An Open Source Platform for Perceived Video Quality Evaluation

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An Open Source Platform for Perceived Video Quality Evaluation

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ABSTRACT

To ensure the best multimedia service quality in order to well address users' expectations, a new concept named Quality of Experience (QoE) has appeared. Two methods can be used to evaluate the user satisfaction, a subjective one and an objective one. The subjective approach is based on measured real data. The problem is there is no dataset large enough and can be used to well evaluate the QoE. In this, work we present our approach to build a data set for subjective evaluation based on a categorization approach and open source software.

Keywords

Quality of Experience (QoE); Controlled environment; Crowd-sourcing; Mean opinion score; Video; Framework.

1. INTRODUCTION

A number of works are already made on the QoE area. For example, Qualinet tries to quantify and propose efficient QoE estimation models. To build a more accurate model, the first need is to build a consistent database. User perception can be is influenced by a huge number of parameters (User Profile, Network parameters, Application parameters, ...). These factors are called QoE Influence Factors (QoE IFs) [2]. Nowadays, there is no available database large enough to includes all these QoE IFs and can be used to produce a better accurate estimation model. In this context, we present CLLF ($Controlled\ LiSSi - Lab\ Framework$) as an open source platform to help researchers to build a large QoE/QoE IFs database for video streaming services (Youtube).

2. RELATED WORK

The QoE is a hot topic given the huge number of works that we can find in the literature. In this section, we will present two video QoE frameworks.

- The first framework is proposed by Figuerola Salas et al.[3]. This system is used on a large scale with preliminary results of a validation study. In fact, this system is based on an HTML5 Web-based tool that collects ratings of videos encoded at different bitrates. This work focuses on High Definition ($720p$ (HD)) video service commonly employed for video services over the Internet. In this framework, authors used different quality of video which are encoded from 784 Kbps and 1 Mbps with $AVC/H.264$ codec, and used Mean Opinion Score method to record the user's perception.

- The second system is proposed by Hanhart et al.[4]. In this framework, the authors investigate two approaches to assess a multi-view video depth (MVD) content on $2D$ displays : at first by using a virtual view. Secondly, by using a free-viewpoint video, which corresponds to a smooth camera motion during a time freeze. In fact, they conducted the crowd-sourcing experiments using seven MVD sequences encoded at different bit rates and tested in both Lab-based evaluation and Crowd-based evaluation, In this work, the single-stimulus (SS) methodology was chosen as this methodology with the MOS method.

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3. FRAMEWORKS DESCRIPTION

3.1 Objectives

The main objective of our proposed platform [1] is to evaluate the video streaming services user perception in controlled environment which is achieved based on our previous proposal : 'QoE IFs hierarchical classification' made in [2]. Based on QoE IFs categories (Network, User profile, Application, Device and User feedback -Figure 1-), we will explain how to proceed to built a framework with a lot of QoE IFs in a controlled environment.

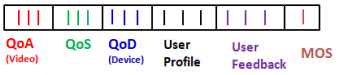

Figure 1: QoE IFs categories presentation.

In fact, the platform goals are summarized in following elements : (i) An application has been developed and installed to evaluate the video streaming services in controlled experimentation. (ii) A platforme has been carried out, to implement our architecture [2]. (iii) Several codecs were considered ($144p$ to $1080p$ (Full HD)) and several types of videos were used (e.g. sport, movie, documentary, news, music, etc.) in the experiments. In the following section, we will explain how we proceed to collect QoE IFs and to achieve these goals.

3.2 How to collect QoE IFs categories ?

To build the dataset, we made a testbed in totally a controlled environment. The Figure 2 presents the overall system components.

In this testbed, users give their MOS at the end of each video. To consider all the QoE IFs that can have an im-

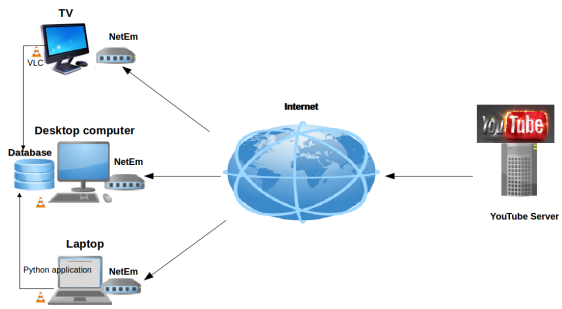

Figure 2: System components

pact on the user's perception, we use and combine a lot of softwares such as : VideoLAN Client player (VLC), Netem (Network Emulator), Python language and MySQL database server. Then, below we will describe how we proceed to collect QoE IFs for each categorie (Figure 1).

3.2.1 UF and UP

User Feedback (UF) is a score given by user to subjectively evaluate a service (MOS). It is represented by the bellow questions. The answer of each question is between 1 and 5 where

User Feedback
1)Starting video time : 1 : very long / 5 : very fast.
2)Lag between image and audio : 1 : very big lag/ 5 : No lag
3)Image quality : 1 : very bad/ 5 : very good.
4)Sound quality : 1 : very bad/ 5 : very good.
5)MOS : 1 : very bad/ 5 : very good.

1 indicates that the quality is not acceptable or very bad (time to start very long, lag between picture and audio very high, etc.) and 5 indicates that the quality is very good (no buffering time, no lag, etc.). In addition, the platform implements an ergonomic interface to ask users about their profiles (Age, Sex, Study level and Experience with the video service).

3.2.2 QoD

Another important aspect is the device quality (QoD). The proposed platform can collect devices information as the screen size and the screen resolution, CPU performance, available memory ....

3.2.3 QoS

To evaluate the impact of network QoS, the platform uses a network emulator called *NetEm*. A preliminary study was done to help us to fix the QoS variations value in order to get out the combinations of QoS that show the problems in the video stream as : video blocking, failure launch, lag between the sound and image,.... In this experimentation, we test 3 QoS factors (delay, loss and rate.) [5, 6] and 117 combinations summarized in the Table 1. These 3 QoS factors are varied in a random manner.

QoE IFs	Values
delay	0, 100, 200, 400 (ms)
rate	256, 512, 768, 1024, 1536 (kbits⧹s)
loss	0, 5, 10 (%)

Table 1: QoS variations on the controlled laboratory testbed.

3.2.4 QoA

To collect the category application factors for the CLLF framework, we worked on two sides. The first part involves the harvesting of traditional application parameters (e.g. bitrate, frame rate, etc). Our platform uses a modified version of VideoLAN Client player (VLC) to gather all these QoE IFs. The second part is the video content (e.g. video type, degree of motion and codec). To implement the second part, (i) we started with the selection of 8 video types based on existing work. (ii) Once the choice is done, we downloaded 24 videos with free rights (Youtube Creative Common) and with different resolutions (between 144p and 1080p), (iii) selected portion of 30 seconds with a specific motion degree, (iv) uploaded them an other time to Youtube and (v) call them with their URL from the player . Figure 3 presents screen shots of the used videos.

Figure 3: Screen shots of used videos.

4. CONCLUSION

Quality of Experience (QoE) appeared to improve network control taking into account the real user's perceived quality. To attempt this goal, we have studied the QoE factors that can impact the user's satisfaction in a mobile controlled environment in order to implement a platform that can be used to build consistent and large databases. This latter can help us to improve QoE estimation models. Our open source platform is still in development to continue to introduce new QoE IFs and enlarge dataset.

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