

OS-ASSIGN-REPORT

This code simulates an ice cream party where families request for ice cream and if present is served. If the pot is empty, the vendor is awakened and the pot is refilled.

Threads and Semaphores are used to run this simulation. Family threads represent families getting ice cream from the vendor. A vendor thread is made to refill the pot whenever empty. To keep the families and the vendor in sync, semaphores are used.

The main function starts the ice cream and vendor threads, reads the input parameters from a file, initialises the output file and semaphores, then runs the simulation for a predetermined amount of time. The main function joins the ice cream threads and detaches them after the simulation is complete, destroys the semaphores, and closes the output file.

The family function shows the family first indicating that they are hungry, then eating the ice cream. If maximum number of turns a family can eat an ice cream is completed, then that thread returns. If the ice cream pot becomes empty, it is redirected to the vendor function.

The vendor function shows the family waiting for the vendor to refill the ice cream pot and then him going back to sleep after completion of the task.

Ultimately, the code uses semaphores and threads to construct a straightforward ice cream party system.

Metrics:

Average waiting time to eat:

The average waiting time to eat for a single family will be the total waiting time between the two eats of the family by n (number of

times they ate). The sum of differences between two eats of a family will be the difference between the time of first eat and last eat.

Average eating time for a single family =

$$\begin{aligned} & (\text{last eat time} - \text{first eat time})/50 = (1.153\text{s})/50 \\ & = 0.02306\text{s}. \end{aligned}$$

As all the threads will have similar average waiting times.

$$\Rightarrow \text{Average waiting time} = 0.023\text{s} = 23\text{ms}$$

Average waiting time to refill:

The average time to refill will be the sum of time difference between the next eat and the previous eat when the refilled is performed. This will be the next eat after the last refill is performed and the previous eat before the first refill is performed.

$$\begin{aligned} \text{Average time to refill} &= (\text{next eat} - \text{previous eat})/50 = 0.786\text{s}/50 \\ &= 0.01572\text{s} \end{aligned}$$

$$\Rightarrow \text{Average time to refill} = 0.01572\text{s} = 15.72 \text{ ms}$$