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User Quality of Experience (QoE) Satisfaction for Video Content Selection (VCS) Framework in Smartphone Devices

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Abstract:

Video streaming is widely available nowadays. Moreover, since the pandemic hit all across the globe, many people stayed home and used streaming services for news, education, and entertainment. However, when streaming in session, user Quality of Experience (QoE) is unsatisfied with the video content selection while streaming on smartphone devices. Users are often irritated by unpredictable video quality format displays on their smartphone devices. In this paper, we proposed a framework video selection scheme that targets to increase QoE user satisfaction. We used a video content selection algorithm to map the video selection that satisfies the user the most regarding streaming quality. Video Content Selection (VCS) are classified into video attributes groups. The level of VCS streaming will gradually decrease to consider the least video selection that users will not accept depending on video quality. To evaluate the satisfaction level, we used the Mean Opinion Score (MOS) to measure the adaptability of user acceptance towards video streaming quality. The final results show that the proposed algorithm shows that the user satisfies the video selection, by altering the video attributes.

Keywords: QoE, smartphone, video content selection.

Introduction:

With the Pandemic COVID-19 hits worldwide, video streaming services become more and more critical to the end-users using this service for online working, education, and entertainment. Also, the increased number of smartphone technologies pushes the explosive growth of the new operating system and software¹. With the vision of providing users with constant connectivity into reality, the smartphone market starts to get peoples attention. It also takes into account the bursting of video content available online today makes the demand for video content and streaming higher². In this context, the techniques and mechanisms in video streaming content selection will promise Quality of Experience (QoE) satisfaction to the user. It is a perplexing task and difficult to cater to the user's perspective. Although wide-ranging research has been developed in the previous study for QoE satisfaction in video streaming satisfaction^{3,4}, the research for QoE video streaming content

selection is still in the initial stages. The mainstream research of these research works suggests QoE management, comprising profiling, scheduling, resource allocation, etc.^{5,6,7} and⁸. In this paper, a selection algorithm is obtainable, improving the QoE satisfaction to end users with the proper selection of video streaming sessions. In terms of QoE satisfaction, some applications available in today's market sometimes do not meet user QoE satisfaction⁹. The quality of video streaming must satisfy the user in the first place. However, the selection must be catered for the classification of video attributes with experimentation of smartphone devices video quality. Other than the satisfaction of QoE, the algorithm will adapt the energy-efficient used in the smartphone devices in streaming sessions. Overall of this element will establish the VCS framework that provides user satisfaction. The rest of the paper is structured as following. Section II presents the proposed QoE VCS framework that

caters to users satisfaction and video content selection. In contrast, Section III provides the information about the proposed algorithm, and Section IV is the experimentation setup and testing environment. Finally, conclusions are drawn in Section V.

User QoE for Video Content Selection (VCS) Framework Propose

A VCS is a process of selecting, producing or modifying content to outfit or tailor to the users preferences, consumption style, computing and

communications environment, and usage context¹⁰. These studies display a brief about content adaptation that sorts the content selection notion. Nevertheless, to familiarize a video content with user preferences, the major issue requires technical constraints¹¹. Other approaches are the adaptation of video with particular scheduling or separate the video apart from a specific setting¹². All the video conditions need to meet the user satisfaction during a streaming session.

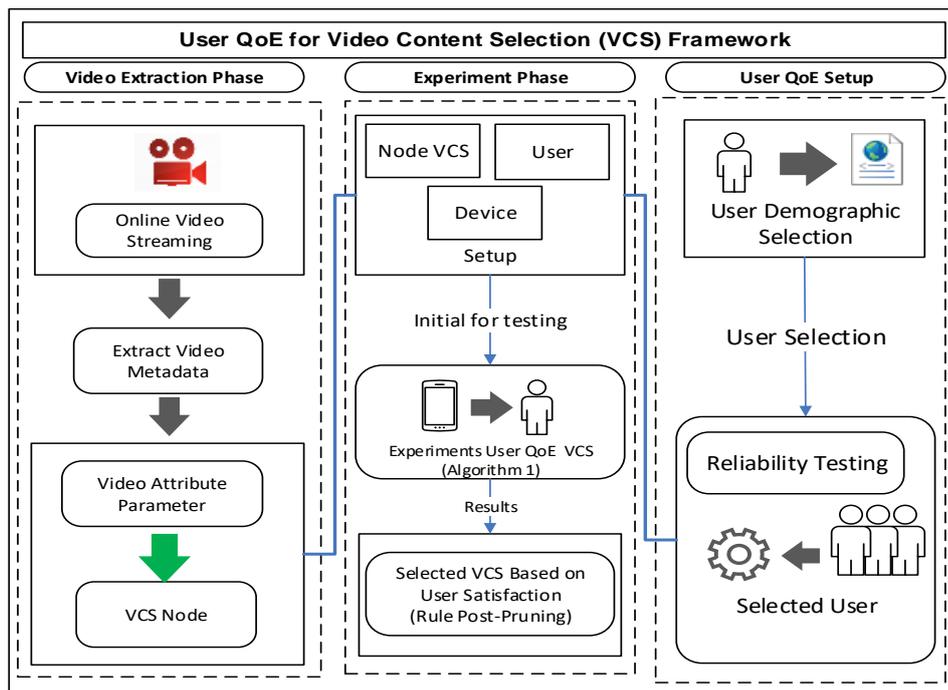


Figure 1. User QoE Video Content Selection (VCS) Framework Propose

Figure 1 shows the User QoE Video Content Selection (VCS) framework propose. This proposed framework has three phases; video extraction phase, experiment phase, and user QoE setup. The first phase is the video extraction phase involving capturing video metadata then converting the video for experiment setup to be categorized for video attribute parameter. Video attribute parameters will be explained later in the experiment. The video attribute formats can be classified as VCS; for example, the video format of 240p = $vc_{(1)}$ and medium video quality 360p can be replaced as $vc_{(2)}$. Let assume $VCS = \{vc_{(1)}, vc_{(2)}, vc_{(3)}, vc_{(4)} \dots vc_{(n)}\}$. Where $\{vc_{(1)} = 144p, vc_{(2)} = 240p, vc_{(3)} = 360p, vc_{(4)} = 480p, vc_{(5)} = 720p, vc_{(6)} = 1080p\}$. These elements or components of video streaming comprise a video resolution, video frame rate, audio bitrate, file size, and video encoding attributes¹³. Some of these video attribute metadata are fixed or permanent, and some of the video attribute variables can be

modified depending on the video compression capability¹⁴.

The next phase is the user QoE setup, and within this phase, the selection of the user demographic is made by random sampling in a large group of respondents for the subjective assessment. According to¹⁵ and¹⁶, the output from any phase is to design a straightforward strategy for content adaptation and selection output for mobile devices. The subjective evaluation for QoE is accomplished by presenting specific stimulations to the human subject to acquire results or user feedback on VCS quality assessment¹⁷. User selection will be based on several characteristics, where the user must have any experience or knowledge using streaming on a smartphone device. In the user selection, respondents will participate in the survey. This stage is to collect initial information about respondents involved in the investigation. For this purpose, the demographic of the respondent is

random. However, the various testing sample is divided into groups (gender, age). Then reliability testing will be done in order to obtain reliability data sampling. Then the next phase is the experiment stage, and this stage combines the setup of the VCS node, user and the streaming experiment setup. This setup will be discussed further in the experiment scenario setup.

Propose Algorithm

Streaming video using a smartphone application requires certain stages: smartphone devices, video applications, users, and network capability. One of the most crucial parts between these stages is the algorithm. In this section, while using a streaming element, the implementation of a suitable algorithm is essential as well¹⁸. Before the implementation of the algorithm, first, we need to discuss the equation VCS modeling used. The VCS equation is explained as following:

$$VCS = \left[\sum_{j=\delta_{c+1}}^{\delta_{c(n)}} (S\delta c) + vc(a1) + vc(a2) + \dots + vc(a(n)) \right]$$

where, VCS is the node of video content selection, $\delta_{c(n)}$ is the smartphone device capability such as the screen size, audio capability, network state. $S\delta c = \{ \chi\delta_{c(1)} + \chi\delta_{c(2)} + \chi\delta_{c(3)} \dots \chi\delta_{c(n)} \}$, where $S\delta c$ is the devices capability. $\chi\delta c$ is the number of elements in devices capability that affects user acceptance towards video streaming satisfaction. For example, VCS node resolution size is in the best resolution available in the streaming session. However, it is still useless if the low smartphone device capability cannot cope with that features. Device capability will be discussed further in the experiment setup. For $vc(a1) + vc(a2) + \dots + vc(a(n))$ is defined as the number of video content attributes that affects user satisfaction, such as video content brightness $vc(a1)$, video content resolution $vc(a2)$, video content frame rate $vc(a3)$, audio bitrate $vc(a4)$. The VCS equation will be implemented in Algorithm 1 for experimentation for user satisfaction based on video content selection.

Algorithm 1: QoE VCS Algorithm for Video Streaming

```

1. INPUT: VCS node,  $\chi\delta c$ , user_QoE; //input parameter
2. BEGIN
3. Initialization ( $\chi$ ) //apps running
4.  $K \leftarrow 0$  // video streaming
   session starting
5. {
6.   Enable
7.   IF (VCS node < Min (user_QoE) THEN //if the video play low
   quality
8.     {  $vc(a(n))$  min ++}; // then increase VCS
   attribute
9.   ELSE IF (VCS node =< Med && Max (user_QoE)) THEN //if the video play the
   maximum quality
10.    {  $vc(a(n))$  max --}; // then decrease VCS
   attribute
11.  EISE IF ( $\sum_{j=\delta_{c+1}}^{\delta_{c(n)}} (\chi\delta c) == Min \&\& Med \&\& Max (user_QoE)$ ) THEN //if the device attribute match the
   node attribute
12.    {  $\sum vcs\ node < \chi\delta c\_en$  }; //then total vcs attribute will
   lower the energy
13.  }
9. RETURN 0;
10. END

```

Algorithm 1 shows the QoE VCS algorithm for video streaming sessions. In line 1, the input begin with the selected VCS node $\{vc_{(1)} = 144p, vc_{(2)} = 240p, vc_{(3)} = 360p, vc_{(4)} = 480p, vc_{(5)} = 720p, vc_{(6)} = 1080p\}$ and the setup of $\chi\delta c$ is depending on device capability on experiment. This algorithm will run a routine check of device capability parameter; CPU usage, memory consumption. $user_QoE$ will be the input from users during testing.

Line 3 executed the running application for the video streaming session. This application is using the Android OS platform for algorithm implementation. This is because it is a suitable way since the Android platform is open source, and it can be manipulated, altered, and modified easily in terms of an algorithm for experimentation^{19, 20, 21}. The following step process will continue the initialization of video streaming $K \leftarrow 0$ and continue

with enabling the video attributes setting. In line 7, ($VCS_{node} < Min (user_QoE)$) is defined as the constraint to the user if they want to increase the VCS attribute such as brightness. In algorithm 1, the setup is to play low quality first for the user (VCS_{node}). In line 8, the user can increase the brightness parameter or change the (VCS_{node}) to other parameters such as resolution until their satisfaction during the streaming session.

In line 9, ($VCS_{node} = < Med \ \&\& \ Max (user_QoE)$) is defined if the streaming playback on maximum attribute then in line 10, the user can lower down the VCS at their satisfaction level. In Algorithm 1, line 11 ($\sum_{j=\delta_{c+1}}^{\delta_{c(n)}} (\chi\delta c) == Min \ \&\& \ Med \ \&\& \ Max (user_QoE)$) states that overall devices content capability $\chi\delta c$ meet the user satisfaction level, then

in line 12, the alteration of smartphone devices energy is triggered for lower energy usage ($\chi\delta c_{en}$) for all the selected VCS ($\sum vcs_{node}$). After the implementation of Algorithm 1 in the experimentation, the data from testing require analysis further. Both data user QoE and VCS node will be analyzed further in the result section.

Experiment Setup and Results

A. Instruments

The instruments setup begins with the selection of the devices ($S\delta c$) for experiments. Since many devices are available in the markets nowadays, we classify the devices based on the smartphone devices characteristic.

Table 1. Smartphone Devices Capability ($S\delta c$) Classification for VCS Experiment.

Smartphones Device	Operating System (OS)	CPU Capability	Screen Resolution	Battery Capacity
Low Capability Device ($LS\delta c$)	Android 3 <	Single-Core =< Dual-core	480 x 800 <	1000 to 1900
Samsung Galaxy V Plus	Android 3	Dual-core 1.2 GHz	480 x 800 px	1500 mAh
Samsung Galaxy S Advance	Android 2.3	Dual-core 1.0 GHz	480 x 800 px	1500 mAh
Samsung Galaxy J1	Android 4.4	Dual-core 1.2 GHz	480 x 800 px	1850 mAh
Asus Zenfone 4	Android 4.3	Dual-core 1.2 GHz	480 x 800 px	1200 mAh
Oppo Joy Plus	Android 4.4	Dual-core 1.3 GHz	480 x 800 px	1700 mAh
Sony Xperia E1	Android 4.3	Dual-core 1.2 GHz	480 x 800 px	1700 mAh
Lenovo A319	Android 4.4	Dual-core 1.3 GHz	480 x 800 px	1500 mAh
Sony Ericsson Xperia Arc S	Android 2.3	1.4 GHz Scorpion	480 x 854 px	1500 mAh
HTC Google Nexus One	Android 2.1	1.0 GHz Scorpion	480 x 800 px	1400 mAh
Samsung Galaxy SII	Android 2.3	Dual-core 1.2 GHz	480 x 800 px	1650 mAh
Medium Capability Device ($MS\delta c$)	Android 4 < Android 6	Dual-core < Quad-core	480 x 800 < 720 x 1280	2000 to 2600
Sony Xperia ZR	Android 5	Quad-core 1.5 GHz	720 x 1280 px	2300 mAh
Lenovo A6000	Android 4.4	Quad-core 1.2 GHz	720 x 1280 px	2300 mAh
Huawei Y6	Android 5.1	Quad-core 1.1 GHz	720 x 1280 px	2300 mAh
Oppo Mirror 5	Android 5.1	Quad-core 1.2 GHz	540 x 960 px	2420 mAh
Asus Zenfone 2 Laser	Android 5.0	Quad-core 1.2 GHz	720 x 1280 px	2400 mAh
Xiaomi Redmi 2	Android 4.4	Quad-core 1.2 GHz	720 x 1280 px	2200 mAh
Samsung Galaxy A5	Android 4.4	Quad-core 1.2 GHz	720 x 1280 px	2300 mAh
Huawei Y5II	Android 5.1	Quad-core 1.3 GHz	720 x 1280 px	2200 mAh
Motorola Moto G	Android 5.1	Quad-core 1.4 GHz	720 x 1280 px	2470 mAh
Oppo A37	Android 5.1	Quad-core 1.2 GHz	720 x 1280 px	2630 mAh
High Capability Device ($HS\delta c$)	> Android 7	> Quad-core	> 1080 x 1920	> 2700
HTC One Max	Android 7.0	Quad-core 1.7 GHz	1080 x 1920 px	3300 mAh
Xiaomi Mi 5	Android 8.0	Quad-core (2x1.8) GHz	1080 x 1920 px	3000 mAh
Samsung Galaxy A5	Android 9.0	Octa-core 1.6 GHz	1080 x 1920 px	2900 mAh
Sony Xperia Z5	Android 7.0	Octa-core 4.0 GHz	1080 x 1920 px	2900 mAh
Sony Xperia X	Android 8.0	Quad-core 2x2.15 GHz Kryo	1080 x 1920 px	2700 mAh
Samsung Galaxy Note 3	Android 7.0	Octa-core 4x1.9 GHz	1080 x 1920 px	3200 mAh
Sony Xperia Z3	Android 7.0	Quad-core 2.5 GHz	1080 x 1920 px	3100 mAh
Oppo R11	Android 7.0	Octa-core (4x2.2) GHz Kryo	1080 x 1920 px	4000 mAh
Samsung Galaxy Note 4	Android 8.0	Octa-core (4x1.3) GHz	1440 x 2560 px	3220 mAh
Xiaomi Mi A1	Android 9.0	Octa-core 2.0 GHz	1080 x 1920 px	3060 mAh

px:pixel; mAh:milliamp/hour; GHz:Gigahertz;

Table 2 shows the classification of the smartphone devices capability ($S\delta c$) for experiments. The selection of devices depending on

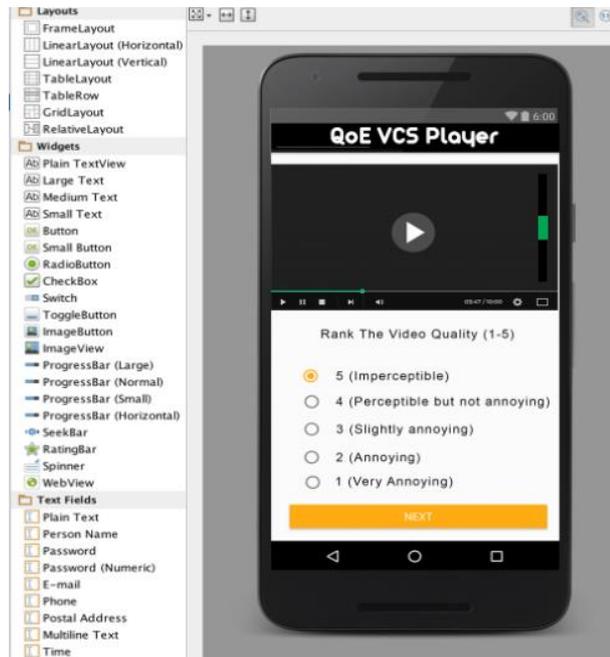


Figure 2. User QoE VCS Apps Interface

Three classes of categories; Low Capability Device ($LS\delta c$), Medium Capability Device ($MS\delta c$) and High Capability Device ($HS\delta c$). Every device will be used for user QoE and VCS node experiments. The next process is the design and development phase. The development of video streaming apps is using the Android Studio development application. Figure 2 depicts the user QoE VCS Apps interface for the experiment purpose. Android Studio has been selected for this apps development platform because of many support updates of the Software Development Kit (SDK). The SDK relies on a current smartphone device operating system update to an old version of SDK. NetBeans, JQuery, and other platforms lack SDK features and are not supported for development testing, making Android Studio more compatible with mobile application development. The streaming session will be executed in the app interface with Algorithm 1 for the VCS node. The users will stream the video to change the attribute of the streaming session depending on their satisfaction. The VCS node attribute, such as the brightness, will be auto-set or manipulate by the users. In the apps, the control ability will be on the right side of the smartphone screen for brightness and resolution and will be at the bottom with the satisfaction level from 1 to 5 that can be chosen. 1 to 5 user's assessment is that the MOS approaches will be enabled for the user QoE assessment.

Additionally, this method deliberates factors

the OS, CPU capability, screen sizing (resolution) and battery capacity. However, every classification meets the minimum requirement of the experiments. that directly affect the user opinion through the multimedia experience, (e.g. received audiovisual, conversational and video quality). There is a wide-ranging variety of direct metrics, the most relevant metrics in the area of video quality assessment²². The QoE VCS Apps have control over attributes presented to them, and it will determine the possible result. The first possible result is the network environment will be dynamic between wireless and LTE 4G switching. This allows the stability of the connection without any interruption during the streaming session. A second possible result would be during the streaming session if the user did not alter any attribute control. The QoE VCS apps will state lower energy usage by giving the user view in the medium-low VCS node for saving energy purposes. However, in this state, energy-efficient areas will not be covered entirely; rather, this paper aims to satisfy the user based on video streaming quality. After the instruments element from device capability selection and the user QoE VCS Apps is finished, the next step is to set up the experiment for subjective method from respondents.

B. Setup

The setup of the experiment begins with the simulated environment. The first experiment foundation is the location for the testing is in the laboratory area without any disruption. The setup starts with the selected network cloud server (Wowza Server & Azure Server) for the streaming session. The purpose of this selection is because of the stability, and there is no difficult setup needed. Moreover, it will cost less than actually owning a server, and developers need to set up the experiments' configuration. After that, all the VCS node sampling will be inserted into this server for streaming experiments purposes. The sampling rate of data transferring for transcoding will be cloaked in 3 Mbps back and forth through the selected network. 3Mbps connection is the average of respondents streaming usage¹⁹. The duration of the video sample is 10 minutes. Next, QoE VCS experiments will be conducted to obtain the user demographic results towards the VCS node. Then the analysis of VCS node results. Since there are too much data to analyze, we used the pruning method to gain the results of the QoE VCS node. After that, we executed three different scenarios where 30 respondents expected videos from a setup server. There is no adaptation or selection to the video in the first scenario, depending on node and video quality. Second scenario, high quality video node

to user with different selection of video node and the last scenario we run based on middle quality with smooth video transcoding based on

the VCS algorithm. Figure 3, illustrates the process of experiment.

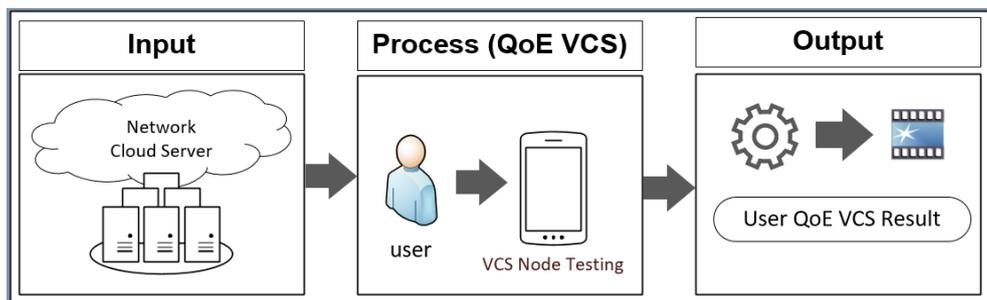


Figure 3. Setup process for experiment.

Next the WiFi interface with the stable connection needs to be established for the experiments. Then the process stage the selected respondent will give devices for testing. In this phase, several early testing has been undertaken to find VCS node testing selection on a particular device. Ten respondents will be chosen for the reliability testing. The QoE VCS apps capture the respondents result while other apps will capture the energy usage and

smartphone devices resources data such as CPU utilization and memory consumption. *PowerTutor* smartphone Android application .apk is used for gauging resource monitor such as energy usage. *PowerTutor* is a small application tool for Android device and its functionality to collect profiling data from smartphone devices power status in the real-time state. The respondents demographic can be seen in the Table 2.

Table 2. Respondent Demographics for QoE VCS Experiments

Respondents	User_VCS Brightness	User_VCS Resolution	User_VCS Frame Rate
<i>Number of Respondents</i>	<i>Low Capability Device (LSδ_c)</i>	<i>Medium Capability Device (MSδ_c)</i>	<i>High Capability Device (HSδ_c)</i>
Male = 30	$\sum \mu = 2.8$	$\sum \mu = 3.6$	$\sum \mu = 4.1$
Female = 30	$\sum \mu = 2.3$	$\sum \mu = 3.2$	$\sum \mu = 3.9$
<i>Age of Respondents</i>			
Male	$\mu = 25.8$	$\mu = 26$	$\mu = 27.5$
Female	$\mu = 26.2$	$\mu = 25.5$	$\mu = 26.3$

$\sum \mu$:total number of average; μ :average/mean;

In the Table 2, the number of demographic respondent for male is 30 respondents and 30 female respondents. For the brightness VCS node testing the $\sum \mu$ result for $LS\delta_c$ is 2.8 male MOS score. The female respondents $\sum \mu$ result for $LS\delta_c$ is 2.3 MOS score. For resolution male experiments, the $\sum \mu$ result $MS\delta_c$ is 3.6 while female $\sum \mu$ result for $MS\delta_c$ is 3.2. For frame rate male experiment, the $\sum \mu$ result $HS\delta_c$ is 4.1 and female the $\sum \mu$ result $HS\delta_c$ is 3.9. The respondents age demographic average from 18 years old to 34 years old. The data in Table 2 show the average of the result based on respondents demographic experiments. After data has been obtained, the next phase is to analyze the data VCS Node result.

VCS Node Analysis

The total number of VCS node after the experiment that is conducted is fairly big and the data from video attribute size will increase gradually, and

some of the data is unusable and incorrectly classified. Unused data, data error, or misclassifying data will lead to overfitting. Overfitting situation occurs either from unseen analyze data result or over-analyze data²⁰. Besides, it happens when the data result continues to scatter trends and more likely set final dissemination data error result of a dataset. The purpose of pruning is to discard or remove parts of classification nodes that are truly not met with the selection data. The variation of pruning is split into two categories; pre-pruning and post-pruning²¹. Post-pruning method enables pruning nodes to after analysis finish.

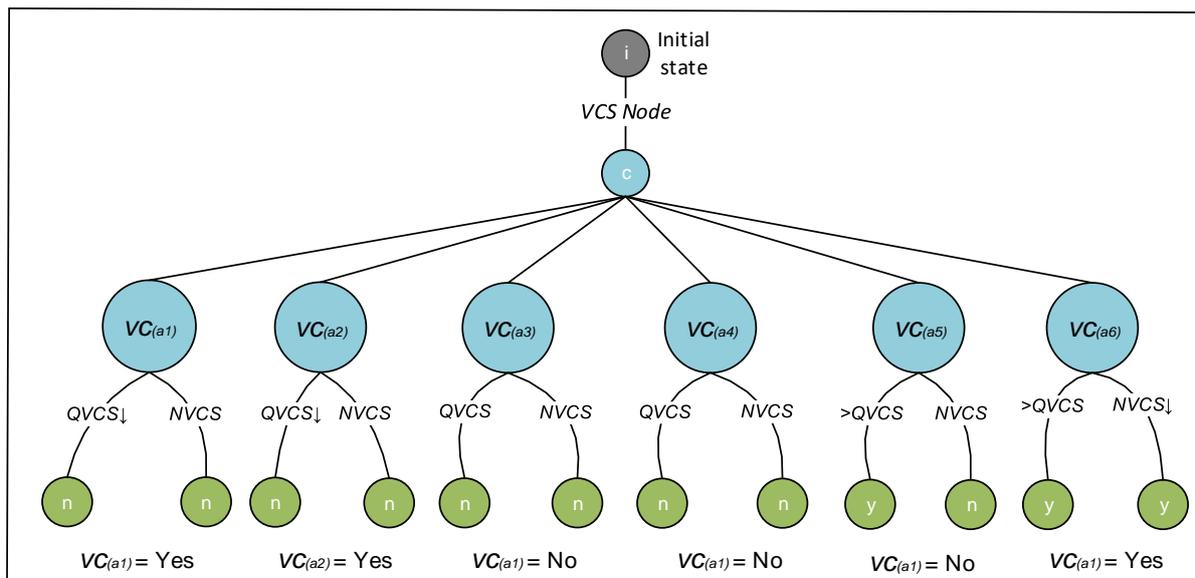


Figure 4. Rule post-pruning QoE VCS node experiments result.

Since the pruning of the node classifies the data for the finished result, a comparison between two methods, reduced-error pruning and rule-post pruning will be compared appropriately. Early testing for defining energy usage in the video attribute is not ideal in terms of reliability and timing²².

Figure 4 shows the rule post-pruning QoE VCS node experiments result. Instead of using repeated analyses of true and false statements, rule post-pruning used other approaches to change the tree statement into rules. $VCS\ node = \{vc_{(a1)} = 144p, vc_{(a2)} = 240p, vc_{(a3)} = 360p, vc_{(a4)} = 480p, vc_{(a5)} = 720p, vc_{(a6)} = 1080p\}$. From the analysis of rule post-pruning method, $vc_{(a1)}$, $vc_{(a2)}$ and $vc_{(a6)}$ have been pruning—the rules for pruning to executed base on two factors. First is the quality from the VCS node attribute during streaming. For example, why $vc_{(a1)}$ is prune because of the low-quality level video attribute ($QVCS$) streaming provided to the respondents. However, in term of streaming network capability ($NVCS$) the VCS node satisfies user perspective. The second factor is network quality ($NVCS$). Since the VCS node increases gradually from $vc_{(a1)}$ to $vc_{(a6)}$, the $QVCS$ becomes better for user points of view. However the $NVCS$ become more fluctuated since the streaming payload requires a lot of network capability. The rest of $vc_{(a3)}$, $vc_{(a4)}$ and $vc_{(a6)}$ is acceptable for the user QoE. These respondents QoE VCS will be analyzed for the final results based on the adapted scenario.

C. Result based on Scenario

There is no adaptation or selection to the video depending on node and video quality in the

first scenario for the execution experimentation. It means that a user cannot alter or modify the VCS node during the streaming session, and the playback plays in the low-quality mode and standard quality. In this scenario, the user acceptance is based on the Mean Opinion Score (MOS) embedded in the apps. The acceptable level will be set on three in the experiments. The second scenario where the adaptation of normal transcoding of video streaming session with the standard playback and user can alter and modify VCS node attribute to achieve their streaming satisfaction.

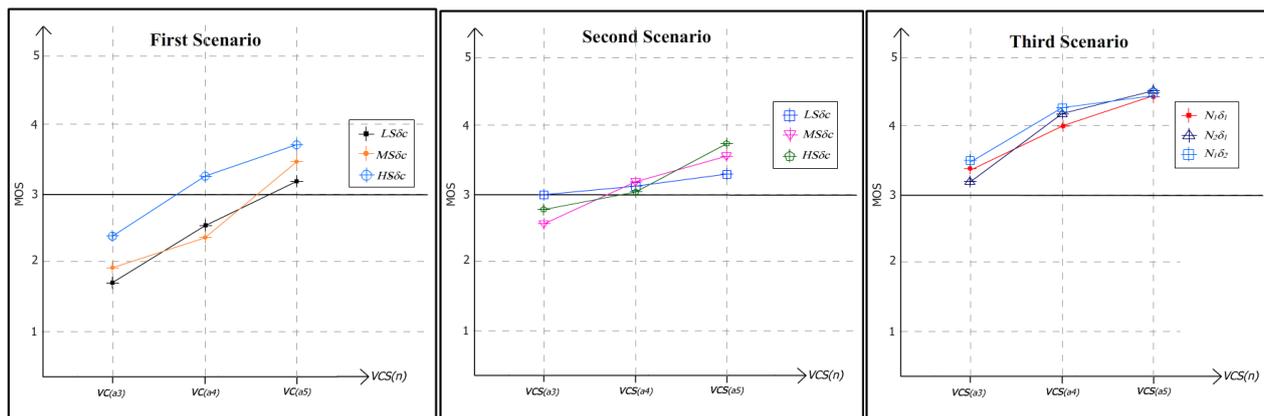


Figure 5. QoE VCS results based on the scenario.

The third scenario is that the respondents have full control towards VCS node streaming satisfaction. Figure 5 shows the three scenario results of respondents QoE VCS nodes. In the first scenario, user acceptance is relatively low, with $LS\delta c$ and $MS\delta c$ MOS result below the acceptable MOS line. From 30 male and 30 respondents, both agree only 30% accept the first scenario for their daily streaming session. The second scenario is where respondents have little control over the VCS node where $LS\delta c$, $MS\delta c$ and $LS\delta c$ achieve the MOS acceptable line. 56 % of Male respondents agree with this scenario, while 48% of females agreed. In the third scenario, the respondents have control over the streaming session and modified VCS node settings. The results for $LS\delta c$, $MS\delta c$ and $LS\delta c$ over the MOS are acceptable line. This scenario outcome with male 78% agreed and female 84% agreed.

Scenario Discussion

The acceptability from the user is relatively low for the first scenario because of the poor video streaming quality in terms of the VCS node attribute. Moreover, the respondents have no control over the alteration of VCS. Video selection for a node is jagged and grain display, and it is difficult for a user to accept the satisfaction for this scenario. The second scenario represents the medium capability of video streaming for the user experience. Since the setup is standard with simple alteration, respondents that satisfy this scenario can be the baseline for user streaming acceptance. Media content developers or streaming providers can use this baseline as a suggested streaming option to the end-user. In the third scenario, we can conclude that all the respondents accepted high-quality streaming sessions by looking at the results. However, the third scenario has some drawbacks, especially for respondents concerned about energy consumption and data usage for average users.

Conclusion:

In this paper, a unique structure for user QoE VCS framework in video streaming quality has been presented to satisfy user QoE. Using node pruning in Rule-post pruning method for content selection in video streaming, the video content selection by quality can be achieved in terms of perceived video quality that satisfies user selection. Selecting video quality depending on user QoE take both process adaptation of network stability and user QoE towards video selection. Simulation results on scenarios showed that the proposed algorithm for both QoE policies succeeds in a variation of video selection.

We used the selection approaches that select the best quality of video streaming based on user QoE in our scenarios. The node parameter determines the quality shown to the user and will be a prune if it was unused or not selected. This will improve the accuracy of quality exactly by including user parameters and node quality. In future work, we tend to have the energy perspective into the framework and evaluate depending on user QoE as well as energy in smartphone devices. Also, we want to increase the parameter by adding more devices for the testing and classifying the devices based on low to a high specification.

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Authors' declaration:

- Conflicts of Interest: None.
- We hereby confirm that all the Figures and Tables in the manuscript are mine ours. Besides, the Figures and images, which are not mine ours, have been given the permission for re-publication attached with the manuscript.

- The author has signed an animal welfare statement.
- Ethical Clearance: The project was approved by the local ethical committee in Universiti Tun Hussein Onn Malaysia.

Authors' contributions:

Muhamad Hanif Jofri. Ida Aryanie Bahrudin. and Noor Zuraidin Mohd Safar. Juliana Mohamed. conceived of the presented idea. Muhamad Hanif Jofri. Ida Aryanie Bahrudin. developed the theory and performed the computations. Noor Zuraidin Mohd Safar. Juliana Mohamed. Abdul Halim Omar. verified the analytical methods. Ida Aryanie Bahrudin. Noor Zuraidin Mohd Safar. encouraged Muhamad Hanif Jofri. to investigate Video Content Selction (VCS) aspect and supervised the findings of this work. All authors discussed the results and contributed to the final manuscript.

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جودة المستخدم عن اختبار (QoE) الرضا لانتقاء اطار عمل محتوى الفيديو (VCS) في اجهزة الهواتف الذكية

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الخلاصة:

يعد جدول الفيديو الاكثر انتشارا اليوم. اضافة الى ذلك، وبسبب انتشار الوباء عالميا، كثير من الناس التزموا المنزل واعتمدوا على الخدمات الجدولية للاخبار والتعليم والتسلية. على اية حال، مستعمل تجربة (QoE) غير مقتنع باختيار محتوى الفيديو بينما يتدفق في الاجهزة الذكية. ينزعج المستعملون بمسح نوعية الفيديو الغير متوقعة التي تحدث في اجهزتهم الذكية. في هذا البحث، نقترح مخطط لاختيار الفيديو الهيكلي الذي يهدف الى زيادة فناعة مستعمل (QoE). تم استعمال نظام الحلول الحسابية لاختيار محتوى الفيديو لانشاء خريطة لاختيار الفيديو التي ترضي مستعمل نوعية الجدول الاكثر اعتبارا. تصنف اختيار محتوى الفيديو الى مجاميع صفات الفيديو. سينخفض مستوى جدول (VCS) بالتدريج ليعتبر اقل اختيار الفيديو الذي لا يقبلها المستعمل اعتمادا على نوعية الفيديو. لتقييم مستوى الفناعة ، استعملنا درجة الرأي الوضع (MOS) لقياس تكيف قبول المستعمل اتجاه نوعية جدول الفيديو. أظهرت النتائج الاخيرة بأن نظام الحلول الحسابية المقترح توضح بأن المستعمل يقتنع باختيار الفيديو بواسطة تغيير صفات الفيديو.

الكلمات المفتاحية : (QoE) ، جهاز ذكي، اختيار محتوى الفيديو.