

Editorial - Adaptive Multimedia Computing

In recent years, there is an emerging research area in multimedia computing, with the increasing number of related work in scalable video, adaptive multimedia documents, adaptive multimedia services, to name just a few. This new trend comes about partly due to the increasing use of mobile media devices where media requirements could change among users and devices and at different times of reception or presentation, and partly due to the changing network conditions, where best-effort service is the general practice. Any change in Quality of Services (QoS) could imply a change in the delivery or scheduling of media contents. To complicate the matter, user interruptions or requirement changes during the communication process could also occur; for example, a user may not be satisfied with the current media quality and decide an upgrade in real time. The status quo is that this new research paradigm is beginning to take shape while no effort has been made to draw a roadmap for it. We could see some major research work missing, for example, formal methods or modeling of adaptive multimedia

The purpose of this special issue of Journal of Systems and Software is to publish the latest work on various aspects of adaptive multimedia: formal methods, modeling, scheduling, authorware, software environment, middleware, presentation software, documents, applications, distributed systems - whatever constitutes the essential elements of the next generation of multimedia services. Its publication will help bring researchers to have more consensus and focus on this new multimedia computing paradigm, identify missing research areas, and attempt to state the status quo of this emerging field.

Papers were solicited from researchers in the following areas:

- architecture for adaptive multimedia;
- adaptive multimedia environment;
- adaptive multimedia systems and applications;
- adaptive mobile media;
- adaptive multimedia authorware;
- adaptive multimedia middleware;
- adaptive multimedia documents;
- adaptive multimedia services;
- adaptive multimedia synchronization;
- adaptive streaming of multimedia; and
- adaptive multimedia modeling.

There were 26 papers submitted, covering all but the last area. The majority of them fell into the categories of “adaptive streaming of multimedia” and “adaptive multimedia services”. This fact indicates that there might be very little work done on adaptive multimedia modeling. Finally six out of 26 papers submitted were selected for publication in this special issue.

Kusmierek and Du’s paper addressed the issues of the mapping between application-level QoS for streaming video and network-level QoS. They investigated what information about the network status is necessary for an application to make

adaptation decisions. A 3-rate adaptation mechanism for video streaming to illustrate adaptivity based on network awareness was proposed.

Lei et al. investigated the problem of bit rate adaptation for transcoding and transmitting pre-encoded VBR video over burst-error wireless channels. An adaptive bit rate adaptation algorithm for transcoding and transmitting pre-coded VBR video stream over wireless channel was presented.

Chen et al. presented an end-to-end real-time adaptive protocol for multimedia transmission. The bandwidth is dynamically allocated according to the network status, and the client buffer occupancy and playback requirement. Their experiment results showed that the proposed real time protocol with a rate adjusting quadratic probing algorithm can utilize network resources better while reducing the packet loss ratios.

Chang and Hsieh proposed an Adaptive Three-layer Framework (ATF) to guarantee inter-stream synchronization of W3C SMIL presentation. ATF functions as the middleware between underlying network protocol stacks and the SMIL applications.

Manvi and Venkataram investigated an agent-based adaptive bandwidth allocation scheme for multimedia communications. Their scheme can find an alternate patch-up route adaptively for every congested/failed link and re-allocate the bandwidth for the multimedia applications affected.

Finally, Liu and Goddard focused on scheduling legacy multimedia applications – those developed for conventional time-sharing systems. A legacy application-compatible and adaptation-oriented scheduling framework was proposed. It supports rate-based execution and periodic threads that run at a constant rate, and non-real-time threads that have no QoS demand.

We would like to thank the authors of the papers published in this special issue for their contributions and hard work. Last but not least, the efforts of the referees in reviewing the papers are hereby acknowledged. Without their help, this special issue would not have existed.

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