WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

POWER MODELLING FOR VIDEO STREAMING APPLICATIONS ON MOBILE DEVICE

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ABSTRACT

It derives an accurate power model for video streaming which they condense to the essential components contributing the most to the overall power consumption. As a use case, it chooses mobile devices on the receiver side performing video streaming in broadcasting or end-to-end scenarios.

n modeling, it considers the complete video streaming tool chain, which mainly consists of data acquisition, video processing, display, and audio handling. It compose an overall power model with the help of models from the literature and propose a dedicated feature selection approach to reveal the most important factors related to power consumption.

1. INTRODUCTION

1.1 General Background:

Video streaming in end-to-end or broadcasting scenarios has become the main contributor to global Internet traffic. Forecasts indicate that the share of video data will even increase to more than three fourths in 2022. Worldwide, all this data is received by millions of portable devices, such as smartphones or tablet personal computers (PCs), which must process the data to be able to display video and play audio for high quality user experiences.

A recent study revealed that 1% of the global greenhouse gas emissions is caused by video communications, which shows that modern video systems contribute significantly to climate change. As a consequence, research on energy efficient video communication solutions is of vital importance

A high-level analysis of the power consumption of a modern smartphone revealed that during local video playback with hardware decoding, more than 1 W of power is constantly needed. Consequently, a fully charged battery is drained after a maximum of 15 hours For virtual reality applications, we have shown that the reduction of the resolution helps in saving power. Furthermore, it was shown that reducing the resolution of a streamed video instead of increasing the quantization is beneficial both in terms of subjective quality and power consumption.

1.2 Motivation:

The objective of the study is to gain a better understanding of streamer motivations and how they construct their identities through video streaming on the platform, Twitch.tv. While a number of studies have been done on the spectator end of video streaming, research concerning the streamers' motivations is scarce. As the industry of video streaming and eSports continues to grow exponentially, it is crucial to gain insights on streamers, both amateur and professional, who keep the industry running. Despite its

current success on the internet, little has been done to study and analyze streamers' motivations for creating and broadcasting their content. Prior studies have examined reasons for why spectators watch and participate in streams.

1.3 Aim:

As a use case, we choose mobile devices on the receiver side performing video streaming in broadcasting or end-to-end scenarios. An accurate power model for video streaming which we condense to the essential components contributing the most to the overall power consumption.

1.4 Goals and Objectives:

Competition among online platforms has forced them to find ways to differentiate themselves. One key way they have done this is by offering exclusive content, often self-produced and created specifically for a market. This approach to streaming competition can have disadvantages for consumers and for the industry as a whole. Once content is made available online, the corresponding piracy searches decrease. Competition or legal

availability across multiple platforms effectively deters online piracy and more exclusivity does not necessarily translate into higher average investment in content, as investment decisions are also dependent on the level and type of competition in online markets.

1.5 Scope and Need:

The video streaming industry is one of the most important industries in the world right now with a huge amount of attention being paid to live media and for good reason! Live video is often the most engaging form of content on today's internet. What does the future of the video streaming industry hold for us? Well, the answer is not really that simple. We're probably in the golden age of video streaming with a number of services available across the world. Other factors that include the rise of video streaming industry is the large mobile penetration in developing countries and cheap data prices.

The business of streaming video content has been expanding rapidly with an increasing number of companies, both large and small, joining the competition. With 27% of Americans now streaming TV shows and movies, It is of little surprise that cable giants are facing the pressure of cord cutting as consumers realize the benefits of opting for video streaming over cable subscriptions. Netflix, Hulu, and now Amazon, offer subscription models while others like Apple, Walmart, and Best Buy run on a pay per view basis. The future of the video streaming business looks bright and offers many opportunities for players in this industry.

2. LITERATURE REVIEW

2.1 Background History

- It was first done by Starlight Networks for video streaming . In recent years, video streaming in end-to-end or broadcasting scenarios has become the main contributor to global Internet traffic "Streaming" was applied in the early 1990s as a better description for video on demand and later live video on IP networks.
- The original invention by Paul Nipkow in 1884.
- In 1991, Windows releases Media Player; both read and play audio and video files.

During the late 1990s and early 2000s, users had increased access to computer networks, especially the Internet. During the early 2000s, users had access to increased network bandwidth, especially in the LAST MILE. These technological improvements facilitated the streaming of audio and video content to computer users in their homes and workplaces.

2.2 Related Work

In video streaming one can find a wide variety of works that consider the power consumption of single parts of this pipeline. For the source network, Zou et al. compared the power efficiency of a Wi-Fi connection to a long-term evolution (LTE) connection when using H.264/AVC coded videos. A very detailed analysis, which focused solely on Wi-Fi power consumption including interference handling, was performed by Sun et al. For audio decoding using MP3, Samanic et al. constructed a model for software processing and suggested power saving algorithms based on code optimizations. Furthermore, Dolezal and Beaver considered audio decoding and output via a speaker.

For video, many researchers focus on the video decoding process. For software decoders, high-level models using few bit stream properties as well as advanced models using up to 90 bit stream features for accurate energy estimations were proposed in. Furthermore, the impact of coding standards, such as MPEG-2, H.263, and H.264/AVC, on power consumption was analyzed in detail in. For hardware decoders, models were developed for power estimation in and for energy estimation in.

3. METHODOLOGY

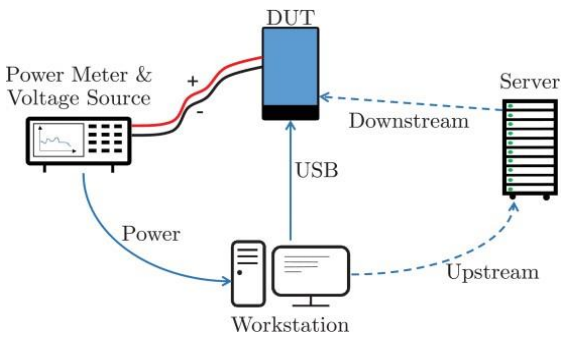


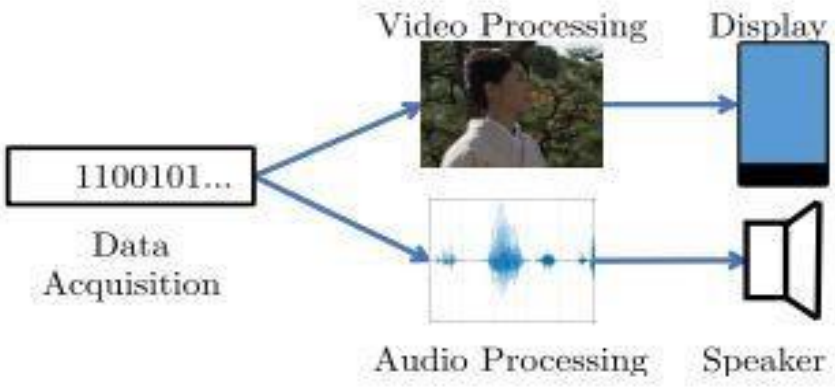
Fig. Measurement setup with DUT, power meter, streaming server, and workstation for measurement automation

A remote broadcasting server is used to simulate real-time video streaming (right). Depending on the use case, hardwired Ethernet or wireless connections such as Wi-Fi or LTE are tested. Finally, the workstation performs automatic power measurements using universal serial bus (USB) control for the power meter and for the DUT. During power measurements, the USB connection to the DUT is disabled. A hardwired Ethernet network connection is used for streaming the test sequences from the workstation to the broadcasting server. The power meter provides an integrated power supply. The supply voltage can be set manually, depending on the demands of the DUT. The power values are sampled at 5 kHz and are transmitted via USB to the workstation. The server is an open real-time messaging protocol (RTMP) broadcasting server. Using MPEG, Flash video (FLV) containers can be uploaded to this server, which broadcasts this data to the Internet. The stream can then be requested and received by any online device worldwide using wired or wireless connections.

WHAT MAKES VIDEO STREAMING HAPPEN?

When a video is streamed to be played on a user's device, the actual file is not downloaded onto the device. Instead the video data packets are transmitted a few at a time, so that the video loads in parts instead of in one go. When a video is downloaded on to a user's device, the entire file is copied.

4. IMPLEMENTATION



Video streaming process

The streaming process starts with the acquisition of audio and video data, which can be read from the local memory or received through a network. After demoing, the video data is processed (top branch), which means that it is decoded, rendered, and displayed. On the bottom branch, the audio data is decoded and the reconstructed raw audio signal is played using a speaker.

5. APPLICATIONS

- Storage and consumption of power
- Lower installation cost.
- High reliability of power.
- Once completely downloaded, a streaming application will function without a network.

6. ADVANTAGES AND DISADVANTAGES

6.1 Advantages

- Video can be viewed in real time.
- Reduction in client storage requirement
- Reduce set up time.
- Transmission signals over low bandwidth facilities.

6.2 Disadvantage

- High bandwidth is required.
- Quality of the media can be affected by the quality of the network.
- File is not available offline.
- High cost for streaming servers.

7. CONCLUSION AND FUTURE SCOPE

The power consumption of video streaming applications on portable devices. It is the first work that considers the power behavior of the complete device. A model summarizing various high level models of the most important functional components was constructed. Video streaming technology lets you watch, create and share videos in real time, a bit like live TV. All you need to be able to live stream is an internet enabled device, like a smart phone or tablet, and a platform (such as a website or app) to live stream from.

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