論 文 の 内 容 の 要 旨

論文題目　　Retrieval and Drawing Assistance for Manga
　　　　　　（漫画の検索と描画支援）

氏　　名　　松井　勇佑

Manga are Japanese style comics, i.e., visual media by which ideas are expressed via images and texts. In Japan, the manga industry serves an extremely large market, and electronic manga (e-manga) are also becoming popular. E-manga are distributed not in print but electronically via online stores, and the market for e-manga is rapidly growing. For example, Amazon Kindle Store, which is one of the largest e-manga platforms, sells more than 130,000 e-manga titles. In the face of the massive quantities concerned, can we create amazing applications like those for naturalistic images? And if this is possible, what kind of new values can be generated? This is a central topic of this thesis.

To answer the question, we propose a fundamental component, a theoretical improvement, and a data-driven application. (1) Fundamental component: sketch-based retrieval architecture: To handle large scale data, the most basic operation is searching. In this thesis, we build a sketch-based manga retrieval framework. The framework is fast and memory efficient; it takes only 70 ms to search 21,142 pages, with a 204 MB memory footprint. From this result, we concluded that retrieval, the fundamental process for large-scale manga data, was achieved. (2) Theoretical improvement: efficient search using hash tables: Next, we develop a fast nearest-neighbor search method using hash tables. To handle more data, further improvement of a core part of the system, the nearest-neighbor search, is required. To cope with billion-scale data, we develop a product quantization table (PQTable). The PQTable produces exactly the same results as a linear PQ search, and is 102 to 105 times faster. (3) Data-driven application: drawing assistance: Finally, we create an application using large-scale image data. Essentially, drawing is a difficult task for novices. We present an interactive drawing system with visual feedback. The user studies indicated that the proposed system help novices draw their own sketches.

According to the proposed methods, this thesis will contribute to the fundamental technology for manga image processing, the theoretical improvement with regard to searches, and will create its application using a large-scale image database. We expect that this thesis will provide a promising future direction for research into manga image processing.