A novel method for three-dimensional tooth axis and alignment using cone-beam computed tomography

**Keywords**

<table>
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<tr>
<th>Dentistry</th>
<th>Cone-beam CT</th>
<th>3D jaw and tooth</th>
<th>3D tooth axis</th>
<th>3D tooth alignment</th>
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**Summary**

We developed a global coordinate system based on maxillary and mandibular feature points from 3D reconstructions using in vivo cone-beam computed tomographic (CBCT) image data, devised a procedure for automatically calculating the tooth axis of the maxillary and mandibular anterior teeth and the absolute 3D position of the tooth alignment.

**Subject Details/Topic**

- We used 3D principle component analysis to calculate the tooth axis (PC-A) as the principal component of the long axis direction of tooth from six subjects.

- To evaluate tooth alignment, we determined a 3D global coordinate system using three feature points comprising the bilateral mental foramina in the mandible and the incisive canal in the maxilla by representing 3D tooth alignment in terms of tooth’s center of gravity (COG).

![](image)

**Advantages**

- Conventionally, tooth alignment is calculated from feature points on the surface of the tooth crown, using ambiguous target points. In comparison, tooth alignment is calculated in our method from the center of gravity of the 3D tooth shape, which gives it the advantage of using unambiguous target points derived from the unique 3D shape of each tooth.

**Applications**

- Orthodontic and prosthetics, especially we will be able to plan of surgical and evaluation of after surgical.

**Plans**

- We will incorporate our proposed method into CBCT’s software system.

**We hope to collaborate with...**

- It can be used for CBCT and dental companies (including software companies).

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