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**DATABASE CONSTRUCTION SYSTEM OF THE  
CRANIO-MAXILLO-FACIAL BONES USING FEATURE POINTS  
FROM 3-DIMENSIONAL CT DATA**

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Three-dimensional analysis of the craniofacial morphology is valuable for simulation and surgery of cranio-maxillo-facial region. We extracted feature points from 3-dimensional CT data of the cranio-maxillo-facial bones, constructed a database, analyzed the statistical properties of geometric characteristics, and 3-dimensionally reconstructed the skeleton based on partial data of this database. In this paper, a computer system design for the database construction is presented.

CT scanning of the cranio-maxillo-facial bones was performed, and 3-dimensional data of the bone component were extracted. After matching of the data to a cranial bone template prepared in advance at 87 points, the accuracy of the reconstructed 3-dimensional morphology of the cranial bone was evaluated. The dense registration of bone surface points is a key feature of the system, which allows detailed statistical analyses and reconstruction. We took a template-based approach to the registration problem. The predefined feature points are manually specified on the surface of CT images, and the system automatically fit the template bone surfaces to them using a Voronoi-based mesh morphing technique. We implemented a prototype system and CT data were processed, resulting in reasonable template fitting.

The construction and analysis of the 3-dimensional morphological database of the cranio-maxillo-facial bones allowed the clarification of the statistical properties of each area. In addition, this database may be clinically useful for planning surgery, simulation, and evaluation in patients with trauma, congenital anomalies, or defects after tumor resection. The method of using a template with correspondence to feature points is thought to be useful for the construction and analysis of a database.