

# A Group Theoretical Approach to Content-Based Image Retrieval

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Facing these days' ever-growing digital storage capacities and technologies such as the Internet, algorithms for fast retrieval of image data based on actual image content are gaining importance. Here, we present the results of applying a new general-purpose indexing and retrieval scheme to image data. This scheme was developed in Prof. Michael Clausen's research group and results from the fusion of a classical full-text retrieval algorithm with fundamental group theory. It has been successfully applied to multimedia data such as audio, music and 3D-meshes in previous work. The resulting image retrieval system quickly locates a given query image in a large image database, thus classifying the retrieval strategy as "query-by-example". Our system's specialty is its capability for subimage queries. This type of queries yields the exact position and orientation of a potentially small image fraction within a database image. In doing so, the allowed operations for aligning the query image with the database images are modeled by a group acting on a set of geometrical image features. Currently, the system supports the invariance groups of two-dimensional translations and two-dimensional Euclidean motions. Queries under the latter group only work well for very simple images; however, this is not due to a restriction of the querying technique as such. The system is rounded off by different means of introducing fault tolerance and robustness against image noise, leading to a promising new approach for certain image retrieval tasks.