CLAIMS

~~What is claimed is:~~

1. A tooth virtual editing method, comprising the steps of:

Step S1, constructing a three-dimensional image basic database of a human oral cavity;

Step S2, acquiring three-dimensional image data of a user oral cavity, performing image pattern recognition on the three-dimensional image data according to the stored three-dimensional image basic database, recognizing an object to which the image data belongs, and establishing an object annotation system of the user oral cavity; and

Step S3, performing virtual editing on the object according to the established object annotation system of the ~~a~~ current user's oral cavity, and displaying an updated three-dimensional image of user's teeth,

wherein said acquiring three-dimensional image data of the user's oral cavity comprises performing three-dimensional true color scanning on the user's oral cavity to obtain a spatial arrangement of the user's teeth and a three-dimensional true color curved surface image of the user's teeth, wherein the spatial arrangement comprises relationships between the teeth and an occlusal relationship between a maxillary dentition and mandibular a dentition in an occlusal state.

2. The tooth virtual editing method according to claim 1, wherein the object comprises: a block and/or an entity, wherein the block is formed by division according to curved surface images of different parts of the oral cavity, and the entity comprises: a tooth entity in a three-dimensional volume shape formed by enclosure of a plurality of blocks associated with a tooth part, and a dentition entity formed by combination of a plurality of tooth entities and gaps between the tooth entities.

3. The tooth virtual editing method according to claim 2, wherein the Step S2 further comprises:

Step S21, performing image pattern recognition on the three-dimensional image data, recognizing a block to which the image data belongs, outputting a recognition result, and establishing a block annotation system of the user's oral cavity; and

Step S22, establishing an entity annotation system covering the user's teeth according to image information of each block in the block annotation system and a spatial relationship between the blocks.

4. The tooth virtual editing method according to claim 3, wherein the three-dimensional image basic database of the human oral cavity stores three-dimensional curved surface image data and three-dimensional entity image data covering all regions of a human oral cavity surface, and editing item list information for performing editing on the object.

5. The tooth virtual editing method according to claim 4, wherein said editing item list information comprises: a serial number of an editing object, an editing content and an appearance image after editing, wherein the editing content contains an editing action for the operation object and parameter settings for the editing action.

6. The tooth virtual editing method according to claim 5, wherein the editing action comprises: removing dental plaque on a block, removing dental calculus on a block, removing pigment on a block, repairing a curved surface shape of a block, rotating a tooth entity, moving a tooth entity, stripping a tooth entity, performing

veneering or cosmetic crown treatment on a tooth entity, and repairing an inlay of a tooth entity; and the parameter settings include: specific quantized numerical parameters and value ranges of the editing action.

~~7. The tooth virtual editing method according to claim 4, wherein said acquiring three-dimensional image data of the teeth of the user oral cavity comprises:~~

~~performing three-dimensional true color scanning on the user oral cavity to obtain a spatial arrangement of the user's teeth and a three-dimensional true color curved surface image of the user's teeth, wherein the spatial arrangement comprises relationships between the teeth and an occlusal relationship between a maxillary dentition and mandibular a dentition in an occlusal state.~~

~~8~~7. The tooth virtual editing method according to claim ~~7~~1, wherein the method further comprises: performing scanning on user's face and user's oral fissure regions near user's ~~the~~ lips when the user's lips are closed or opened to obtain an oral cavity surface image visible from the outside in the user's oral fissure region, performing image pattern recognition on the oral cavity image visible in the user's oral fissure region according to the stored three-dimensional image basic database, recognizing a block to which the oral cavity surface visible in the user's oral fissure region belongs, outputting a recognition result, and establishing a block annotation system of the user's face and the user's oral fissure regions.

~~9~~8. The tooth virtual editing method according to claim ~~8~~7, wherein the three-dimensional image basic database pre-stores three-dimensional curved surface image data of human teeth in various scenarios, the three-dimensional curved surface image

is pre-divided into a plurality of mutually connected blocks, and annotation information is established for each said block, the annotation information containing image information of the block, a spatial position relationship between adjacent blocks, and a spatial position relationship between a certain maxillary dentition block and a corresponding mandibular dentition block abutting the maxillary dentition block, as well as a spatial position relationship between a certain mandibular dentition block and a corresponding maxillary dentition block abutting the mandibular dentition block in the occlusal state; and

the three-dimensional image basic database further pre-stores three-dimensional entity image data of human teeth in various scenarios, and the three-dimensional entity image data contains annotation information of a corresponding entity, the annotation information containing three-dimensional image data of the entity, a spatial position relationship between adjacent entities, and a spatial position relationship between a certain maxillary dentition entity and a corresponding mandibular dentition entity abutting the maxillary dentition entity, as well as a spatial position relationship between a certain mandibular dentition entity and a corresponding maxillary dentition entity abutting the mandibular dentition entity in the occlusal state.

~~10~~9. The tooth virtual editing method according to claim ~~9~~8, wherein pre-dividing the three-dimensional curved surface image into a plurality of mutually connected blocks comprises: firstly dividing the oral cavity surface into a series of mutually connected regions, and then dividing a curved surface image of a region into one or more mutually connected blocks.

~~11~~10. The tooth virtual editing method according to claim 4, wherein according to the three-dimensional image basic database, the acquired image data is matched with image data of a corresponding object stored in the three-dimensional image basic database according to a preset image pattern recognition algorithm to obtain a mapping relationship therebetween, an offending object is determined in the three-dimensional image of the user's teeth according to the mapping relationship, and editting is performed on the offending object.

~~12~~11. The tooth virtual editing method according to claim 4, wherein when the recognition for the acquired image data cannot be achieved based on the current basic database, the image data is uploaded to a cloud server for artificial recognition to input the annotation information or revise the editing item list information, and then the basic database is updated according to the recognition result, the annotation information and the editing item list information.

~~13~~12. The tooth virtual editing method according to claim ~~12~~11, wherein in a case of adding a new object and annotation information thereof into the basic database after artificial recognition, the editing list information of the object is added into the basic database by manual operation, and in a case of revising the annotation information of an existing object in the basic database without adding a new object after artificial recognition, whether to adaptively revise original editing item list information of the existing object in the basic database is determined by manual operation.

~~14~~13. A tooth virtual editing ~~system~~ device, comprising:

a three-dimensional image basic database established according to big data of human oral cavities;

an image data acquisition ~~module~~ device for acquiring and obtaining three-dimensional image data of a user's oral cavity and sending the three-dimensional image data to an image pattern recognition ~~module~~ device;

the image pattern recognition ~~module~~ device for receiving the three-dimensional image data sent by the image data acquisition ~~module~~ device, retrieving from the three-dimensional image basic basic database ~~of the system~~, and recognizing an object to which the three-dimensional image data belongs;

a virtual editing ~~module~~ device for, according to the recognized object, performing virtual editing on the three-dimensional image of the object; and

a display ~~module~~ device for displaying appearance of the edited three-dimensional image data of the object ~~user's teeth~~,

wherein said acquiring three-dimensional image data of the user's oral cavity comprises performing three-dimensional true color scanning on the user's oral cavity to obtain a spatial arrangement of the user's teeth and a three-dimensional true color curved surface image of the user's teeth, wherein the spatial arrangement comprises relationships between the teeth and an occlusal relationship between a maxillary dentition and mandibular a dentition in an occlusal state.

~~15~~14. The tooth virtual editing ~~module~~ device of claim ~~14~~13, wherein the pattern recognition ~~module~~ device performs pattern recognition on the three-dimensional image data of the user's oral cavity according to image information stored in the three-dimensional image basic database and determines a serial number of an object to which the three-dimensional image data belongs; and the virtual

editing ~~module~~ device indexes the serial number of the object to a specific object so as to obtain the image information of the object and retrieve editing item list information of the object in the three-dimensional basic database.

~~16~~15. The tooth virtual editing ~~module~~ device of claim ~~14~~13, wherein the system further comprises a cloud server connected with both the image pattern recognition ~~module~~ device and the three-dimensional image basic database, and when the recognition for the image data send by the image acquisition ~~module~~ device cannot be achieved by the image pattern recognition ~~module~~ device, the image data is sent to the cloud server for artificial recognition to input the annotation information and revise the editing item list information, and then the three-dimensional basic database is updated according to the recognition result, the annotation information and the editing item list information; and the cloud server performs iterative training on the image pattern recognition ~~module~~ device based on the updated three-dimensional basic database.

~~17~~16. A computer device comprising a memory and one or more processors, the memory having stored therein computer readable instructions which, when executed by the one or more processors, the one or more processors perform the method of claim 1 ~~steps of:~~

~~Step S1, constructing a three-dimensional image basic database of a human oral cavity;~~

~~Step S2, acquiring three-dimensional image data of a user oral cavity, performing image pattern recognition on the three-dimensional image data according to the stored~~

~~three-dimensional image basic database, recognizing an object to which the image data belongs, and establishing an object annotation system of the user oral cavity; and~~

~~Step S3, performing virtual editing on the object according to the established object annotation system of a current user, and displaying an updated three-dimensional image of user's teeth~~.

~~18~~17. ~~One or more~~A non-transistory computer-readable storage~~ media~~ medium having stored therein computer-readable instructions that, when executed by one or more processors, the one or more processors perform the method of claim 1~~ steps of:~~

~~Step S1, constructing a three-dimensional image basic database of a human oral cavity;~~

~~Step S2, acquiring three-dimensional image data of a user oral cavity, performing image pattern recognition on the three-dimensional image data according to the stored three-dimensional image basic database, recognizing an object to which the image data belongs, and establishing an object annotation system of the user oral cavity; and~~

~~Step S3, performing virtual editing on the object according to the established object annotation system of a current user, and displaying an updated three-dimensional image of user's teeth~~.