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Greenify - Energy as a Service.

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Abstract: *As the emotional development in the quantity of cell phones as of late, the test of restricted vitality limit of these gadgets has not been settled palatably. Be that as it may, in the period of distributed computing, the restriction on vitality limit can be dialed down a productive path by offloading overwhelming errands to the cloud. It is imperative for cell phone and distributed computing designers to have bits of knowledge into the vitality expense of cell phone applications before actualizing the offloading procedures. We will attempt to assess the vitality expense of interactive media applications on cell phones that are associated with Multimedia Cloud Computing (MCC). In this we will attempt to spare vitality expense of transferring and downloading a video record to and from MCC with the vitality expenses of encoding the same video document on a cell phone. The above system will performed by utilizing HTTP and FTP Internet conventions with 3G and Wi-Fi system interfaces.*

Key Words: Multimedia Cloud Computing, Battery, Offloading.

1. Introduction

As the sensational development in the quantity of cell phones as of late, the test of constrained vitality limit of these gadgets has not been settled acceptably. Be that as it may, in the period of distributed computing, the constraint on vitality limit can be dialed down a productive route by offloading overwhelming undertakings to the cloud. Mobile shopper hardware gadgets, particularly telephones, are controlled from batteries which are restricted in size and along these lines limit. This suggests overseeing vitality well is principal in such gadgets. Cell phones infer the vitality required for their operation from batteries. On account of numerous purchaser gadgets, particularly cellular telephones, battery limit is extremely confined because of requirements on size and weight of the gadget. This suggests vitality proficiency of these gadgets is imperative to their ease of use. Consequently, ideal administration of force utilization of these gadgets is basic. Cutting edge top of the line cell telephones consolidate the usefulness of a pocket-sized specialized gadget with PC-like capacities, bringing about what are for the most part alluded to as cell phones. These coordinate such differing usefulness as voice correspondence, sound and video playback, web perusing, short message and email correspondence, media downloads, gaming and that's only the tip of the iceberg. The rich usefulness builds the weight on battery lifetime, and develops the requirement for compelling vitality administration.

2. Related Work Done

Portable purchaser hardware gadgets, particularly telephones, are fueled from batteries which are restricted in size and in this way limit. This suggests overseeing vitality well is vital in such gadgets. Cell phones infer the vitality required for their operation from batteries. On account of numerous buyer hardware gadgets, particularly cellular telephones, battery limit is extremely confined because of limitations on size and weight of the gadget. This suggests vitality productivity of these gadgets is imperative to their ease of use. Consequently, ideal administration of force utilization of these gadgets is basic. Present day top of the line cellular telephones join the usefulness of a pocket-sized specialized gadget with PC-like abilities, bringing about what are by and large alluded to as cell phones. These incorporate such assorted usefulness as voice correspondence, sound and video playback, web searching, short-message and email correspondence, media downloads, gaming and that's only the tip of the iceberg. The rich usefulness expands the weight on battery lifetime, and extends the requirement for viable vitality administration. Distributed computing (CC) has been broadly perceived as the following eras processing framework. CC offers a few focal points by permitting clients to utilize framework (e.g. servers, systems, and stockpiles), stages (e.g. middleware benefits and working frameworks), and delicate products (e.g. application programs) gave by cloud suppliers (e.g., Google, Amazon, and Salesforce) easily. What's more, CC empowers clients to flexibly use assets in an on interest style. Accordingly, versatile applications can be quickly

provisioned and discharged with the negligible administration endeavors or administration supplier's collaborations.

2.1 Relationship between Battery and Application.

Handheld gadgets use rechargeable electrochemical batteries. Their charging time is between 1.54 hours and they keep running for a couple of hours, however more current pocket PCs keep running the length of 14 hours. For proficient and compelling use of a battery, it is essential to regard the battery as a quantifiable asset whose ascribes are accessible to the working framework and applications on interest. A percentage of the essential battery characteristics are:

1. Full plan limit: It is the remaining limit of a recently fabricated battery.
2. Full charge limit: It is the remaining limit of a completely charged battery toward the start of a release cycle.
3. Theoretical limit: It is the most extreme measure of charge that can be removed from a battery in view of the measure of dynamic materials it contains.
4. Standard limit: It is the measure of charge that can be extricated from a battery when released under standard burden and temperature conditions.
5. Actual limit: It is the measure of charge a battery conveys under given burden and temperature conditions.

Battery release conduct is influenced by various components, including the release rate, temperature, and the quantity of charge-energize cycles. Those components influence a battery as takes after. To begin with, battery limit diminishes as the release rate increments. Second, underneath room temperature, because of lessening in compound action and resulting increment in inner resistance, The full charge limit diminishes. At much higher temperature, the genuine conveyed limit decreases as well. Third, the famous, high thickness Lithium-Ion batteries lose a bit of their ability with every release charge cycle because of electrolyte deterioration. This misfortune in limit is known as limit blurring.

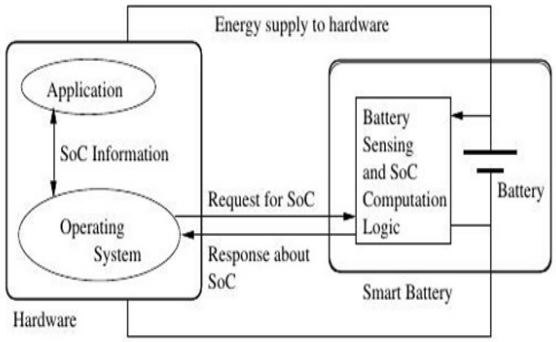


Figure: Relationship between a smartphone battery and an application.

2.2 Mobile Cloud Computing

Portable Cloud Computing at its least difficult, alludes to a foundation where both the information stockpiling and the information preparing happen outside of the cell phone. MCC as another worldview for portable applications whereby the information preparing and capacity are moved from the cell phone to intense and unified figuring stages situated in mists. These brought together applications are then gotten to over the remote association in view of a flimsy local customer or web program on the cell phones.

MCC utilizes computational growth approaches by which asset imperative cell phones can use computational assets of fluctuated cloud-based assets. In MCC, there are four sorts of cloud-based assets, to be specific inaccessible stable mists, proximate stationary registering substances, proximate versatile processing elements, and half breed (blend of the other three model).Giant mists, for example, Amazon EC2 are in the removed fixed gatherings while cloudlet or surrogates are individual from proximate fixed figuring elements. Cell phones, tablets, handheld gadgets, and wearable registering gadgets are a piece of the third gathering of cloud-based assets which is proximate versatile processing substances.

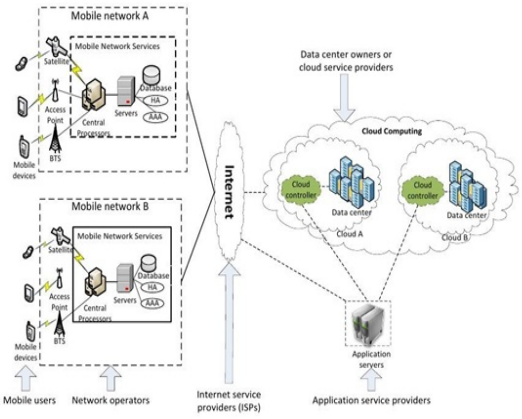


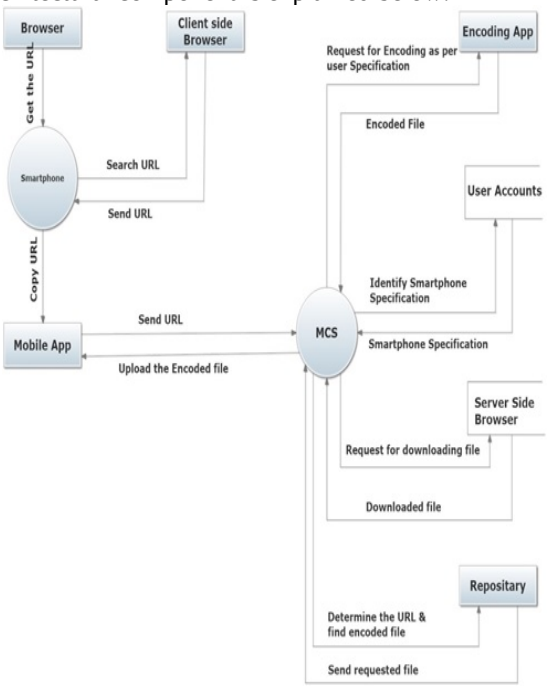
Figure: Mobile Cloud Computing Architecture

3. Proposed Method

In this paper, we propose a method to reduce the consumption of battery, while watch a video on a smart phone. In this method we will be calculating the luminance of the each Video frame. Each video consist on number of frames which comprises to form a video. We will be using SSIM (Structural Similarity) Index Algorithm to calculate the difference in the luminance of each frame.

4. System Architecture

Working of the system with respect to architectural component is explained below:



4.1 Upload a Video on Cloud Platform

User copy link from youtube for downloading video also monition there in which format you want to download it finally send all to cloud for processing.

4.2 Video Transformation Engine

A. Get the users screen size and backlight settings:

When user sends a request to the cloud with that user's device send the back light setting it means it contains device configuration.

B. Download the video:

On cloud server will download the video from youtube server.

C. Optimize the video for user's device:

Convert video according to users back light settings.

4.3 Backlight Optimization Engine

A. Split video in to number of frames:

Once video is download then split video in to number of frames

B. Calculate SSIM index for video frames:

Calculate SSIM index of each frame for changing the brightness using backlight optimization algorithm

C. Calculate luminance contrast and structure comparison:

Also find the luminance contrast and structure of each frame for image comparison.

4.4 Download Video from cloud Server

Download video from cloud server according to the user's device.

4.5 Save Energy Consumption

Calculate & Display Save Energy Consumption.

4.6 Mange Database of Videos on Cloud

Maintaining Logs for video like Upload video, Download video etc.

5. Algorithm

Dynamic Back-Light Optimization Algorithm

Let **X** and **Y** two N * M arrays representing the (Y) luminance channel of the frames to evaluate; **X** represents the reference copy, while **Y** the lossy/distorted sample. Let **x** and **y** their monodimensional versions, obtained by merging together the columns (or the rows) of the bidimensional arrays. This is a useful step in order to eliminate a summation in formulas and to write a cleaner code in numerical softwares, but doesn't affect the generality of this treatment. Let N = N * M for simplicity.

So, the first step is to measure the luminance of **x** and **y**, which is understood as the the average of their values, here respectively indicated as $\boldsymbol{\mu_x}$ and $\boldsymbol{\mu_y}$**:**

$$\mu_x = \frac{1}{N}\sum_{i=0}^{N-1} x_i \qquad \mu_y = \frac{1}{N}\sum_{i=0}^{N-1} y_i$$

Then, the function for the comparison of the luminance, l(**x**,**y**), is defined as follows:

$$l(x,y) = \frac{2\mu_x\mu_y + C_1}{\mu_x^2 + \mu_y^2 + C_1}$$

Where $C_1 = (K_1L)^2$, with K_1 is an arbitrary constant (<< 1) usually set to 0.01 and L is equal to the maximum possible pixel value of the image (or, more specifically, of the luminance channel); so, if are used 8 bits per sample, $L = 2^8-1 = 255$.

Next, luminance's information is removed by calculating the standard deviations of the two images (respectively indicated as $\boldsymbol{\sigma_x}$ and $\boldsymbol{\sigma_y}$), in order to obtain their average contrast:

$$\sigma_x = \left(\frac{1}{N-1} \sum_{i=0}^{N-1} (x_i - \mu_x)^2 \right)^{1/2}$$

$$\sigma_y = \left(\frac{1}{N-1} \sum_{i=0}^{N-1} (y_i - \mu_y)^2 \right)^{1/2}$$

And now, the contrasts are compared by using the following function:

As you could expect, C_2 is a constant usually equal to $(K_2L)^2$, with $K_2 << 1$ and usually set to 0.03.

The third piece of the puzzle is the structure comparison function s(**x**,**y**), that remembers Pearson's correlation index between two signals:

With $C_3 = C_2/2$, and

$$\sigma_{xy} = \frac{1}{N-1} \sum_{i=0}^{N-1} (x_i - \mu_x)(y_i - \mu_y)$$

Finally, here is the SSIM Index:

$$SSIM(x,y) = [l(x,y)]^{\alpha} \cdot [c(x,y)]^{\beta} \cdot [s(x,y)]^{\gamma}$$

The exponents α, β and γ, greater than zero, are parameters used to calibrate the weight of the three functions in the measurement; typically, $\alpha = \beta = \gamma = 1$, so the SSIM Index can be rewritten as follows:

$$SSIM(x,y) = \frac{(2\mu_x\mu_y + C_1)(2\sigma_{xy} + C_2)}{(\mu_x^2 + \mu_y^2 + C_1)(\sigma_x^2 + \sigma_y^2 + C_2)}$$

As the index of structural similarity approaches 1, the greater the degree of fidelity of the encoded copy is close to the original.

In evaluating the quality of the images, however, the given SSIM Index is not applied directly to the entire image: it's preferred to work *locally* because the characteristics of a scene are space-varying. Therefore a circular symmetric Gaussian window of size 11×11 and standard deviation of 1.5 is introduced, that moves the entire image pixel by pixel, producing a function with appropriate weights, changing the parameters of brightness, contrast, and covariance as follows:

$$\mu_x = \sum_{i=0}^{N-1} w_i x_i ,$$

$$\mu_y = \sum_{i=0}^{N-1} w_i y_i ,$$

$$\sigma_x = \left(\sum_{i=0}^{N-1} w_i (x_i - \mu_x)^2 \right)^{1/2} ,$$

$$\sigma_y = \left(\sum_{i=0}^{N-1} w_i (y_i - \mu_y)^2 \right)^{1/2} ,$$

$$\sigma_{xy} = \sum_{i=0}^{N-1} w_i (x_i - \mu_x)(y_i - \mu_y).$$

Let M the number of windows applied to the frames: M previously defined SSIM Indexes are generated, and it's possible to define a new index (usually called MSSIM) by averaging the M measures:

$$SSIM(x,y) = \frac{1}{M} \sum_{j=1}^{M} SSIM_j(x,y)$$

The adoption of this last version of SSIM Index is widespread.

6. EXPERIMENTS AND RESULTS

In this section, we will show how we used the android application and saved the battery while watching a video. The Algorithm proposed in the paper will help us to produce a backlight file.

First the user will log into his account in the application using his Username and Password. If he authenticate correctly then he will be sent to the Index page where all the operation which can be performed by the application will be shown. If he is new User then he will be directed to Registration page where he will register. In Index page the five different option provided Upload Video, Download Video, File Manager, Stats, Edit Profile.

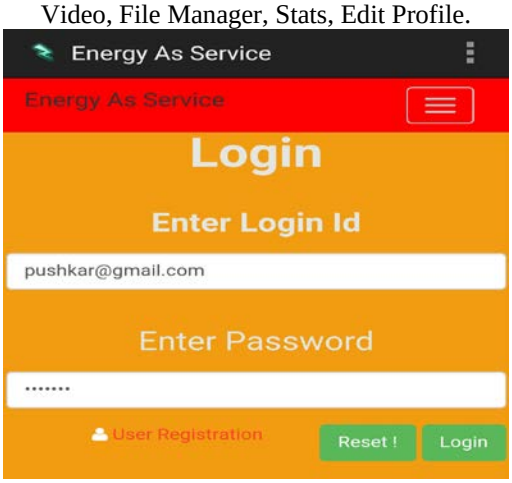


Figure : User Login into Application

First the User will provide a YouTube URL (Uniform Resource Locator). Then he will specify in which format does he need the video that are MP4, FLV, 3GP then he will give a file name to that Video. After that the Application first will download the video at the server side then it will process the video using the Algorithm and generate a Backlight file.

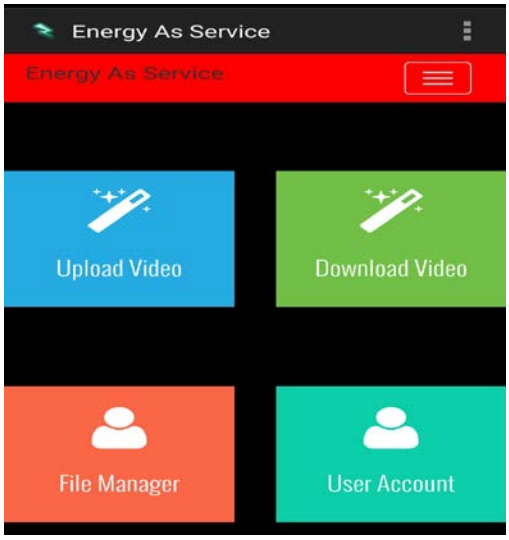


Figure : Index Page

Then the User will download the Video and Backlight from the server. Then the User will play the Video in the Application and Backlight file will also play with it, due to which the Luminance of the Video will Increase or Decrease Automatically.

Hence we will be able save the Battery, by 15 to 49 % while watching a Video.

Figure: Downloading Form

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