

ADAPTIVE VIDEO STREAMING FOR BANDWIDTH VARIATION WITH OPTIMUM QUALITY

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DECLARATION

I declare that this is my own work and this thesis does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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Prof. Dileeka Dias

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Dr. M.S.D Fernando

Abstract

Bandwidth scarcity is a common problem faced in video transmission over broadband networks, particularly in wireless medium. It is important to find solutions for that since high bandwidth consuming video applications such as video streaming, video conferencing are of high interest to the broadband and mobile users today.

This thesis presents adaptive video streaming based methodology to address the given problem. Adaptive streaming is discussed through transcoding. It is a solution that can be adopted to overcome this problem in any network environment.

Conversion of video to a form that has less information so that the resulting data volume is appropriate for streaming over a low bandwidth scenario can be done with transcoding. But the video quality drops due to transcoding. A compromise can be made between the video quality and network delay. Effect on video quality and data volume with the variation of transcoding parameters are analyzed in this research, especially with the temporal scaling parameters. A relationship between the transcoding parameters, the data volume reducing factor and the video quality is obtained through numerical methods. Hence a methodology derived from the numerical method is proposed to achieve an adaptive streaming solution. One of the significant outcomes of this thesis is the video quality measurement mechanism proposed that could be used in the presence of spatial and temporal scaling.

This solution presents the best transcoding parameters to achieve optimum quality video in a low bandwidth situation. With that, when there is a large number of users are sharing the network, they could watch a video at a lower, but acceptable quality with no interruption.

Keywords – Adaptive stream, Transcode, Video quality, Frame Rate, Quantization



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To my parents and my wife for their love, support and encouragement



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List of Abbreviation

Abbreviation	Description
ARSM	Auto Rate Selection Mechanism
CIF	Common Intermediate Format
DCT	Discrete Cosine Transform
DI	Digital Item
DIA	Digital Item Adaptation
DRP	Data Reduction Percentage
DSCQS	Double Stimulus Continuous Quality Scale
DSIS	Double Stimulus Impairment Scale
DVQ	Digital Video Quality
FR	Frame Rate
HVS	Human Visual System
ITS	Institute of Telecommunication Science
ITU	International Telecommunication Union
JND	Just Noticeable Difference
LAN	Local Area Network
MAC	Media Access Control
MOS	Mean Opinion Square
MSE	Mean Square Error
NFD	Normalize Frame Difference
NMV	Normalize Motion Vector
NTIA	National Telecommunication and Information Administration
PEVQ	Perceptual Evaluation of Video Quality
PSNR	Peak Signal to Noise Ratio
QF	Quantization Factor
QoS	Quality of Service
ROI	Region Of Interest
SNR	Signal to Noise Ration
SS	Single Stimulus
SSE	Sum of Square Error



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SSIM	Structural Similarity Index
SVC	Scalable Video Coding
USHA	Universal Seamless Handoff Architecture
VLC	VideoLan Client
VQEG	Video Quality Experts Group
VQM	Video Quality Matrix
VQV	Video Quality Value
VTP	Video Transport Protocol



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