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A Brief Review on Queue Management Systems for Different Applications

Nagarathna [1*], Raj Shri Guru [2], Supriya S Rathod [3], Surabhi T R [4]

[1, 2, 3, 4] Department of Electronics and Telecommunication, Dayananda Sagar College of Engineering, Kumaraswamy Layout, Bengaluru, Karnataka, India
*Corresponding Author Email: supriyarathod246@gmail.com

Abstract

Queue management technology helps to reduce actual and predicted customer wait times, improve customer satisfaction, and provide the data to your managers needed to further optimize service, Queue Management System (QMS)presents a viable solution for different applications. It is employed to manage lines in a queue area in a variety of circumstances and locales. The article discusses the concepts of Queue Management Systems for Hospitals, Satellite Networks Based on Traffic Prediction, using Deep Neural Networks (DNN). Managing high patient loads in tertiary care hospitals represents a significant challenge in streamlining health service delivery. At several hospital service locations, including the registration, lab, and bill payment counters, patients must frequently wait in line. In these circumstances, Queue Management Systems (QMS) offer a practical patient management option. Satellite Internet the Adaptive Random Early Detection (ARED) queue management algorithm is proposed to be improved by traffic prediction based on a dynamic triple exponential smoothing model, smoothing coefficient optimization of the model using a differential evolutionary algorithm, and a cubic function based on traffic prediction. Customers and the administrative staff of the company can use a queue management system that uses the Open-CV platform and CNN algorithm for image processing, together with real-time person detection and people count recording. This essay also discusses several techniques in relation to their applications. With services that have medium to lengthy waiting periods, the proposed method seeks to reduce customer discontent.

Keywords

Adaptive random early detection, CNN image processing, cubic function, differential evolution algorithm, dynamic triple exponential smoothing model, System for Managing Hospitals.

INTRODUCTION

A queue management system is a strategy for managing lines of people in various settings and queuing areas. Queuing theory is the study of how queues are formed and spread. Doctor's offices, access to diagnostic procedures, specialist referrals, airport check-in, baggage claim, runway delays, waiting for landing, growing traffic, etc. are some typical settings where queueing theory is applied. Long wait times in clinics, hospitals, and emergency rooms (ER) may make treatment unaffordable for sick patients and encourage irrational behavior, such as patients leaving the hospital without receiving care, which may result in treatable diseases becoming incurable and unavoidable negative outcomes. According to studies, prolonged wait times in emergency departments cause stress for both patients and the employees who work there. They also frustrate patients who visit there. According to studies, prolonged wait times in emergency departments cause stress for both patients and the employees who work there. They also frustrate patients who visit there. Currently, the US government is concerned with providing quality health care and wellness for its citizens, which is not consistent with the effect of extended waiting times. This is the rationale behind this review of the management of extended waiting times in emergency rooms. In order to manage diverse service-based work owes in hospitals, the author suggests a thorough mobile- enhanced queue management system. The proposed system includes full patient counters, hospital pharmacies, waiting areas, and laboratories. The system is appropriate for usage without specialized hardware support because it is built using interfaces on mobile devices and smart displays. The suggested system includes a novel feature called crowd-based token production at numerous counters, where tokens are produced dependent on the number of tokens served at that counter. In high-traffic situations, which are frequent in government healthcare institutions in India, this might aid in crowd control. The system is also anticipated to handle several token generations at a single counter, which could be used for cases where family members avail healthcare services. The system also supports seamless queue management between different service areas (for example registration and doctor visits) by transferring the queue number from the registration desk to the OPD area as well as for downstream services so that the patient does not need to generate/collect multiple tokens [1]. The self-closeness of satellite organization administrations is exaggerated in the long-range reliance on the traffic, which puts the entire hub network in a burst condition for a protracted period of time and has a substantial impact on queueing execution. The selfcomparison information stream is predictable, and the expected network traffic can foresee the burst state of queueing. The foundation of a high-accuracy traffic expectation model and an examination of a line-the-board calculation for satellite organizations given traffic forecast can thus control network blockage and limit line length ahead of time [2]. The great impediment looked at during the shrewd lining frameworks, for example, openness to a shifted client base, decreased cost of the organization, convenience utility, diminished the above and log jam related with misleading solicitations, should be evaluated with consideration. There is likewise a physiological obstruction for clients stressing that leaving the holding up region will without a doubt detach them from the framework causing the protracting holding up times upon return. Besides, the obliviousness in further developing the client experience regardless of the bother of administration with the holding up lines makes it unfortunate. Creating answers for the dreary errand of hanging tight for administrations is a basic need, particularly because of the developing interest as the number of inhabitants on the planet keeps on lifting.

Since web applications are currently coordinated inside the dynamic social orders, utilizing such a means to better lining frameworks is natural. From now on, we propose a snare of things to take care of the issue [3].

RELATED WORKS

Patient length-of-stay in the emergency department through dynamic queue management.

This includes the many Data Innovation (IT) frameworks and data sets that support the ED and its supporting divisions in carrying out their functions. For instance, processes from the ED work in tandem with those from the research center (such as blood tests) and the X-beam offices. Blood Framework and X-beam Framework are used individually in the cycles in the research facility and the X- beam offices. The findings of the two patient tests are contained in the Blood Framework and the X-beam Framework, respectively. These frameworks serve as the structural underpinnings of the ED cycle. The real-time frameworks provide data that is used to support both the scientific model and the choice assistance model[4].

Adaptive Active Queue Management Based on Model Predictive Control.

To design an AQM algorithm based on MPC, the traditional zero-order hold (ZOH) is used to discretize. Suppose the values of δp and δq are sampled in each interval Ts, then the transfer function which relates the δp and δq can be:[5]

$$G(z) = \frac{(m_1 z^{-1} + m_2 z^{-2})}{(1 + n_1 z^{-1} + n_z z^{-2})} z^{-d} \qquad (1)$$

where d = dR T0s e is the system delay, m1, m2, n1, n2 are determined by the network parameters, and Ts as the following:

$$\begin{cases} m1 = \dfrac{C^3 R_0^3\left(\left(2-2e^{\frac{-Ts}{R_0}}\right)N + CR_0\left(-1+e^{\frac{-2NTs}{CR_0^2}}\right)\right)}{4N-2CR_0} \\ m2 = \dfrac{C^3 e^{-\frac{(2N+CR_0)Ts}{CR_0^2}} R_0^3\left(2\left(-1+e^{\frac{Ts}{R_0}}\right)N - CR_0\left(-1+e^{\frac{-2NTs}{CR_0^2}}\right)\right)}{2(-2N+CR_0)} \\ n1 = -e^{-\frac{2NTs}{CR_0^2}} - e^{-\frac{Ts}{R_0}} \\ n2 = e^{-\frac{(2N+CR_0)Ts}{CR_0^2}} \end{cases} \qquad (2)$$

Define the values of δp and δq as the input value u and output value y, respectively, then the dynamic model of TCP behavior can be described as the following input- output difference equation:

$$A(z^{-1})y(t) = z^{-d}B(z^{-1})u(t), \qquad (3)$$

where $A(z{-}1) = 1{+}n1z{-}1{+}n2z{-}2$, $B(z{-}1) = m1z{-}1{+}m2z{-}2$.

To derive the predictive value of δq after a jth interval, i.e., just its seconds later, a Diophantine equation is introduced:

$$A(z^{-1})E(z^{-1}) + z^{-j}F(z^{-1}) = 1, \qquad (4)$$

where E(z −1) and F(z −1) are the polynomials determined by A(z −1) and j, which can be expressed as E(z −1) = e0 + e1z−1 + ⋯ + ej−1z−(j−1), F(z−1) = f0 + f1z−1. Multiplying E(z −1) to the two sides of (7), we have:

$$: y(t+j) = z^{-d}B(z^{-1})E(z^{-1})u(t+j) + F(z^{-1})y(t). \qquad (5)$$

Let j = d +1, and transfer the above equation from the Z domain to the time domain, then

$$y(t+d+1) = f_0 y(t) + f_1 y(t-1) + g_1 u(t) + g_2 u(t-1)$$

$$+ \cdots + g_{d+2} u(t-d-1), \qquad (6)$$

where g1 = e0m1, g2 = m1e1 + m2e0, g3 = m1e2 + m2e1...gd+1 = m1ed + m2ed−1, gd+2 = m2ed. Note that y(t) = δq(t) = q(t)−q0, and the reference queue length is q (t + d + 1) = q0, so y (t + d + 1) = 0, then (10) can be simplified as:

$$u(t) = h_1 y(t) + h_2 y(t-1) + h_3 u(t-1) + \cdots$$

$$+ h_{d+3} u(t-d-1), \qquad (7)$$

where $h_1 = -\frac{fo}{g1}$, $h_2 = -\frac{fi}{g1}$, $h_3 = -\frac{g2}{g1}, \ldots, h_{d+3} = -g_{d}g_{\pm 1}2$. on Hebb-learning theory to adjust the parameters hi (i = 1, 2,d + 3) shown . To make the equation easier to understand, rewrite as follows:

$$u(t) = K \sum_{i=1}^{d+3} w_i(t)\, x_i(t) \qquad (8)$$

Smart Mobile System for the Real-Time Tracking and Management of Service Queues.

The Internet of Things (IoT), which uses the being structure of cellphones to distribute tickets to visitors, is the cause of our smart line operation. Since the Arduino platform is open source and cheaply priced, we selected it. The customer opens the operation, scans the Near Field Communication (NFC) guard of the registering slave unit with their NFC-enabled smartphone, and then chooses whether to leave the staging area until they receive a visual and audible alert to return or stay and use the entertainment options in the app. To make the app screen more intuitive for the stoner, it is created to function as an actual status board. In order to decrease erroneous service requests and improve the accuracy of the dynamic time vaticination algorithm, we specify a compass close to the requested service where the app may be utilized. For convenience, the drug users are also given the option to exchange their tickets. When a customer scans a ticket registration unit, the system process starts. The user can produce a ticket by scanning the QR code on it if they do not have an NFC-capable smartphone. The app then starts up and shows the digital ticket in addition to the queue position. The user interface (UI) is made simple and easy to use for the user by having the ticket and status board seem like their real-world equivalents, as shown in Figure 2 below. While subsection B elaborates on the streaming and queue management unit, subsection A describes the registration and verification unit and the system's workflow [6].

An Approach for Non-Critical Service Queue Management Systems.

The method helps systems that provide non-critical services organize their movables effectively. It also controls the queue of guests arriving. The strategy is to improve the client experience while retaining the advantages of the handed service. A mobile application that displays available times and locations can be used by the customer to schedule an appointment online in the first step. The customer verifies her reservation in the alternative step when she arrives at the service location. She can do this by using a mobile device to scan a QR code. This is essential if you want to avoid touching any screens during the COVID-19 pandemic. The system will decide the class of the client precedence in the third phase. The system will locate the client's position in the virtual line in the fourth phase. Eventually, in the fifth step, the anticipated waiting time to be served is reckoned. Section IV describes the steps leading from 3 to 5. On the mobile operation, the client's position and the remaining time will be reported, allowing her to stay put and return when her turn is about to occur. Managing the line is an essential part of the thus mentioned approach. As a result, Section IV provides a thorough explanation of the precedence line method. Section V applies the strategy and evaluates it [7].

The impact of queuing algorithms on the quality of service for real-time traffic during load balancing

On the connection point of the switch, the components to prevent overburden (line length limits) implement a method of disposing of traffic parcels by extending the normal length of the line, whereas the blockage board is the executives of traffic bundles ready to be upgraded in equipment or programming lines. On the connection point of the switch, the components to prevent overburden (line length limits) implement a method of disposing of traffic parcels by extending the normal length of the line, whereas the blockage board is the executives of traffic bundles ready to be upgraded in equipment or programming lines [8].

Analysis of the queue discipline for the wireless sensor node's dynamic power management.

The line discipline in the context of administrative time is challenging to fictionalize. The line postpones example in this study was completed using the Simulink (MATLAB) environment. Think about a sensor hub that employs the M/M/1 line structure and could recognize and respond to two distinct types of events that show up in its feedback. It has a power supervisor block for controlling the board dynamic power, an occasion age block for creating two distinct types of occasions, a single server for connecting with the sensor hub processor, and a lining defer analyzer for reviewing high- and low-need event postponement. The lined defers analysis evaluates the postponement of low- and high-need circumstances using the DPM-based WSN model. When the more essential events are handled first, the executive solution, which employs a remote sensor hub, uses less power and misses fewer occurrences. The high appearance speed of lowneed occasions and low appearance pace of high-need occasions are accepted through demonstration and investigation. If the managing or correspondence of the current development hinders the emergence of a higher need occasion, it is a preventive need strategy rather than a preplanner need strategy. If necessary, the acquired occasions might be returned to the need line for additional treatment to slow down the speed of low-need occasions. The reproduction boundaries for deferred examination are displayed in the image below [9].

CONCLUSION

In this research, a Savvy Line the Executives Framework that can be used for thorough patient administration in emergency clinics is introduced. The Satellite Organization Creator Given that the traffic forecast has an increased cubic capacity, the model is improved with triple dramatic smoothing, and the executive calculation proposes a better ARED calculation while taking organization traffic expectations into account. The model also includes individual counting, and Line expectation is completed with the use of convolution calculations, sophisticated neural network techniques, and DNN calculations. To sum up, the executive framework brilliant line can increase efficiency and client satisfaction while reducing hanging tight time for administrations.

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