Cache Replacement for Transcoding Proxies on image transformation

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1 Introduction

Due to the increasing popularity of the Internet, the WWW (World Wide Web) has become the most popular way to distribute multimedia contents. The world with fixed network terminals will be changed into a ubiquitous networked society where anything can be connected no matter anywhere and anytime. Mobile communication in such a ubiquitous networked society is demanded dramatically and meaningful as an important role. As for this situation, the traditional media will be transferred into web based media for almost all enterprises.

However, the total data size of web objects is often so large that users, via narrow bandwidth, take a long time to get all web objects of web pages. Therefore, users often terminate the transmission of the web page before all of the web objects are successfully transmitted. Hence, many studies have been performed to enable delivery of Web page data in short time, in which it is often adopted that quality of an image is adjusted to reduce the data on transmission and increase the probability of successful transmission. In addition, mobile devices make web server access diversified. Because processing capacity of mobile devices is lower than a normal PC,

the processing time of data is much longer especially for a large quantity of data. Usually mobile devices display a small image and simple format of image, so it is necessary to adjust the image before transmission.

2 Proxy server

In this paper, a WAP proxy system, which is well known as a transcoding proxy, is adopted between a client and a web server with narrow bandwidth. Image adjustment is to reduce the resolution of image and change the image format so that the data in transmission are reduced. For instance, a high resolution JPEG image can be reformatted into a low resolution one, or a GIF format image can be reformatted into JPEG format image. In addition, an important function of proxy server is to cache the data in transmission. Cache replacement algorithm has a great impact on the performance of proxy server. The saved delay in accessing web server means the cached data can save most access time. We name the saved access time the saving cost. The higher saving cost, the lower total web sever access time is. In this paper, in order to increase the saving cost of cached data version, we consider the impact among all versions in cache.

3 Cache Replacement Algorithm

In this paper, we defined two new terms, a generation version and an influence version, in order to analyze influence relations among cached versions. The generation cost is the cost of generating a new version. The generation version means the version with the smallest generation cost when it is used to generate a new version. The influence version means the version with the second smallest generation cost when it is used to generate a new version. The cost of a generation version is denoted as $min\_cost1_{i,z}$ and the cost of a influence version is denoted as $min\_cost2_{i,z}$. Each cached versions can be generation version and influence version, that is each cached version has the two parameter defined above. The default values of $min\_cost1_{i,z}$ and $min\_cost2_{i,z}$ are generated from their web server.

The proposed algorithm is based on these two parameters. The difference of $min\_cost2_{i,z}$ and $min\_cost1_{i,z}$ means the final saving cost of the current

version according to other cached version. Moreover, in combination with the access rate of a version, I suggested a function to calculate a saving cost of a version. This study always take into account the co-effect of generation version and influence version to calculate a saving cost of an appropriate generation version. Thus, the total saving cost will be increased, which means the access time will be reduced.

4 Implementation and Evaluation

The proposed algorithm is implemented in NS2. The simulation includes many clients, a proxy, and a web server. All parameters are variables within a defined scope to perform different experiments. According to the simulation results, our methods can increase the average saving cost and the average hit ratio. The results demonstrate our method is efficient and significant.

5 Conclusions

Our research considers the relationship of versions in cache to calculate the saving cost. An analysis is performed on caching behaviors. The algorithm and the function of calculating saving cost, based on the analysis, are proved to be efficient and feasible. The simulation shows that the cache replacement is more efficient, and decease the web server load and network traffic. The response time of client is also decreased. All algorithms and parameter functions are implemented and simulated in NS2. The results of simulation show that our results are better than previous work.