Cloud-Based Multimedia Content Protection System

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Abstract

In day to day life so many multimedia contents are created and uploaded in the Internet. It is easy to duplicate copyrighted multimedia materials. The paper presents a novel system for multimedia content protection on cloud infrastructures. These duplicated multimedia contents are illegally distributed over the Internet can result in significant loss of revenues for content creators. It is difficult to find out the illegally made multimedia contents copies made over the internet. In this paper a novel system for protection of multimedia contents on cloud infrastructures is presented. This system helps to protect different types of multimedia contents such as 2-D/3-D videos, audios, images etc., This system is based on cloud infrastructure which provides quick access to computing hardware and software resources. The components that are mainly included in this system are creating signatures of 3-D videos and the distributed index which is used to match multimedia objects.

Keywords: Copyright, Cloud Infrastructures, Internet, Index Multimedia, Signatures.

1. Introduction

Advances in processing and recording equipment of multimedia content as well as the availability of free online hosting sites have made it relatively easy to duplicate copyrighted materials such as videos, images, and music clips. Illegally redistributing multimedia content over the Internet can result in significant loss of revenues for content creators. Finding illegally-made copies over the Internet is a complex and computationally expensive operation, because of the sheer volume of the available multimedia content over the Internet and the complexity of comparing content to identify copies.

The system can be used to protect various multimedia content types, including regular 2-D videos, new 3-D videos, images, audio clips, songs, and music clips. The system can run on private clouds, public clouds, or any combination of public-private clouds. Our design achieves rapid deployment of content protection systems, because it is based on cloud infrastructures that can quickly provide computing hardware and software resources. The design is cost effective because it uses the computing resources on demand. The design can be scaled up and down to support varying amounts of multimedia content being protected. The proposed system is fairly complex with multiple components, including: (i) crawler to download thousands of multimedia objects from online hosting sites, (ii) signature method to create representative fingerprints from multimedia objects, and (iii) distributed matching engine to store signatures of original objects and match them against query objects.

The problem of protecting various types of multimedia content has attracted significant attention from academia and industry. One approach to this problem is using watermarking, in which some distinctive information is embedded in the content itself and a method is used to search for this information in order to verify the authenticity of the content.

Many previous works proposed different methods for creating and matching signatures. These methods can be classified into four categories: spatial, temporal, color, and transform-domain. Spatial signatures (particularly the block-based) are the most widely used.

Youtube Content ID, Vobile VDNA, and MarkMonitor are some of the industrial examples which use fingerprinting for media protection, while methods such as can be referred to as the academic state-of-the-art.

The existing system has some limitations that said as follows:

Watermarking approach may not be suitable for already-released content without watermarks in them. Watermarking may not be effective for the rapidly increasing online videos, especially those uploaded to sites such as YouTube and played back by any video player.

Spatial signatures weakness is the lack of resilience against large geometric transformations. Temporal and color signatures are less robust and can be used to enhance spatial signatures. Transform-domain signatures are computationally intensive and not widely used in practice.

2. Related work

Ahmed Abdelsadek [1] have proposed a distributed system for matching multimedia objects. For fastest searching and matching the proposed system used to store and index large-scale high-dimensional datapoints. It offers multimedia applications having the function of finding the nearest neighbors on large-scale datasets.

A. Abdelsadek and M. Hefeeda [2] proposed a new method for partitioning, searching, and storing high-dimensional datasets on distributed infrastructures which support the MapReduce programming model. The data points used in this system are SIFT features, where each one has 128 dimensions. The results of the proposed system achieved 95% accuracy compared to the ground-truth nearest neighbors. It also showed that DIMO is scalable and elastic which means that it can efficiently utilize varying amounts of computing resources.

Mohamed Aly [3] have presented a method for building image retrieval systems that can handle hundreds of millions of images. It is based on dividing the Kd-Tree into a “root subtree” that resides on a root machine, and several “leaf subtrees”, each residing on a leaf machine. The implementation is done in two ways, Independent Kd-Tree and Distributed Kd-Tree, to parallelize Kd-Trees using the MapReduce architecture, which shows the power of DKdt which, for 100M images, has over 30% more accuracy than IKdt and at the same time over 30 times more throughput, and it can processes a query image in a fraction of a second .

Jon L. Bentley [4] have presented the multidimensional binary search tree as a data structure for storage of information to be retrieved by associative searches. It is shown to be quite efficient in its storage requirements. A significant advantage of this structure is that a single data structure can handle many types of queries very efficiently. An algorithm is presented to handle any general intersection query.

3. Methodology

The proposed system can be used to protect various multimedia content types. The proposed system presents complete multi-cloud system for multimedia content protection. The system supports different types of multimedia content and can effectively utilize varying computing resources.

Novel method for creating signatures for videos. This method creates signatures that capture the depth in stereo content without computing the depth signal itself, which is a computationally expensive process. New design for a distributed matching engine for high-dimensional multimedia objects. This design provides the primitive function of finding -nearest neighbors for large-scale datasets.

The design also offers an auxiliary function for further processing of the neighbors. This two-level design enables the proposed system to easily support different types of multimedia content. The focus of this paper is on the other approach for protecting multimedia content, which is content-based copy detection (CBCD). In this approach, signatures are extracted from original objects. Signatures are also created from query (suspected) objects downloaded from online sites. Then, the similarity is computed between original and suspected objects to find potential copies.

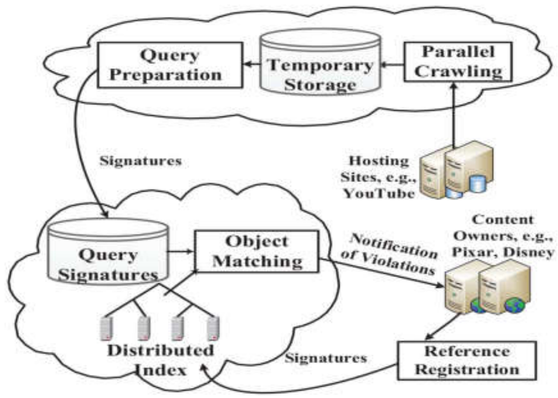

Figure 1. System Architecture of Multimedia Content Protection System

The Cloud-Based Multimedia Content Protection System . System contains the following modules.

- Data Owner Details
- User Details
- Attack
- Verify
- Download Files
- Upload Files
- Request Key

A. Distributed Matching Engine

This module describes the designing of matching engine suitable for different types of multimedia objects that is scalable and elastic. It can support different types of multimedia objects, including images, 2-D videos, and 3-D videos. To achieve this generality, divide the engine into two main stages. The first stage computes nearest neighbors for a given data point, and the second stage post-processes the computed neighbors based on the object type. In addition, our design supports high-dimensionality which is needed for multimedia objects that are rich in features.

B. Signature Creation

The system abstracts the details of different media objects into multi-dimensional signatures. The signature creation and comparison component is media specific, while other parts of the system do not depend on the media type. Our proposed design supports creating composite signatures that consist of one or more of the following elements:

• Visual signature: Created based on the visual parts in multimedia objects and how they change with time;

• Audio signature: Created based on the audio signals in multimedia objects;
• Depth signature: If multimedia objects are 3-D videos, signatures from their depth signals are created;
• Meta data: Created from information associated with multimedia objects such as their names, tags, descriptions, format types, and IP addresses of their uploaders or downloader's.

4. Results and Discussion

The system consists of the following processes: -

A. Registration of the data owner for uploading the video, songs, text etc. and also sending request key for user.
B. After the process of registration the data owner uploading the multimedia content in the cloud and then uploading the file the data owner he can view the file details and can send the key to the user.
C. User have to register to download the documents. After registration user can request the key to download multimedia documents.
D. After Sending the request key user can view the keys sent by the data owner. Using the keys provided by the data owner user can download the multimedia documents.

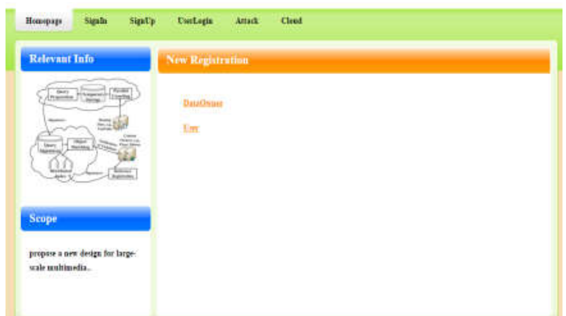

Figure 2. Home Page of Cloud Based Multimedia Content Protection System

Figure 3. Data Owner Registration Page

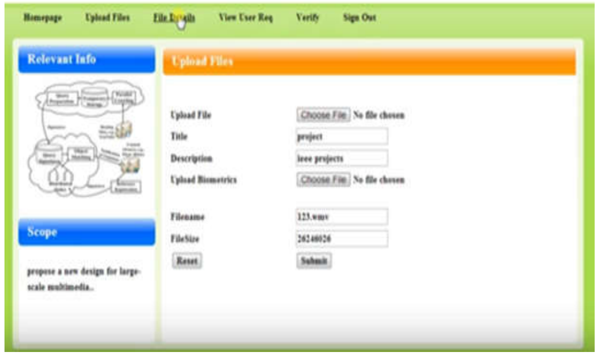

Figure 4. Multimedia Contents Uploading Page

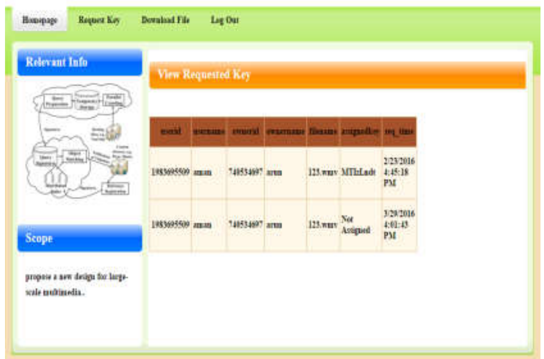

Figure 5. View requested keys in User Page

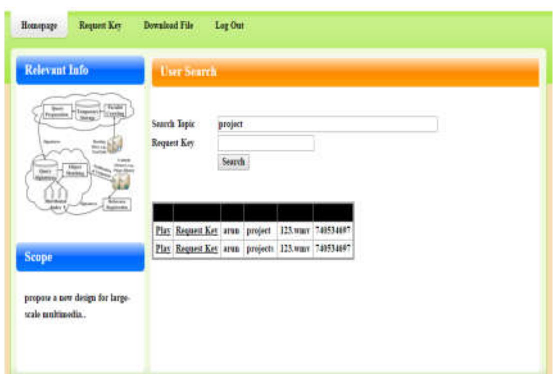

Figure 6. View the Multimedia Content by using pay-key

5. Conclusion

The proposed system supports different multimedia content types and it can be deployed on private and/or public clouds. Two key components of the proposed system are presented. The first one is a new method for creating signatures of 3-D videos. Our method constructs coarse-grained disparity maps using stereo correspondence for a sparse set of points in the image. Thus, it captures the depth signal of the 3-D video, without explicitly computing the exact depth map, which is computationally expensive. Our experiments showed that the proposed 3-D signature produces high accuracy in terms of both precision and recall and it is robust to many video transformations including new ones that are specific to 3-D videos such as synthesizing new views. The second key component in our system is the distributed index, which is used to match multimedia objects characterized by high dimensions. The distributed index is implemented using the MapReduce framework and our experiments showed that it can elastically utilize varying amount of computing resources and it produces high accuracy.

Future scope for the work in this paper is to design signatures for recent and complex formats of 3-D videos such as multi view plus depth. A multi view plus depth video has multiple texture and depth components, which allow users to view a scene from different angles. Signatures for such videos would need to capture this complexity, while being efficient to compute, compare, and store.

References

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