

Development of an AI system to predict facial morphology after orthodontic treatment

Principal Investigator

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Project Outline

Conventional prediction of facial changes after orthodontic treatment is based on the profile of the patient's hard tissues (dental skeleton) and soft tissues (muscles and skin) as depicted on a cephalogram before orthodontic treatment. There are many software that can visualize and simulate the lateral view after treatment by image processing, such as making the soft tissue follows proportionally the hard tissue moved on the 2D cephalogram. However, as shown in the table on the right, the accuracy of such models is low because some of them are based on wrong assumptions.

Conventional software

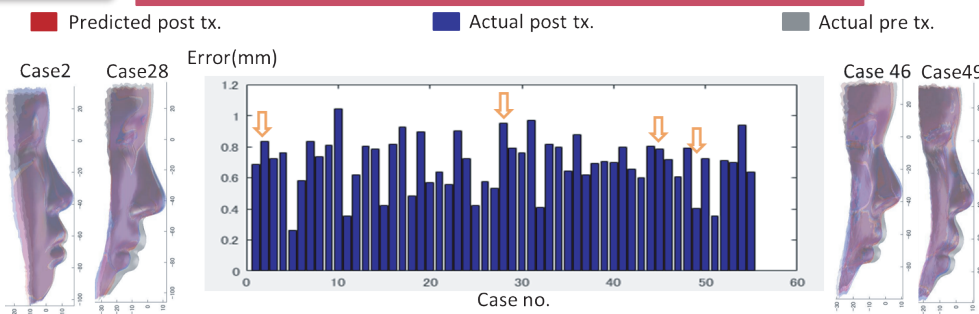
Parts	R ²
Upper lip and Maxillary front teeth	0.28
Lower lip and Lower front teeth	0.40

Very low

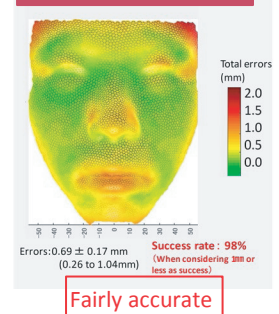
The purpose of this project was to create (1) an accurate simulation based on scientific evidence and (2) a 3D simulation, which was achieved by (1) mesh fitting to the face and (2) AI prediction.

Results

Errors of each case



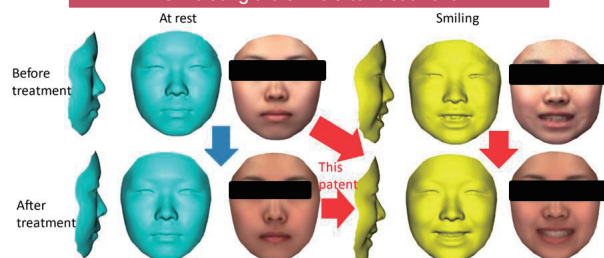
Total errors



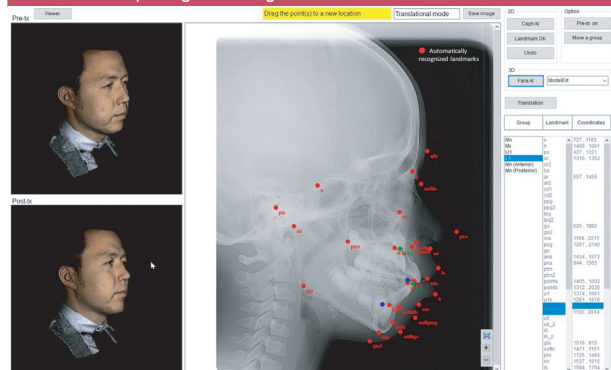
Related patents

Patients are most concerned about the change in their appearance. Thus far, there was no previous report on simulating changes in lip morphology during smiling after treatment. We created a new system that simulates facial changes during smiling.

Simulating the smile after treatment



Automatic cephalogram recognition & soft tissue simulation software



We also developed a diagnostic assistant tool, as shown in the figure above, which integrates AI to identify landmarks and soft tissue simulation.

Main Target Diseases

Malocclusion & Jaw Deformity

Number of Patients

Domestic: 6,000,000

Worldwide: 42,000,000

Patent

PCT application filed

Publications and Awards

• Scientific reports (*Sci Rep* **11**, 15853 (2021))

• INNOVATINO AWARD FOR EXCELLENCE IN ORTHODONTICS RESEARCH (2019)