An Efficient Video Processing Technique to Detect Movie Piracy Using Map Reduce

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Abstract

Now days movies are streaming on internet as soon as they are going to release in the market. In this digital era movies are pirated during transmission from one location to another. Once the copy is pirated that affects the revenue of the movie industry there are many approaches implemented to detect the movie piracy. The paper proposes a visible watermarking technique on video to detect whether the movie is pirated or not. While implementing the watermark technique the data become massive to handle these massive data the traditional tools are not suitable for processing. The process for video watermarking is very time consuming. Hardtop map reduce environment is considered for rapid implementation of video watermarking technique. The experimental results show that the developed framework out performs well in video processing when compared to existing tools.

Keywords: *Hadoop, Map Reduce, watermark, overlay filter, watermarking.*

1. INTRODUCTION

The movie industry is a very prominent and fast growing market. Many other momentous industries greatly anticipate on the movie industry incorporate the software industry among others. Movie piracy [14] question or phenomenon is

gaining more and serious attention in many countries of the world, particularly in those countries with advanced video industries, because piracy is being alleged to constitute a serious threat to the stability and survival of not only the video and film industries, but also the economies of those countries [16].

Some notable countries caught in the web of the serious threat of video piracy include: the United States of America (USA); the United Kingdom (UK); France; India; China, and Nigeria among others. Movie piracy in particular accounts for almost 1/3 of the worlds pirated products. The adverse impact of the movie piracy practice is presented in a case in Canada where 12,600 full time equivalent jobs were lost. This affected the entire economy and the movie industry as well which experienced a loss of 4,900 direct jobs.

The growth of film 'piracy' has become an increasingly high-profile issue. Business groups, national governments, international organizations and law enforcement agencies have claimed that 'piracy'[8] has undergone near-exponential growth, doing untold damage to the movie industry[3].

The entertainment industry is a very significant economic contributor but with the rampant piracy, the industry might lose its economic value. Piracy [12] has adverse impacts on people's lives especially the industry players. It is in the public knowledge how some of the movies that are flooded in the market are costly to make. Making a movie can reach up to the levels of hundreds of millions in American dollar currency. The Figure 1 shows the Potential market Lost to Piracy According countries.

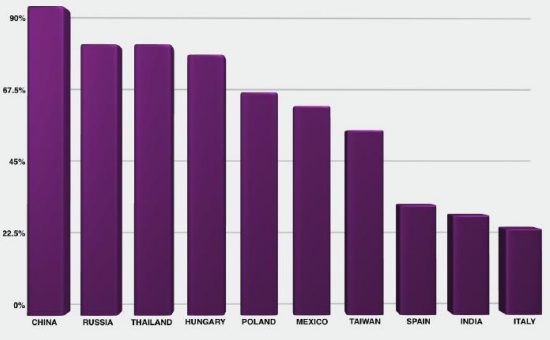

Figure 1: Potential market Lost to Piracy according countries

There are some approaches are there for protecting the data. One of the methods is to use cryptographic techniques [1] by encrypting the data. But these methods

may not provide authenticity when the data is decrypted by any third party. Hence water marking is a technique which will be useful for protecting and providing authorization of the data owner.

The paper proposes a visible watermarking [2][5] technique on video to detect whether the movie is pirated or not. While implementing the watermark technique the data become massive to handle these massive data the traditional tools are not suitable for processing. The process for video watermarking is very time consuming. Hadoop map reduce environment is considered for rapid implementation of video watermarking technique.

The organization of the paper is as follows. The existing techniques to detect the movie piracy and map reduce implementation are discussed in section 2. In section 3 the algorithms for visible watermarking using Map Reduce are presented in detail. Chapter 4 presents the results and comparison of computational time of different videos on various nodes. In chapter 5 the performance of the techniques and other details of the proposed system are discussed.

2. RELATED WORK:

Dutta et al [6] presented a watermarking method for compressed video streams which the invisible watermark bits inserting in P-frames. The experimental results show the robust watermarking has exceed most of the current patterns with respect to evaluation metrics. Dubey et al [7] discussed problems of pirated digital movies and how to handle not to be pirated.

Recent research work emphasize on secure spead spectrum way of watermarking that is good for piracy deterrence. Prashanth et al[9] discussed the problem of pirated CDs are produced with small camera while movie screening. They implemented Anti Piracy System in Cinema Theatres to prevent recording of movie screening. Shojanazeri et al[10] figured out proliferation of media sharing the pirated videos through internet and other technologies. They analysed several video watermarking techniques by identifying their state of art and provides the main key performance indicators. Nakashima et

al[11] proposed a position estimated system based on spread spectrum audio watermarking which estimates the position using the watermarking algorithm and a position emulator when the camcorder is recording in order to avoid camcorder piracy.

The system also detects collusion attacks by finding the detection strength. Jyothish et al [13] proposed a cryptographic approach to increase the security level of the ownership information which is hidden in the video sequences by embedding the cipher watermark using SVD watermark embedding algorithm which computes the sum of absolute deviation between successive frames at the encryption end and performs the SVD watermark extraction algorithm at the decryption end. Asikuzzaman et al [15] to protect content in video the Digital video watermarking is introduced.

3. METHODOLOGY:

Paper introduces an approach to detect whether the film is pirated or not based on adding a watermark to video file using ffmpeg tool and an algorithm for implementing the proposed approach in a cluster framework using Map Reduce

3.1 FFMPEG

A novel and efficient tool for decoding and encoding for video is Ffmpeg which can be used to encode several codec formats into other different format. It has several libraries which can be incorporated into programs to provide operations such as scaling, filters and other prost processing operations.In our process mainly used to split the video into three parts such as audio, video and frames to avoid the video to produce the video without noise.

3.1.1. Overlay Filter

Input will be given to Overlay Filter which will process the video with respective libraries integrated with Hadoop Map reduce.

$$L^k(x,y) = L^{k-1}(x,y) * \frac{255 - \alpha^k(x,y)}{255} + L^k{}_0(x,y) * \frac{\alpha^k(x,y)}{255} \quad (1)$$

where $1 \leq k \leq F_0$. Here, F_0 is the number of Frames. α^k (x, y)= opacity level, 0 to 255 is the range of value of α^k ($\cdot$) .

$L^0(x, y)$, $L^k(x, y)$, and $L^k_0(x, y)$ are the pixel value of the main layer, the k-th temporary layer, and the k-th overlay layer, respectively. When k is equal to F_0, $L^k(x, y)$ represents the pixel value of corresponding watermarked Video[17].

3.2. Map Reduce

Apache Hardtop is having most powerful functionality called Map Reduce which is having Map and Reduce functions for processing large volume of either structured or unstructured data by using key, value pair form[4]. However for unstructured video it is very difficult to create such pair on raw video. Hence the video file can be spitted into frames on which the Map Reduce will be operated.

In Map phase the video and logo is divided into chunks and these chunks are spread across multiple nodes or machines. So the nodes or machines themselves are called chunk server. Each chunk replicated on different machines. Video processing is performed by splitting the data into windows. These windows will be processed with hadoop framework by creating key-value pair. While creating such format the frame number will be used as a key. Figure 2 shows an example of processing flow using Hardtop Map Reduce.

The input of the Map function is a single video frame, and the Map function produces one video frame as output. In this figure, each video frame is divided into parts, and each part has a unique key number. Here the watermarking technique is implemented where the logo is imposed on each frame.

Sorting will be performed by using the key number at Reduce function. The reducer is fired once for every key after collecting key/value pairs from all the Mapers. Its execution is deferred in the job configuration until all the map tasks are completed.

The framework will process video frames in parallel by using Data nodes at slave machines and stores the processed frames at centralized database called Hadoop Distribute File System (HDFS).

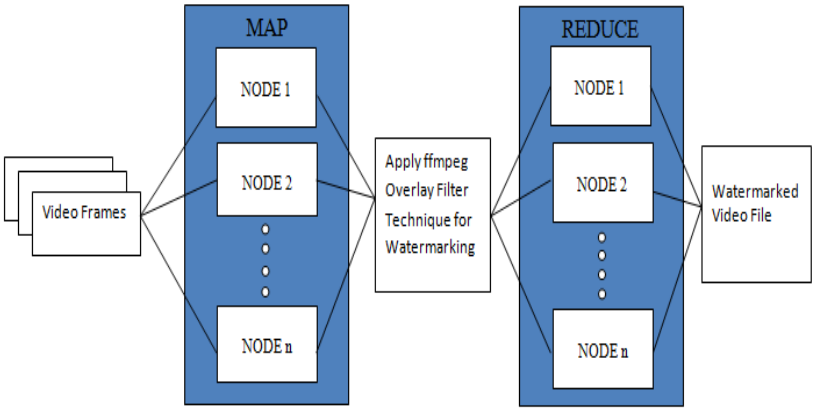

Figure 2: Processing flow using Map Reduce

3.3. Algorithm for Visible watermarking Technique

Step 1: Select Input Video for embedding Watermarking

Step 2 : Select watermark logo.

Step 3 : Place watermark logo in HDFS.

Step 4: Make an executable ffmpeg file.

Step 5: Get the length of the video

Step 6: Spilt the video into windows Bases on 00:01:00 min duration Using ffmpeg file and place in HDFS.

Map:

Step 7 : The windows are assign as Filename to different nodes

Step 8: Set the position of each in window i.e. the watermark should be inserted which corner of the window.

Step 9 : Read each window and watermark logo do the following

Step 10: Apply watermark logo for each Window, 1 to number of windows using eq(1).

Reduce:

Step 11: Collect all watermarked windows Group them into video.

Step 12: Save the watermark video in hdfs Output folder.

Step 13: Now copy the watermark video to Local file system

3.4 System Model.

Figure 3 shows the flow of the video watermarking scheme. The technique employs the Hadoop infrastructure and the MapReduce technology on video watermarking and specifies the input and output locations. The video processing job will be submitted to Name node which will make use of Data nodes for processing. The task tracker is responsible for assigning roles to each job tracker for processing frames while embedding watermark in each video frame. The Reducer will combine each frame to make video file with newly inserted watermark. Finally the result will be stored at HDFS.

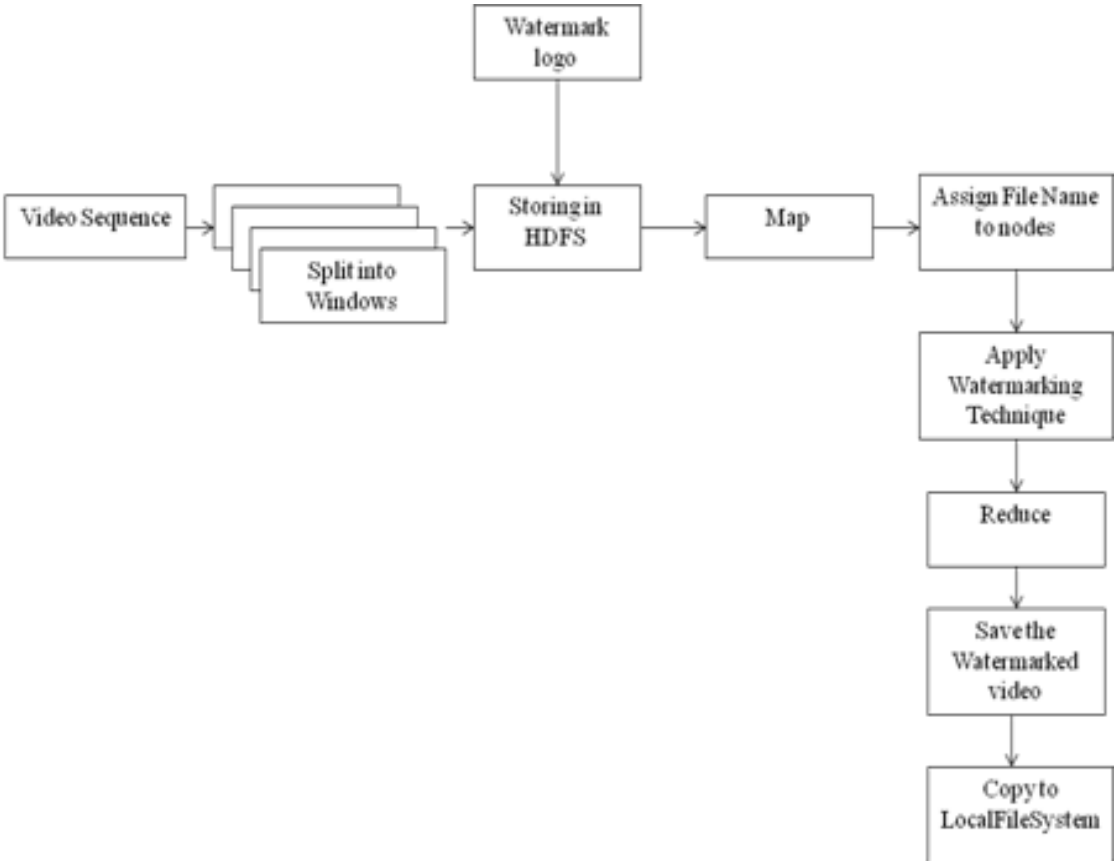

Figure 3: Algorithm for Watermarking Technique.

4. EXPERIMENTAL RESULTS

The chapter presents the experimental results and analysis of Map Reduce approach to implement watermarking technique

For experimentation, 5 different video files are taken in .mp4 format as shown in table 1 and the respective graphs are shown from Figure 4 to Figure 8.The watermark logo is of 25X25 pixel 1.4 kb size should be .png format. The video and logo imported it to the “input” directory that will be processed by the watermarking job. These videos will be processed over the Hadoop framework, in which the watermark embedding process executed. The performance evaluation parameter execution time is considered for different frame length videos and graphs are drawn...

The Above process is done for remaining videos and noted the execution of each video on various number of nodes Table 2 shows the total execution time for different videos denoted using frames.

Table 1: Description of input videos

S.No	Name	Frames	Length(HH:MM:SS)
1	Test.mp4	768	00:00:32
2	Test2.mp4	10076	00:07:07
3	Test3.mp4	17400	00:11:03
4	Test4.mp4	22655	00:13:42
5	Test5.mp4	93951	00:52:03

Table 2: Total computational time of different frames on different nodes

Frames	1-Node	2-Nodes	3-Nodes	4-Node
	Time(Sec)	Time (Sec)	Time (Sec)	Time (Sec)
768	22.88	20.989	20.717	19.734
10,076	91.7	74.709	57.265	54.895
17,400	138.17	115.66	89.306	85.206
22,655	431.505	150.383	122.267	103.5
93,951	1246.695	367.981	273.966	236.651

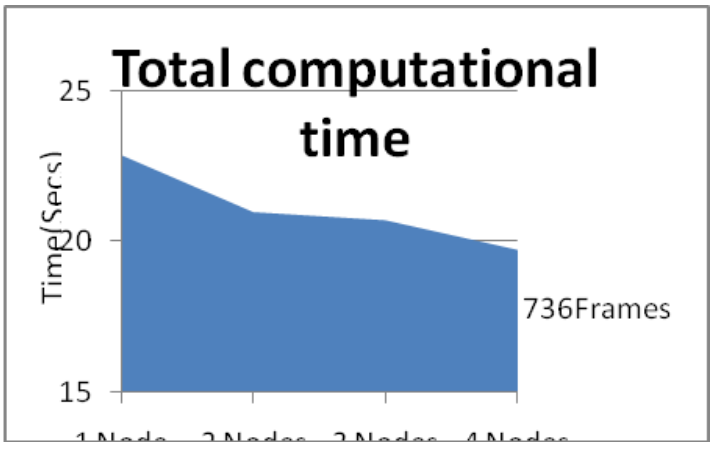

Figure 4: Area graph represented for total computational time of 736 frames

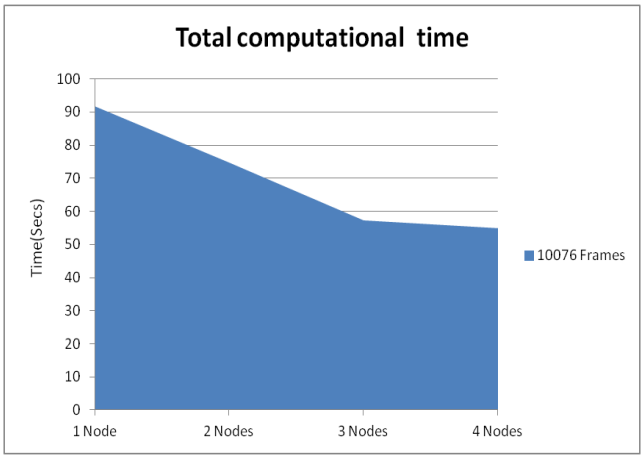

Figure 5: Area graph represented for total computational time of 10076 frames

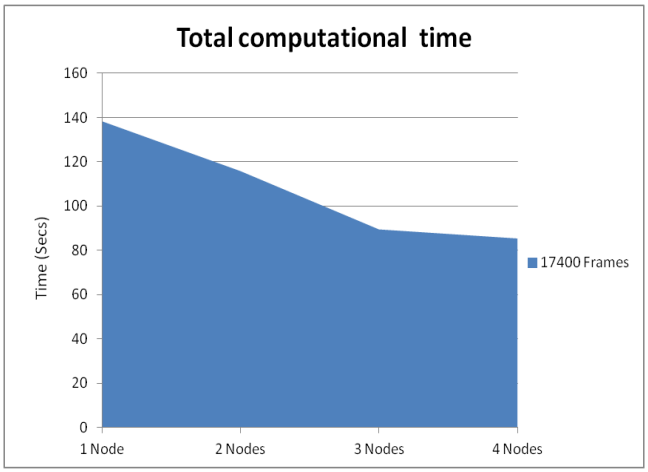

Figure 6: Area graph represented for total computational time of 17400 frames

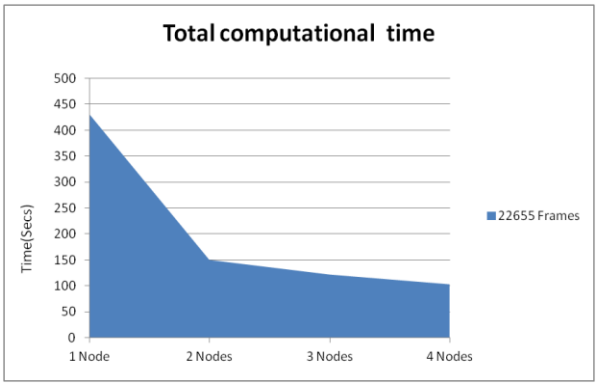

Figure 7: Area graph represented for total computational time of 22655 frames

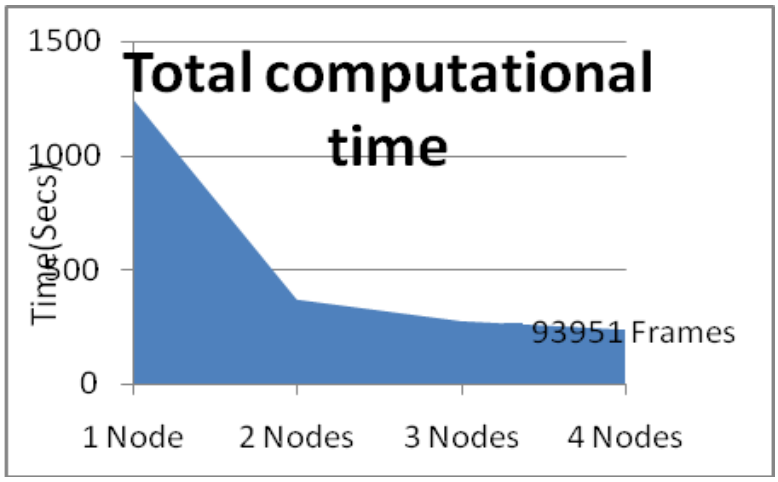

Figure 8: Area graph represented for total computational time of 93951 frames

The nodes increase the execution time is reduced .As a result the performance of the technique in map reduce is efficient shown in Figure 11.

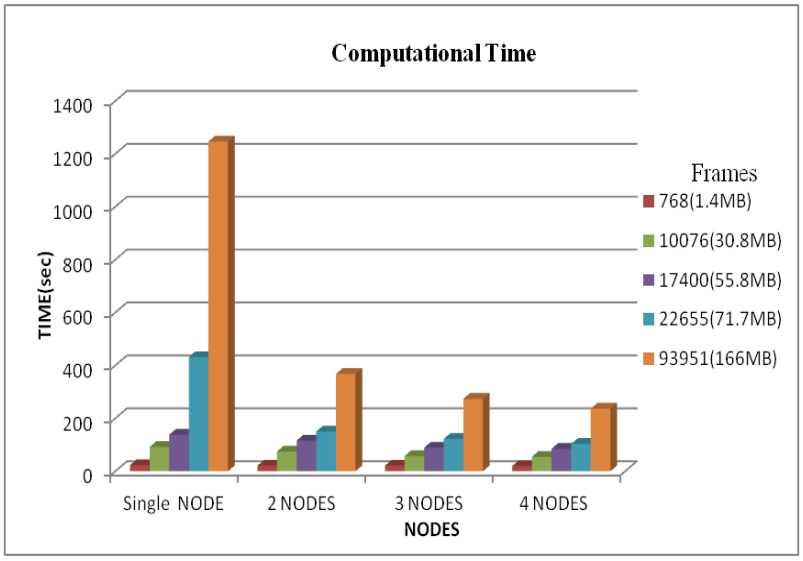

Figure 9: Performance of the technique in map reduce

CONCLUSION AND FUTURE WORK:

Table 4.3 shows the percentage decrease in execution time with the use of parallel evaluation on 4-node Hadoop cluster for each input profile, as compared to single node evaluation. This results in an average increase in performance (in terms of time) of 74.10% at a very small cost.

This shows that Map Reduce gives a faster method for performing the watermarking technique on video, which is also depicted in Figure 4.11. The aim of this paper is to provide and efficient video processing technique to detect movie piracy by using hadoop map reduce frame work. More models need to be studied to protect movie piracy.

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