure 2 alongside the recipe definitions.

Figure 2: Recipe Structure and Definitions  
  
A computer screen with text

Description automatically generated

The last structure to be created was the baker structure, which is seen below in figure 3. The baker requires access to the ingredients, resources, and recipes.

Figure 3: Baker structure  
  
A screen shot of a computer code

Description automatically generated

With this being done, the shared resources were then initialized to appropriate values and it was time to write functions to do the work of the program. The first function to be examined is the acquire ingredient’s function. This function begins by decrementing the pantryLock semaphore to ensure that the pantry is available for use. The for loop then iterates through all of the ingredients, taking the ingredients necessary for the recipe and checking to see if the ingredient is in the fridge or pantry. After ingredients are acquired, the function lets us know when each baker leaves the fridge or pantry respectively. The function can be seen below in figure 4.

Figure 4: Acquire Resources function:  
A screen shot of a computer

Description automatically generated

The next function created was the mixIngredients function. This function is a fairly simple function and works in a similar fashion to the acquire resources function but with less complexity, so I will not post the screen shot of this function. Semaphores are used to ensure the resources are accessible. The cookRecipe function was similarly straight forward, using semaphores to ensure the oven is available for cooking.   
  
Now the bakers are able to do the work they need to do and just need to be created. This is first done in main with the following code:

Figure 5: Baker Initialization  
A computer screen shot of a program code

Description automatically generated

An array of bakers as well as an array of baker threads is created, each with their own unique baker ID and each linked to their kitchen resources.

The next step was to create the bakerThread function. This function that executes the work of the bakers. This function loops through the recipes, then uses the previously created aquireIngredients, cookRecipe, and mixIngredients functions to perform baker operations. This is seen in a snippet of the function below in figure 6.

Figure 6: bakerThread Function

A computer code on a black background

Description automatically generated