

THE STATE COMMITTEE FOR COMMUNICATION, INFORMATIZATION
AND TELECOMMUNICATION TECHNOLOGIES OF THE REPUBLIC OF UZBEKISTAN

COMMITTEE FOR COORDINATION SCIENCE AND TECHNOLOGY DEVELOPMENT
UNDER CABINET OF MINISTERS OF UZBEKISTAN

TASHKENT UNIVERSITY OF INFORMATION TECHNOLOGIES

CENTRE FOR THE DEVELOPMENT OF SOFTWARE
AND HARDWARE-PROGRAM COMPLEXES

SCIENTIFIC AND TECHNICAL SOCIETY OF RADIO ENGINEERING,
ELECTRONICS AND COMMUNICATION OF UZBEKISTAN

PERSPECTIVES FOR THE DEVELOPMENT OF INFORMATION TECHNOLOGIES

ITPA-2014

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INFORMATIZATION AND TELECOMMUNICATION TECHNOLOGIES
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TASHKENT UNIVERSITY OF INFORMATION TECHNOLOGIES

**CENTER FOR DEVELOPMENT OF SOFTWARE PRODUCTS AND
HARDWARE-SOFTWARE COMPLEXES
UNDER THE TUIT**

**SCIENTIFIC AND TECHNICAL SOCIETY OF RADIO ENGINEERING,
ELECTRONICS AND COMMUNICATION OF UZBEKISTAN**

**TRANSACTIONS
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TECHNOLOGIES ITPA 2014”**

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ГОСУДАРСТВЕННЫЙ КОМИТЕТ ОБЩЕСТВЕННОЙ
ИНФОРМАТИЗАЦИИ И ТЕЛЕКОММУНИКАЦИОННЫХ
ТЕХНОЛОГИЙ РЕСПУБЛИКИ УЗБЕКИСТАН



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4. Conclusion

These tools are useful because they decrease costs and increase the speed at which applications are developed. In addition, cross-platform mobile development tools are generally quite simple to use as they are based on the common languages for scripting, including CSS, HTML, and JavaScript. However, cross-platform mobile development does have a few drawbacks. First, mobile operating systems are frequently updated. Whenever a mobile operating system receives a new update, the applications must also be updated to be compatible with the new system. In addition, rendering times with cross-platform mobile development may be longer as each operating system needs a separate set of code.

References:

1. "Cross-Platform GUI Programming with wxWidgets" by Julian Smart and Kevin Hock, 2012.
2. "Cross-Platform Development in C++: Building Mac OS X, Linux, and Windows Applications" by Syd Logan (Dec 7, 2007)

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MODELLING OF QUEUEING SYSTEMS WITH MULTI-CLASS SELF-SIMILAR NETWORK TRAFFIC

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Abstract: In this article contributes to performance modelling of priority queueing systems by proposing a novel queue-decomposition approach, which offers several potential advantages and unique innovations. Specifically, we extend the well-known Empty Buffer Approximation (EBA) method to model priority queueing systems with multiple traffic flows and decompose the original priority queueing system into a group of single-server single-queue (SSSQ) systems, which can make the challenging performance modelling problem tractable.

Keywords: Priority queueing, self-similar traffic, performance modelling, priority queueing systems, queue decomposition.

1. Introduction

Modern communication networks are required to support multimedia applications, such as, video, voice, and data, which demand differentiated Quality-of-Service (QoS) guarantees. Due to its scalability and manageability, the Differentiated Services (DiffServ) architectural framework has been proposed as a promising scheme to cope with these demands. In such a framework, packets are classified into a number of traffic classes, which are labelled appropriately and handled with differentiated priorities. Therefore, the priority queueing principle plays a crucial role in the implementation of the DiffServ architecture and has a great impact on its efficiency.

With the aim of creating a cost-effective analytical tool for investigating the performance of priority queueing systems in the presence of multi-class self-similar network traffic, this paper proposes an efficient queue-decomposition approach and further derives the analytical queue length distributions for individual traffic flows based on LDPs. The key contributions of the paper include: We extend the well-known Empty Buffer Approximation (EBA) method, which was widely used for modelling priority queueing systems under only two traffic flows, to deal with multi-class self-similar traffic.

2. The purpose of the task

This article focuses on analytical modelling of strict priority queueing systems subject to multi-class self-similar traffic flows. Figure 1 presents a model of such queueing systems fed with N traffic flows. Flows 1 to N are assigned priorities in a descending order, i.e., traffic flow 1 has the highest priority whilst flow N has the lowest priority.

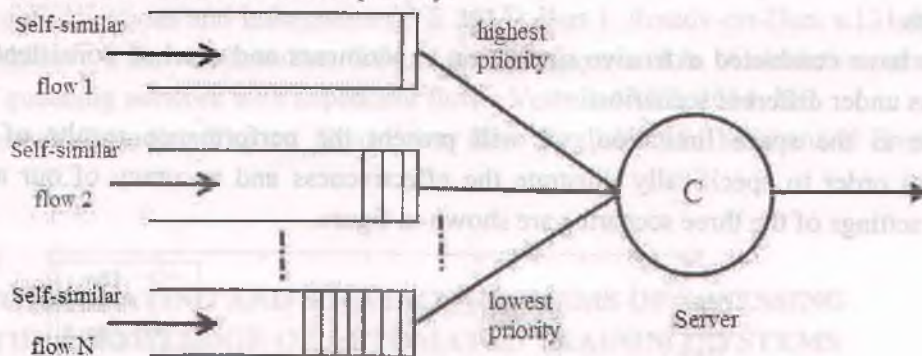


Fig 1. The model of the priority queueing system.

Many analytical models and techniques have been developed to characterize traffic self-similarity or generate self-similar traffic traces, such as, fractional Brownian motion (fBm) fractional Gaussian noise (fGn) [1], Multi-fractal Wavelet Models (MWMs), superposition of Markov Modulated Poisson Processes (MMPPs), and superposition of ON/OFF sources with heavy-tailed distributed ON and/or OFF periods[2], [3]. Among these models, fBm is identified as an efficient way for modelling and generating self-similar traffic and is, hence, adopted by this study.

The goal of queue-decomposition is to equivalently divide the complex priority queueing system into a group of individual SSSQ systems in order to reduce the system complexity and make the targeted task tractable. The key issue is to derive the service capacities, namely, $c_1, c_2, \dots, c_N$, of the N individual SSSQ systems. In what follows, we will introduce the well-known Empty Buffer Approximation (EBA) method [4] and extend it to a more general case.

Extended Empty Buffer Approximation (EBA). Berger and Whitt originally proposed the well-known EBA method for modelling the queue length of the low priority traffic in a two-class priority queueing system. The total queue in such a priority system is almost exclusively composed of the low priority traffic because the queue length of the high priority traffic, compared to that of the low priority traffic, is negligible. As a consequence, the EBA suggests that the total queue length distribution of the queueing system can be reasonably used to approximate that of the low priority traffic. The validity of the EBA has been empirically proven, even in the case where the high priority traffic load is much heavier than that of the low priority traffic [2].

3. Function module

Following the priority queueing principle, we can reasonably extend the EBA method to priority queueing systems subject to multiple traffic flows as follows. Given a priority queueing system with N traffic flows, the inherent priority nature leads to the fact that the aggregate queue of the first l ($1 < l < N$) higher priority traffic flows is negligible as compared to that of the residual $(N - l)$ lower priority traffic flows. Therefore, the total queue of the system can be used to approximate the aggregate queue of the last $(N - l)$ lower priority traffic flows.

It should be pointed out that the extended EBA is effective even when N and l are considerably large because the large N and l usually imply that the last $(N - l)$ traffic flows can

obtain much less service. As a consequence, the arrivals of these traffic flows pile up in buffer and build extremely long queues.

In this article, we demonstrate the effectiveness of the proposed queue-decomposition approach and validate the accuracy of the developed performance model via comparing the analytical results of queue length distributions to those obtained from extensive simulation experiments.

We have conducted extensive simulation experiments and reached consistent performance conclusions under different scenarios.

Due to the space limitation, we will present the performance results of three typical scenarios in order to specifically illustrate the effectiveness and accuracy of our approach. The parameter settings of the three scenarios are shown in figure.

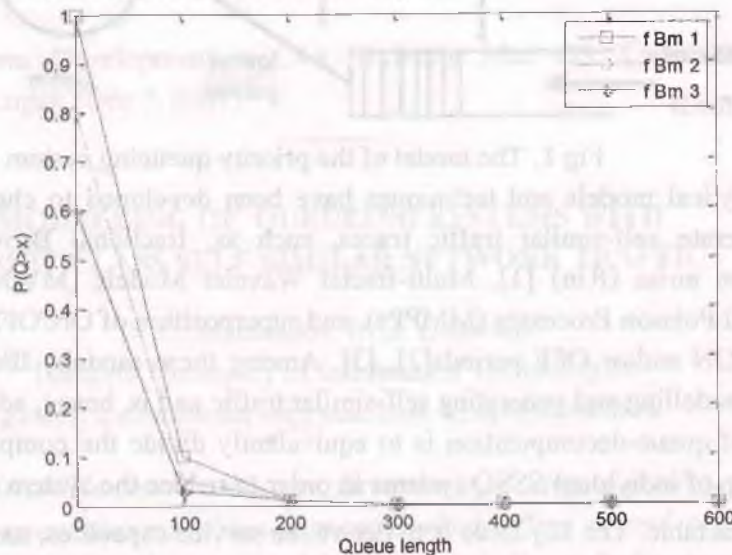


Figure 2. Dependence queue length with priority.

Note that model involve three heterogeneous fBm traffic flows, while modeling consists of five homogeneous fBm traffic flows with Hurst parameter $H = 0.8$. The different in that *fBm1* in Priority 1 has the highest arrival rate while *fBm3* has the lowest rate; Priority 2 is almost the same. Particularly, the mean arrival rate of *fBm1* Priority 3 is several times larger than those of the other four fBm traffic flows. In addition, the length of fBm traffic traces generated in our simulations is lots of time units. Figures 2 present analytical and simulation results, where the horizontal axes represent queue lengths, while the vertical axes denote the corresponding probability distributions. Moreover, 95% confidence intervals are presented for simulation results in Figures 2.

4. Conclusions

In this article, we evaluate the effects of the variance coefficient of fBm traffic on the performance of the priority queueing system and then investigate the impact of the newly incoming traffic sources on the queue length distributions of individual traffic flows.

With the rapid development of communication techniques and equipments, more and more network applications request differentiated and guaranteed Quality-of-Service (QoS). The Differentiated Services (DiffServ) architecture, where classified traffic flows are handled with the priority queueing policy, has been proposed as a promising scheme for QoS provisioning. Since the finding of the self-similar traffic nature in communication networks and multimedia systems, research interests in the priority queueing policy have been moved to those systems subject to self-similar traffic. However, existing studies on analytical modelling of priority queueing systems are often limited to two traffic flows only.

References:

1. P. Mannersalo and I. Norros, "Approximate formulae for Gaussian priority queues," in *Proc. 17th International Teletraffic Congress (ITC-17)*, 2001, pp. 991-1002.
2. Amirsaidov U.B. Models and methods for calculating network characteristics, taking into account the fractal traffic. Proceedings of the North Kazakhstan branch of the Moscow Technical University of Communications and Informatics (Ô È 2014), Part 1, Rostov-on-Don, s.131-134.
3. Amirsaidov U.B., Mahmudov S.O., Musakhodjayeva I.A. Calculation method of characteristic of queueing network with dependent flow.- *Vestnik TUIT*, 2014, №3.
4. L. Kleinrock Queueing Theory: Translation from English.- M.: Mechanical Engineering, 1979 - 432 p.

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FORMULATING AND SOLVING PROBLEMS OF ASSESSING THE KNOWLEDGE OF AUTOMATED TRAINING SYSTEMS

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Abstract. The paper looks at the task of assessment of the level of knowledge of the object of control in automated learning complexes and systems. A general scheme of the object of control – level of knowledge of learners. The module of the object of control in the class of end automates in the form of bi-clemm black box is suggested. The paper justifies an algorithm for determining the searched grades of level of knowledge of learners with the help of known method of calculation of empirical average of current grades of level of knowledge of learners.

Keywords: automated learning system, computer simulators, assessment of level of knowledge of learners, end automate, reliability of assessment of level of knowledge of objects of control.

1. Introduction

The task of improving the quality of training set before institutions of higher and secondary special education requires significant restructuring of teaching work in higher and secondary specialized educational institutions. It is related to the further development of scientific and technical progress, with the introduction of the growing number of modern computing technology into the national economy and with the introduction of automated control systems.

Development of computer technology is happening so rapidly that the organizational forms of its application have not yet achieved the necessary maturity. Effective use of computers in the learning process requires a comprehensive solution of some problems of organizational, methodological and scientific nature. Development and implementation of automated learning systems is required by the tasks of further improvement of education in higher and secondary special educational institutions set out in the known laws of the state.

2. Setting the task of control of level of knowledge of learners

One of the major problems encountered in the construction of automated control systems and learning is the problem of measuring the power level of the student's knowledge, which is interpreted as a special case of the general problem of determining the output signal in control systems [1,2]. The efficiency of operation of the entire computer-aided instruction systems depends largely on the correct and reliable measurement of the most important indicator of the learning