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Expert Queuing System using Statistical Analysis and Fuzzy Logic Technique

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Abstract
This research suggests an expert or smart queue system to control the auditors in government and private companies characterized by the number of critics, where the proposed system determine the proper queue of client by calculating the average length of time for the work of each employee (service) and determine the type of operation approved, with the number of employees and auditors registered, and enter these data for computations based on fuzzy logic. These processes determine the length of time needed to finish a number of processes. The number of clients expected their service are determined based on the number and type of operation which can create a timetable for operations within the working time (primary queue) . As case study the Department of Civil Affairs is ben taken.
Keywords: expert systems, fuzzy logic, queuing system, .smart queuing systems, queuing management.

1. INTRODUCTION

A queue system is used to control queues of elements form in various situations and locations in a queue area. The process of queue construction and propagation is defined as queuing theory. [1] Queuing systems were studied by many studies considering the finest way for creating smart and steady system which could work in many environment.[2] also many researchers established a method which used fuzzy logic for calculating and expecting variable value depending on a number of parameters.[3] in this study fuzzy logic technique is used to develop expert (smart) queuing system to offer service for clients in different environments with fewest waiting time.

The normal queuing system used in a lot of government and private institutions to organize clients in ascending order (queue) like QMS AKIS [4] , where first client is service , followed by the second then the third and so on. the client who his turn has not come yet must wait. Waiting may be long, hours in cases of extreme stress and the peak period. Given the fact that clients hold jobs within government and private companies are also condemned to hours of work a specific conflict with the time of their customers as agents of the Department of Civil Affairs, they should either request leave or part leave. Either way divests service they need within their institutions and their companies of the services they provide, which delay development in the state and lose of money.

The recommended structure will reduction waiting time where appointments will be determined based on client desire and timely style which allows him to finish his business in his departments and institutions with continuing his work in the service of its clients

2. METHODOLOGY

The proposed technique is an expert queue system to regulate the client in government departments and private companies characterized by the number of employees, where the proposed system determine the proper queue of client by calculating the average length of time for the work of each employee and determine the type of operation carried out with the number of employees and clients registered and enter these data for computations based fuzzy logic. Where these processes determine the length of time needed to complete a number of processes.

The number of clients expected their services are determined based on the number and type of operation which can create a timetable for operations within the working time (initial queue). The system has a number of operations in the initial queue such as, reserve a specific time for a specific process, determine a specific time period, sending a text message before the period of time from the date had been set by the client. Using expert system and fuzzy logic so second queue is created and derivative from both the initial queue , and the new booking process, this new queue (second queue) is variable according to the change of inputs , results and the booking process.

The time period for employees Are intermittently and continually calculated, updated, every second. This is based on the results of the initial queue and change bookings new line with previous bookings kept fixed and the establishment of a new book and required the intervention of sites within the correct second column. All data is stored for operations and analysis for statistical information used to improve the expert system.

2.1 Real time management and data collection for statistical analysis

Managers have access to a tracking screen with warnings which enable general observing and control of the system. However, the system positions backups automatically, to guarantee that the aim waiting levels per

service are respected, as a function of the allocation of employee to the services and the forecasts and actual arrivals of clients.

In the central placement in enterprise grade queue management solution, the management console allows to configure all the parameter to run the token dispenser, keypad for service desk, displays, Announcement and the user management.

statistical reports enable tables and graphs of the following parameters and variables to be linked and presented. Such as(time periods, waiting times, handling times, times present, services provided, reasons). These reports are configurable temporal documents for different needs, displaying functions with variables.

3. IMPLEMENTATION OF THE PROPOSED SYSTEM:

In this section step of proposed system is discussed in detail and shown.

First stage training:

Count all employee, for each employee train on all services, find the average for services for all employee(average of services). find the average of employee for all services. Save the results in tables in data base. Then find the order of service for each employee from the fastest to the slowest and save them in table. Then find the ascending order of employees for each service from the fastest to the slowest.

2nd stage:

The number of employees with names is detected at the beginning and all there information will be collected from training stage. then the queue is filled with clients services at least same number of employees. Taking the best distribution according to service employee priority. The first service will be taken by the highest employee priority (fastest employee in this service) , then the 2nd will be taken by the next fastest employee for this service …. And so on) until all employees busy.

In client queue : the queue will be sorted according to many factorial(parameters) therefore no delay for any client. The remaining time and the ending time(finish time) for each employee is calculated and saved with the best services, the employees will be sorted ascending according to there remaining time and the clients will be sorted in the queue also according to there services the employee best services will be at the beginning of the queue then the 2nd employee best service and so on, if more than client have the same service the first in queue is chosen.

If there is no match between the best (fastest) service of employee with any of the first (number of employee services -1) then the 2nd best service for that employee is taken and so on. For each client in queue waiting time is calculated and should not be more than (number of employees*2-1) otherwise the highest priority will be given to the client and recalculate the queue.

3rd stage: up normal queue:

Another queue (time queue) is established corresponding to the client queue where the time for each client is saved. The table will show the connection of the client and time queues. Time queue is started at the beginning of work hours and ends at the finish hour minus the time of average service time of pervious service.

T2=t1-sat

tn=tn-1 + SAT

where

n< =finish time.

SAT: Average Service time

T1: finish time

T2: service time.

N: number of services.

Calculating unoccupied time and append it with client in client queue and give service high priority for serve highest if current time + alert time = chosen time, If current time equals alarm time then send SMS to client. then serve.

3.1 SYSTEM DEVELOPING AND FORMS OF THE QUEUING SYSTEM :

This system were developed following many phases, at the beginning there were Analysis of the existing system, then Identify requirements, followed by System Design, after that System Programming, then there were Experiment System, then Modify and debug the system, and then the Implementation of the system, after that Identify errors, and finally Correct mistakes.

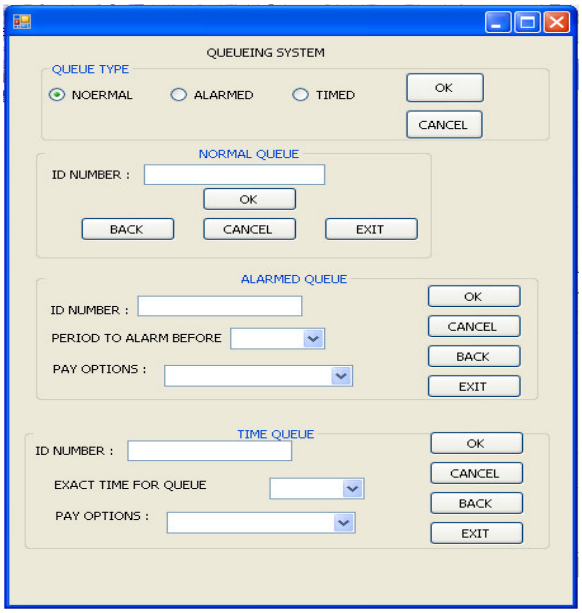

Figure1 : shows the main form of the system.

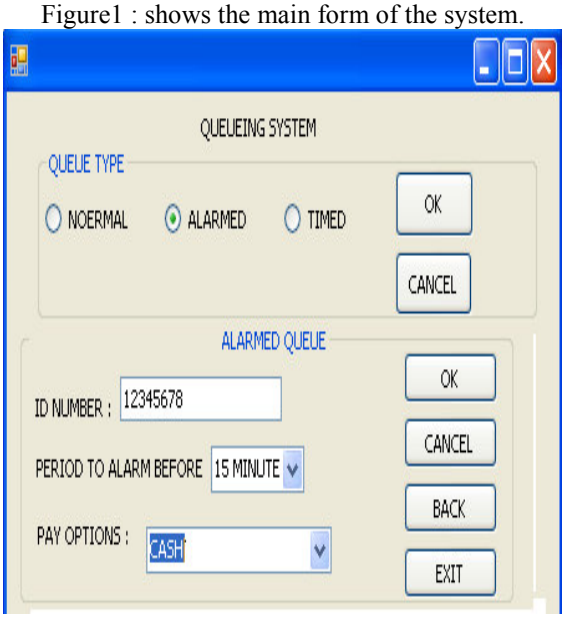

Figure2 : shows the form of alarmed option system.

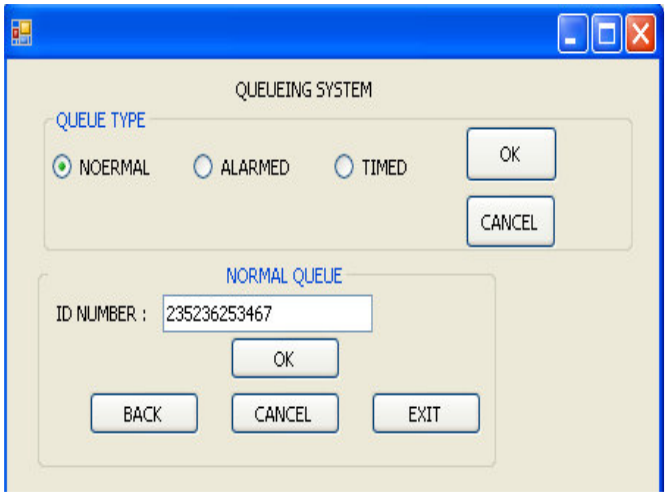

Figure 3 : shows form of queuing system using normal queue option.

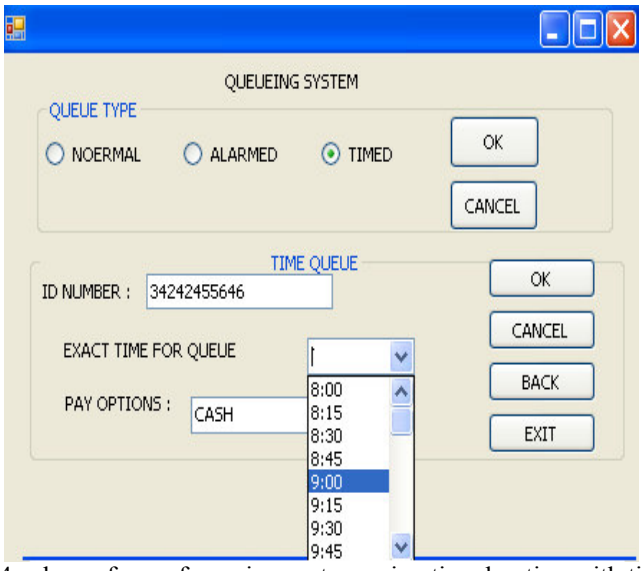

Figure 4 : shows form of queuing system using timed option with time list.

4. OBJECTIVES:

There are many objectives for this proposed system such as, Create an expert queue, Systems Programming, Raising the level of services provided to clients, Developing the local community, and Using artificial intelligent for predicating next client in queue. Also there are many benefits of this system which are, Reduce wasted waiting periods, Save money wasted due to absence from work, Reduce overcrowding within the institutions, Provide a unique service to clients.

5. TESTING AND RESULTS

The following tables shows the time of operations for all employees

	suhaib (E1)	Khalil (E2)	Mohd (E3)	M:S
identity	01:06	00:56	01:03	00:54
civilian	02:57	02:11	01:51	01:34
birth	02:40	02:51	02:35	02:17
Family book	02:39	01:33	01:14	00:48
passport	01:37	01:52	01:48	01:51
death	01:03	02:20	02:13	01:55
divorce	01:17	01:11	01:25	02:17
marriage	01:13	02:33	02:19	02:43

all	suhaib	Khalil	mohd	M:S
identity	00:58	00:55	00:50	00:54
civilian	01:50	01:45	01:36	01:34
birth	02:40	02:10	02:02	02:17
Family book	01:00	00:45	00:40	00:48
passport	02:10	01:37	01:45	01:51
death	02:00	02:55	01:50	01:55
divorce	02:30	02:15	02:10	02:17
marriage	02:54	02:48	02:26	00:43

EMP1	1st	2nd	3rd	avg
identity	01:28	00:37	01:22	01:06
civilian	03:03	02:51	02:54	02:57
birth	02:50	02:37	02:33	02:40
Family book	02:46	02:13	02:20	02:39
passport	01:09	02:13	01:28	01:37
death	02:12	02:27	02:06	02:15
divorce	01:22	01:17	01:15	01:18
marriage	01:15	01:04	01:21	01:13

EMP2	1st	2nd	3rd	avg
identity	01:00	00:50	00:57	00:56
civilian	02:51	02:01	01:40	02:11
birth	02:59	02:50	02:43	02:51
Family book	02:07	01:36	01:14	01:33
passport	02:20	01:53	01:24	01:52
death	02:38	02:14	02:07	02:20
divorce	01:25	01:05	01:01	01:11
marriage	03:07	02:20	02:12	02:33

EMP3	1st	2nd	3rd	avg
identity	01:06	01:02	01:02	01:03
civilian	02:05	01:47	01:41	01:51
birth	02:49	02:37	02:19	02:35
Family book	01:26	01:12	01:04	01:14
passport	02:06	02:34	01:43	01:48
death	02:25	02:10	02:04	02:13
divorce	01:40	01:22	01:11	01:25
marriage	02:35	02:10	02:13	02:19

6. CONCLUSION

From previous results, smart queuing system could be used for governmental and private companies. Which can produce an efficient queue depending on fuzz logic calculations to predicates the perfect time to serve client with the lowest waiting time. The proposed technique can reduce delays in serving clients and it speed up serving operations.

7. FUTURE WORKS

Some problems in the system can be solved using more parameters and could produce powerful and reliable system.

Soft computing could be used for generating larger queue that holds for week not just one day. The system could be developed to web site and mobile application so that it can be used from smart phones and internet

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