

## Large-Scale 3D Multimedia Protection System

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### ABSTRACT:

We propose a new design for large-scale multimedia content protection systems. Our design leverages cloud infrastructures to provide cost efficiency, rapid deployment, scalability, and elasticity to accommodate varying workloads. The proposed system can be used to protect different multimedia content types, including 2-D videos, 3-D videos, images, audio clips, songs, and music clips. The system can be deployed on private and/or public clouds. Our system has two novel components:

- (i) method to create signatures of 3-D videos, and
- (ii) distributed matching engine for multimedia objects.

The signature method creates robust and representative signatures of 3-D videos that capture the depth signals in these videos and it is computationally efficient to compute and compare as well as it requires small storage. The distributed matching engine achieves high scalability and it is designed to support different multimedia objects. We implemented the proposed system and deployed it on two clouds: Amazon cloud and our private cloud. Our experiments with more than 11,000 3-D videos and 1 million images show the high accuracy and scalability of the proposed system. In addition, we compared our system to the protection system used by YouTube and our results show that the YouTube protection system fails to detect most copies of 3-D videos, while our system detects more than 98% of them. This comparison shows the need for the proposed 3-D signature method, since the state-of-the-art commercial system was not able to handle 3-D videos.

### INTRODUCTION

#### What is cloud computing?

Cloud Computing is the use of computing resources (hardware and software) that are delivered as a service over a network (typically the Internet). The name comes from the common use of a cloud-shaped symbol as an abstraction for the complex infrastructure it contains in system diagrams. Cloud computing entrusts remote services with a user's data, software and computation. Cloud computing consists of hardware and software resources made available on the Internet as managed third-party services. These services typically provide access to advanced software applications and high-end networks of server computers



#### Structure of cloud computing

#### How Cloud Computing Works?

The goal of cloud computing is to apply traditional supercomputing, or high-performance computing power, normally used by military and research facilities, to perform tens of trillions of computations

per second, in consumer-oriented applications such as financial portfolios, to deliver personalized information, to provide data storage or to power large, immersive computer games. The cloud computing uses networks of large groups of servers typically running low-cost consumer PC technology with specialized connections to spread data-processing chores across them. This shared IT infrastructure contains large pools of systems that are linked together. Often, virtualization techniques are used to maximize the power of cloud computing.

### Characteristics:

The salient characteristics of cloud computing based on the definitions provided by the National Institute of Standards and Terminology (NIST) are outlined below:

- **On-demand self-service:** A consumer can unilaterally provision computing capabilities, such as server time and network storage, as needed automatically without requiring human interaction with each service's provider.
- **Resource pooling:** The provider's computing resources are pooled to serve multiple consumers using a multi-tenant model, with different physical and virtual resources dynamically assigned and reassigned according to consumer demand. There is a sense of location-independence in that the customer generally has no control or knowledge over the exact location of the provided resources but may be able to specify location at a higher level of abstraction (e.g., country, state, or data center). Examples of resources include storage, processing, memory, network bandwidth, and virtual machines.
- **Rapid elasticity:** Capabilities can be rapidly and elastically provisioned, in some cases automatically, to quickly scale out and rapidly released to quickly scale in. To the consumer, the capabilities available for provisioning often appear to be unlimited and can be purchased in any quantity at any time.
- **Measured service:** Cloud systems automatically control and optimize resource use by leveraging a metering capability at some level of abstraction appropriate to the type of service (e.g., storage, processing, bandwidth, and active user accounts). Resource usage can be managed, controlled, and reported providing transparency for both the provider and consumer of the utilized service.

### EXISTING SYSTEM:

- ❖ 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 Mark Monitor 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.

### DISADVANTAGES OF EXISTING SYSTEM:

- ❖ 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.

### PROPOSED SYSTEM:

- ❖ We present a novel system for multimedia content protection on cloud infrastructures. The system can be used to protect various multimedia content types.
- ❖ In our proposed system we present 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.

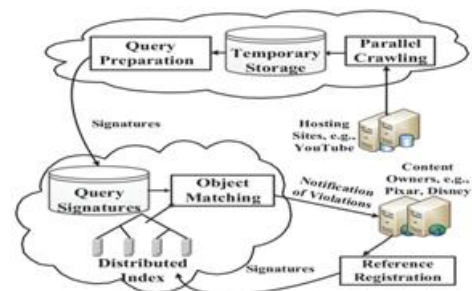
### ADVANTAGES OF PROPOSED SYSTEM:

- ❖ Accuracy.
- ❖ Computational Efficiency.
- ❖ Scalability and Reliability.
- ❖ Cost Efficiency.
- ❖ 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.

### SYSTEM ARCHITECTURE:



### IMPLEMENTATION

#### MODULES:

1. Data owner Module
2. Data User Module
3. Encryption Module
4. Rank Search Module

#### MODULES DESCRIPTION:

##### Data owner Module

Protect different multimedia content types, including 2-D videos, 3-D videos, images, audio clips, songs, and music clips. The system can be deployed on private and/or public clouds. Our system has two novel components: (i) method to create signatures of 3-D videos, and (ii) distributed matching engine for multimedia objects. The signature method creates robust and representative signatures of 3-D videos that capture the depth signals in these videos and it is computationally efficient to compute and compare as well as it requires small storage.

##### Data User Module:

Matching engine achieves high scalability and it is designed to support different multimedia objects.

We implemented the proposed system and deployed it on two clouds: Amazon cloud and our private cloud. Our experiments with more than 11,000 3-D videos and 1 million images show the high accuracy and scalability of the proposed system. In addition, we compared our system to the protection system used by YouTube and our results show that the YouTube protection system fails to detect most copies of 3-D videos, while our system detects more than 98% of them

### Encryption Module

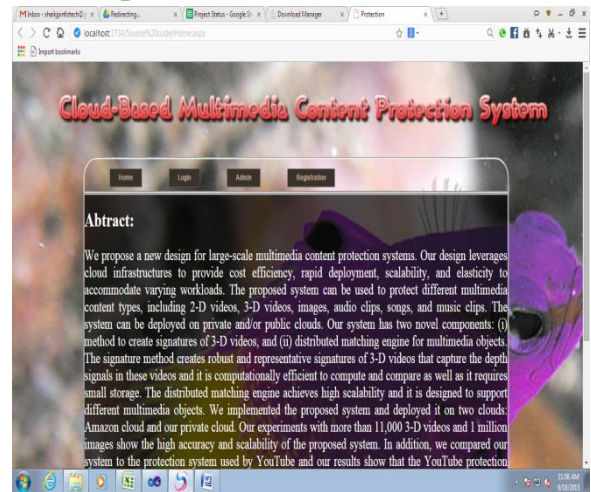
Multimedia content protection systems using multi-cloud infrastructures. The proposed system supports different multimedia content types and it can be deployed on private and/or public clouds. Two key components of the proposed system are presented. The first one is a new method for creating signatures of 3-D videos. Our method constructs coarse-grained disparity maps using stereo correspondence for a sparse set of points in the image.

### Rank Search Module:

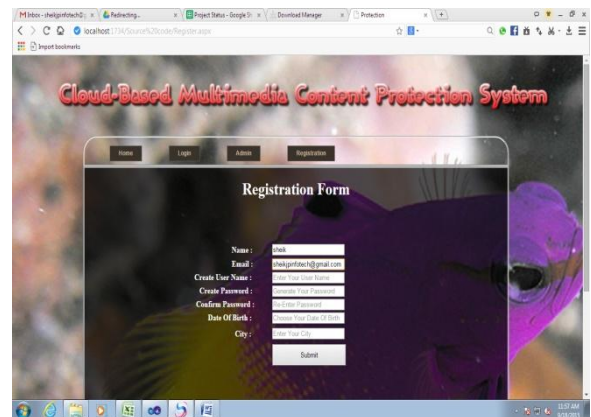
Rank needs to store the whole reference dataset multiple times in hash tables; up to 32 times. On the other hand, our engine stores the reference dataset only once in bins. Storage requirements for a dataset of size 32,000 points indicate that Rank needs up to 8 GB of storage, while our engine needs up to 5 MB, which is more than 3 orders of magnitude less. These storage requirements may render Rank not applicable for large datasets with millions of points, while our engine can scale well to support massive datasets.

### SCREEN SHOTS

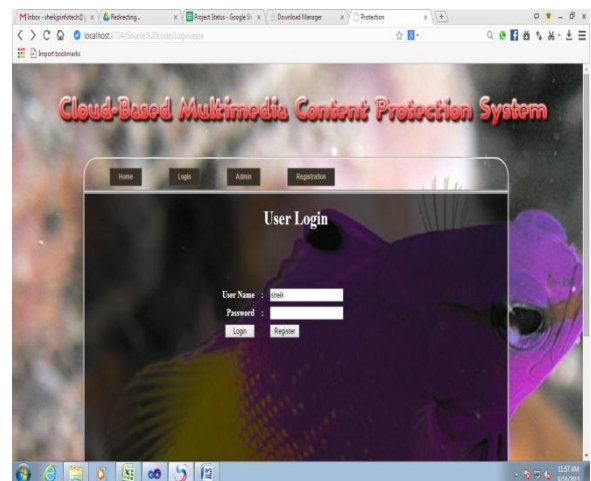
#### 1. Home Page:



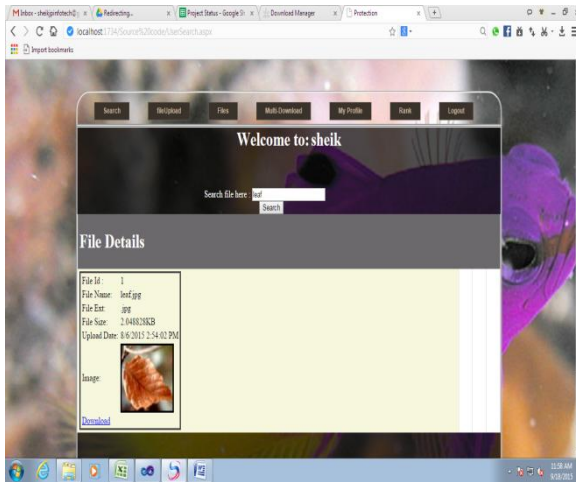
#### 2. User Registration:



#### 3. User Login:



### Search:



### CONCLUSION:

Distributing copyrighted multimedia objects by uploading them to online hosting sites such as YouTube can result in significant loss of revenues for content creators. Systems needed to find illegal copies of multimedia objects are complex and large scale. In this paper, we presented a new design for multimedia content protection systems using multi-cloud infrastructures. 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. The experiments also showed that it outperforms the closest system in the literature in terms of accuracy and computational efficiency. In addition, we evaluated the whole content protection system with more than 11,000 3-D videos and the results showed the scalability and accuracy of the proposed system. Finally, we compared our system against the Content ID system used by YouTube. Our results showed that:

- (i) there is a need for designing robust signatures for 3-D videos since the current system used by the leading company in the industry fails to detect most modified 3-D copies, and
- (ii) our proposed 3-D signature method can fill this gap, because it is robust to many 2-D and 3-D video transformations. The work in this paper can be extended in multiple directions. For example, our current system is optimized for batch processing. Thus, it may not be suitable for online detection of illegally distributed multimedia streams of live events such as soccer games. In live events, only small segments of the video are available and immediate detection of copyright infringement is crucial to minimize financial losses.

To support online detection, the matching engine of our system needs to be implemented using a distributed programming framework that supports online processing, such as Spark. In addition, composite signature schemes that combine multiple modalities may be needed to quickly identify short video segments. Furthermore, the crawler component needs to be customized to find online sites that offer pirated video streams and obtain segments of these streams for checking against reference streams, for which the signatures would also need to be generated online. Another future direction for the work in this paper is to design signatures for recent and complex formats of 3-D videos such as multiview plus depth. A multiview 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.

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