

DEDICATION

To my inspiration in life, the symbol of challenge and hardwork...
To my dear father.

To the source of peace and sympathy...
To the one who granted love without tiredness...
To my ever beloved mother.

To the rosy part of my life, my brother Abd El-Aziz
and my darling sisters, Fatma, and Afra, who always supported me
with their love and compassion...

To my fiancé for his kind help, patience, and encouragement...

To those who lived the experience with me...
Who were always there, with support and love... To my dear friends,
Limy, Ola, Ala'a, Sara, Elaaf, Safaa and Sara.
To all, I dedicate this work.

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Abstract

The increasing demand for video services has made video caching a necessity to decrease download times and reduce Internet traffic. In addition, it is very important to store the right content at the right time in caches to make effective use of caching. An informative decision has to be made as to which videos are to be evicted from the cache in case of cache saturation. Therefore, the best cache replacement algorithm is the algorithm which dynamically selects a suitable subset of videos for caching, and maximizes the cache hit ratio by attempting to cache the videos which are most likely to be referenced in the future. In this thesis we study the most popular cache replacement algorithms (OPT, CC, QC, LRU-2, LRU, LFU and FIFO) which are currently used in video caching. We use simulations to evaluate and compare these algorithms using video popularities that follow a Zipf distribution. We consider different cache sizes and video request rates. Our results show that the CC algorithm achieves the largest hit ratio and performs well even under small cache sizes. On the other hand, the FIFO algorithm has the smallest hit ratio among all algorithms.

المستخلص

أدى الطلب المتزايد على خدمات الفيديو إلى ضرورة التخزين المخبئي لملفات الفيديو لتقليل عدد مرات التحميل وتقليل الازدحام على الإنترنت. وبالإضافة إلى ذلك، من المهم جدا الإستفادة الفعالة من التخزين المخبئي عن طريق تخزين المحتوى المناسب في الوقت المناسب. في حالة تشبع ذاكرة التخزين المخبئي للفيديو يجب إتخاذ قرار لإختيار الفيديو الذي سيتم حذفه. وعليه، فإن أفضل خوارزمية إستبدال هي الخوارزمية التي تختار المجموعة المناسبة من ملفات الفيديو للتخزين. تزيد نسبة الإصابة لذاكرة التخزين المخبئي من خلال تخزين الفيديو الأكثر احتمالا يتم الرجوع إليه في المستقبل. في هذا البحث تمت دراسة خوارزميات الإستبدال المخبئية لتخزين ملفات الفيديو الأكثر شيوعا وهي (FIFO, LFU, LRU, LRU-2, QC, CC, OPT). قمنا باستخدام المحاكاة لتقييم ومقارنة هذه الخوارزميات و تم تمثيل إنتشار ملفات الفيديو باستخدام توزيع زيف (Zipf distribution). وقد أخذنا في الإعتبار إختلاف أحجام ذاكرة التخزين وإختلاف معدلات طلب ملفات الفيديو. أظهرت النتائج أن الخوارزمية (CC) تحقق أكبر نسبة إصابة وتعمل بشكل جيد حتى مع أحجام ذاكرة التخزين الصغيرة. من ناحية أخرى، الخوارزمية (FIFO) لديها أصغر نسبة إصابة بين جميع الخوارزميات.

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List of Abbreviations

API	Application Programming Interface
ARC	Adaptive Replacement Cache
CAR	CLOCK with Adaptive Replacement
CC	Chunk-based Caching
FIFO	First In First Out
LFU	Least Frequently Used
LRU	Least Recently Used
MRLRU	Modified Pseudo LRU
Not	Number of guaranteed Hits
OOP	Object Oriented Programming
OPT	Optimal
OS	Operating System
PLRU _m	MRU based Pseudo LRU
PLRU _t	Tree-based Pseudo LRU
QC	Quality based video Caching
RTGF	Response Time Gain Factor
WWW	World Wide Web