Canteen Ordering Application (MWH4-13)

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Overview

1) Introduction
The canteen ordering application system is an ordering system which is integrated with a mobile application, barcode and e-payment system with a food waiting time estimation function. The canteen customers can order or pre-order through the mobile application.

Methodology

1) System Design
   a) Approach used to implement the whole system.
      The canteen ordering system is designed to integrate with an existing system by controlling the same POS printer.

2) Method for estimation of waiting time
   a) Decisions about the adoption of a model in Queuing Theory
      In order to estimate the waiting time of a customer, the system adopts Queuing Theory with “Several Servers – Several Queues” Model with modifications.

Results

1) Canteen Ordering Application System
After connecting all the components of the system, it is able to work properly with the designed functions.

With specialization, as different types of food are served at different food counters, different cooking times, customers make orders and “queue” in different queues in respect of their food type. For modifications, since the arrival times of users are not fixed, that is, there are peak and non-peak hours of the canteen, doing real-time estimation with smaller time units can better reflect the real life situations and increase the accuracy of the results.

Arrivals -> Queues -> Service Stations -> Customers Leave

Several, Parallel Servers – Several Queues Model

1) Factors affecting the estimation of waiting time in the selected model
The two main factors are the arrival rate of customers and the service rate of the canteen. Arrival rate is equal to the number of customers ordering per unit time and the service rate is the food-provision rate of the canteen.

2) Canteen Ordering Application
The application works properly with the following functions.

Login System: Account registration, login, logout, input validation, forget password retrieval.

Ordering: Displaying the canteen list, showing the canteen menu according to the food types, favourite menu options, showing the waiting numbers, ordering food, shopping cart, getting notification when the food is ready, generating a QR Code when the food is ready, estimating the waiting time.

Account System: Top up, reviewing transaction history, account summary

3) Estimation of Waiting Time
   a) The following graph is the distributions of the actual waiting times of customers in different periods.

b) The following is the average relative error of the waiting time estimation by simulation: Lunch: 19%, Tea time: 12%, Dinner: 17%
c) Average relative error by averaging the waiting time to calculate: 26%
d) As a result, we can see that using queuing theory to estimate the waiting time can enhance the accuracy of the estimation.