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A Privacy-Preserving Content-based Image Retrieval Method in Cloud Environment

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***Abstract*—**In order to protect data privacy, image with sensitive or private information needs to be encrypted before being outsourced to a cloud service provider. However, this causes difficulties in image retrieval and data management. A privacy-preserving content-based image retrieval method based on orthogonal decomposition is proposed in the paper. The image is divided into two different components, for which encryption and feature extraction are executed separately. As a result, cloud server can extract features from an encrypted image directly and compare them with the features of the queried images, so that users can thus obtain the image. Different from other methods, the proposed method has no special requirements to encryption algorithms, which makes it more universal and can be applied in different scenarios. Experimental results prove that the proposed method can achieve better security and better retrieval performance.

***Keywords*—**Privacy-preserving, image retrieval, secure search, orthogonal decomposition

I. INTRODUCTION

With the rapid development of Multimedia and Internet, massive images are generated and distributed, how to store and share such large amount of data efficiently becomes an important issues. It is a natural solution to outsource images in cloud service due to its tremendous advantages, such as on-demand self-service, ubiquitous network access, location independent resource pooling, rapid resource elasticity, usage-based pricing and transference of risk [1]. Reports show that Cloud services specifically designed for image storage and sharing, such as Instagram, are among the largest growing internet services today [2]. Additionally, how to efficiently search the image information from a massive image database is another challenging issues in large-scale images storing and sharing. Content-based image retrieval (CBIR), which involves extraction of visual features from image and search in the visual feature space for similar images, has grown rapidly in recent years. Progresses have been made in both the derivation of new features and the construction of signatures based on these features. The richness in the mathematical formulation of signatures grows alongside the invention of new methods for measuring similarity. In order to improve retrieval accuracy further, some methods are proposed to narrow down the "semantic gap" between the visual features and the richness of human semantics, such as machine learning and relevance feedback, etc. [3, 4]. Yu. et al. proposed to jointly considers visual features and click features in image retrieval to solve this semantic gap problem [5,6,7,8].

However, despite the tremendous advantages, privacy becomes the biggest concern about image storage and CBIR outsourcing in cloud. Under cloud environment, data owner, cloud service providers (CSP) and data user can be taken by different parties. Data owners no longer store their data locally so that they will lose

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