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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte STEFANO CORAZZA and EMILIANO GAMBARETTO

Appeal 2018-006481
Application 14/451,237
Technology Center 2600

Before MAHSHID D. SAADAT, BETH Z. SHAW, and
JOHN D. HAMANN, *Administrative Patent Judges*.

SAADAT, *Administrative Patent Judge*.

DECISION ON APPEAL

Pursuant to 35 U.S.C. § 134(a), Appellant[1] appeals from the Examiner's decision to reject claims 1 and 4–22, which are all the claims pending in this application.[2] We have jurisdiction under 35 U.S.C. § 6(b).

We affirm.

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[1] We use the word "Appellant" to refer to "applicant" as defined in 37 C.F.R. § 1.42. Appellant identifies the real party in interest as Adobe Systems Incorporated. Appeal Br. 3.
[2] Claims 2 and 3 have been canceled.

STATEMENT OF THE CASE

Introduction

Appellant's disclosure is directed to a method and system for "animation of 3D characters and more specifically to the rigging and animation of 3D characters" that use "a non-rigged mesh or a group of non-rigged meshes that define the appearance of the character." Spec. ¶¶ 2, 7.

Claim 1 is illustrative of the invention and reads as follows:

> 1. A method of automatically rigging at least one mesh to define an external appearance of a 3D character, comprising:
>
> creating a 3D representation of the external appearance of the 3D character;
>
> identifying salient points of the 3D representation;
>
> fitting, by a server, a reference skeleton to the 3D representation based on the identified salient points;
>
> calculating, by the server, skinning weights for the 3D representation based upon the fitted reference skeleton; and
>
> transferring the fitted reference skeleton and the calculated skinning weights to the 3D character.

The Examiner's Rejections

Claims 1, 4, 5, 17, and 18 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Lin (US 2011/0157306 A1; pub. June 30, 2011) and Isner (US 2007/0035541 A1; pub. Feb. 15, 2007). Final Act. 2–6.

Claims 6 and 7 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Lin, Isner, and Petrov (US 2002/0050988 A1; pub. May 2, 2002). Final Act. 6–7.

Claim 8 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Lin, Isner, and Petrov, in view of Lim (US 2009/0153554 A1; pub. June 18, 2009) and M. Belkin (*Laplacian Eigenmaps for*

Dimensionality Reduction and Data Representation, Neural Computation 15, pp. 1373–1396 (2003)). Final Act. 7–8.

Claims 9 and 10 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Lin, Isner, and Lim. Final Act. 8.

Claim 11 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Lin, Isner, Petrov, Lim, Belkin, and I. Baran (*Automatic Rigging and Animation of 3D Characters*, ACM Transactions on Graphics, Vol. 26, No. 3, Article 72, Publication date: July 2007). Final Act. 8–9.

Claim 12 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Lin, Isner, and T. Ju (*Reusable Skinning Templates Using Cage-based Deformations*, ACM Transactions on Graphics, Vol. 27, No. 5, Article 122, Publication date: December 2008). Final Act. 9–10.

Claims 13 and 15 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Lin, Isner, and Baran. Final Act. 10–11.

Claim 14 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Lin, Isner, Baran, and Handelman (US 6,088,042; iss. July 11, 2000). Final Act. 12.

Claim 16 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Lin, Isner, Baran, and Petrov. Final Act. 12–13.

Claims 19–21 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Lin, Isner, Lim, and Belkin. Final Act. 13.

Claim 22 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Lin, Isner, Lim, Belkin, and Baran. Final Act. 13–14.

ANALYSIS

We have reviewed the Examiner's rejections in light of Appellant's arguments that the Examiner has erred. We disagree with Appellant's conclusions. The Examiner has provided a comprehensive response, supported by sufficient evidence, to each of the contentions raised by Appellant. We adopt as our own (1) the findings and reasons set forth by the Examiner in the action from which this appeal is taken and (2) the reasons set forth by the Examiner in the Examiner's Answer in response to Appellant's Appeal Brief (*see* Ans. 3–7). However, we highlight and address specific findings and arguments for emphasis as follows.

Claims 1 and 17

In rejecting claim 1, the Examiner finds Lin discloses the recited method claims including creating a 3D representation of a 3D character, identifying its salient points, fitting a skeleton to the representation, and calculating the skinning weights for the 3D representation. Final Act. 2–3 (citing Lin ¶¶ 25, 28, 35–44). The Examiner also finds Isner teaches the claimed step of "transferring a fitted reference skeleton and the calculated skinning weights to the 3D character." Final Act. 3. With respect to performing the "fitting" step by a server, the Examiner take Official Notice that performing the recited tasks by computers connected across a network including servers would have been conventional and well known to one of ordinary skill in the art. *Id.* With respect to the reason for the combination, the Examiner finds the combination with Isner would have improved the animation capabilities for a 3D character. Final Act. 4–5 (citing Isner ¶ 8). The Examiner makes similar findings regarding the rejection of claim 17. Final Act. 5–6.

Appellant contends the proposed combination does not teach or suggest the claimed subject matter and asserts:

> More particularly, the combination of Lin in view of Isner fails to describe, teach, or otherwise suggest "creating a 3D representation of the external appearance of the 3D character" and subsequently "transferring the fitted reference skeleton and the calculated skinning weights to the 3D character" as recited by independent claim 1 or "automatically rig[ging] the 3D character by transferring the fitted reference skeleton and the calculated skinning weights to the 3D character" as recited by independent claim 17.

Appeal Br. 10–11. By referring to Paragraphs 25, 27, and 39 of Lin, Appellant assets the reference merely "teaches 'obtaining image data from a real [human] model' and 'constructing a virtual model in accordance with the image data'" and provides for "'fit[ting] the set of skeletons to the appearance features and the trunk features'" and "animating the avatar in virtual space." Appeal Br. 11; *see also* Reply Br. 3–4. According to Appellant, considering Lin's human model teaches the claimed 3D character and Lin's virtual model avatar teaches the claimed 3D representation, "requires Lin to teach transferring a reference skeleton fitted from the virtual model and skinning weights calculated for the virtual model back to the human model." Appeal Br. 12. Appellant also argues that Isner does not cure the deficiency of Lin because Isner also "teaches directly manipulating a 3D character itself (e.g., the character's face) rather than fitting and skinning a 3D representation of the external appearance of a 3D character." Appeal Br. 13.

The Examiner responds by restating Lin's disclosure in paragraphs 25–28, 30–31, and 36–38 and explaining that Lin establishes the 3D representation of a model and fits the template skeleton and the mesh vertex of the skin to the 3D character. *See* Ans. 3–4. With respect to Isner, the Examiner explains a soft tissue solver provides the necessary skinning weights for the surface mesh to be added or attached to the skeletal representation. Ans. 4 (citing Isner ¶¶ 7, 40). The Examiner further finds Isner teaches "transferring, . . . , skinning weights" by disclosing that the skin information generated by the soft tissue solver can be transferred to other objects. Ans. 4–5 (citing Isner ¶ 86).

We agree with the Examiner's finding that Lin's avatar includes a set of skeletons and a skin attached to the skeletons, whereas the skeletons have a set of moveable nodes (i.e., salient points) based on the information contained in a set of template skeletons and the skin is derived from skin information composed of data of a plurality of triangles or mesh vertices. *See* Lin ¶ 25–27. Lin also teaches adjusting the skeleton according to the size of the model and modifying the skin information by a mesh vertices weight calculating unit to fit and transfer the skin information to the skeletons template based on the relationship between the set of skeletons and the weights of the mesh vertices. *See* Lin ¶¶ 30–31. Similarly, Lin describes an animation generation method including reading out the skin information and the skeleton information, "wherein the skin information is composed of data of a plurality of mesh vertices, and the skeleton information comprises geometric data of each bone of the set of template skeletons and the linkage relationship between the bones of the set of template skeletons." Lin ¶ 38.

We also agree with the Examiner that that Isner provides the details of animation by attaching the skeleton to a mesh and the soft tissue information based on the skinning weights. Ans. 4 (citing Isner ¶¶ 7, 40). Contrary to

Appellant's argument that Lin does not "teach or suggest transferring the fitted reference skeleton and the calculated skinning weights to the 3D character" (Reply Br. 3), the transferring step is taught or suggested by Isner's description of how the motion or other attributes of the skin may be applied or transferred to other objects. See Ans. 4–5 (citing Isner ¶ 86). As stated by the Examiner, this characterization is also supported by Appellant's Specification describing "'Retargeting of motion data generally involves characterization, which is the process of bringing the character to a reference pose and of mapping the joints of the character's skeleton to a predefined reference skeleton' (Appellant's specification, para. 0005)." Ans. 5.

Accordingly, we are not persuaded by Appellant's arguments that the Examiner erred in finding the disclosures of Lin and Isner teach or suggest the disputed features of claims 1 and 17.

Claim 13

Appellant contends the rejection of claim 13 is in error because Lin does not teach or suggest "characterizing the fitted skeleton of the non-rigged mesh with respect to a reference skeleton." Appeal Br. 15. Appellant points to Paragraph 25 of Lin and argues:

> In direct contrast to independent claim 13, Lin teaches, "[f]or the convenience of subsequent processes, the model shot by the camcorders may be asked to face a designated direction with a designated posture." *Id.* at [0025], emphasis added. Lin continues, "[f]or example, the model may be asked to face ahead and stretch like an eagle with both hands and feet protrude sideways and outwards, respectively." *Id.* Accordingly, because Lin teaches capturing a human model in a designated pose, Lin negates the need to characterize a skeleton fitted to a non-rigged mesh with respect to a reference skeleton. Therefore, it is not surprising that Lin does not teach or suggest

> "characterizing the fitted skeleton of the non-rigged mesh with respect to a reference skeleton," as recited by independent claim 13.

Appeal Br. 15–16.

The Examiner responds the non-rigged mesh of Lin is formed of 20 thousand triangle meshes having additional information such as color, material and weights information. Ans. 5 (citing Lin ¶ 25). The Examiner further finds Isner teaches that a mesh is represented by a data structure including information about vertices, edges, and faces, which in combination with Lin, suggests defining skinning weights and characterizing the fitted skeleton steps. Ans. 5–6; *see also* Final Act. 10–11.

We agree with the Examiner. As discussed above, Lin teaches adjusting the skeleton and modifying the skin information by a mesh vertices weight calculating unit to fit the skeleton, which is later transferred to the skeletons template based on the relationship between the set of skeletons and the weights of the mesh vertices. *See* Lin ¶¶ 30–31. Lin also discloses reading out the skeleton information provides geometric data of each bone of the set of template skeletons and the linkage relationship between the bones of the set of template skeletons, which suggests a fitted skeleton is characterized based on a reference skeleton, as recited in claim 13.

Accordingly, we are not persuaded by Appellant's arguments that the Examiner erred in finding the disclosures of Lin, Isner, and Baran teach or suggest the disputed features of claim 13.

Claim 7

Appellant contends the rejection of claim 13 is in error because the proposed combination of references, and the relied portion of Petrov in particular, fails to teach or suggest "the 3D representation is a single closed form mesh. Appeal Br. 18. Appellant specifically argues that Petrov trims and patches parts of the mesh, but not a single closed mesh. Appeal Br. 19.

We are unpersuaded. As explained by the Examiner, Petrov creates a 3D polygonal mesh model of the object that is based on the silhouette contour polygons and removal of extraneous spaces from the initial model. Ans. 6 (citing Abs.); *see also* Final Act. 6–7. Therefore, although Petrov teaches "trimming and patching the holes," the result is a construct that comprises "a single closed form mesh." We also agree with the Examiner's explanation that the resulting mesh meets the claim language because "a continuous object that is patched for holes constitutes a single form mesh." Final Act. 6–7.

Accordingly, we are not persuaded by Appellant's arguments that the Examiner erred in finding the disclosures of Lin, Isner, and Petrov teach or suggest the disputed features of claim 7.

Claim 8

Appellant contends, in addition to Lin, Isner, and Petrov, the Examiner improperly relies on Lim and Belkin as disclosing isomaps and laplacian eigenmaps is in error because Lim is unrelated to the recited features and Belkin "is unrelated to identifying salient points of a 3D representation of the external appearance of a 3D character." Appeal Br. 20. The Examiner responds the proposed combination teaches or suggests the claimed features of claim 8 because Isner teaches identifying the salient points, Lim teaches analyzing and detecting feature points to translate them to feature points, whereas Belkin teaches methods of pattern recognition such as Isomaps, Laplacian, and PCA (principal components analysis) approaches. Ans. 6.

We agree with the Examiner that Belkin's algorithm improves information retrieval and data mining applied to imaging and mapping. *See* Belkin, Introduction. Therefore, although Belkin does not mention "identifying salient points of a 3D representation," one of ordinary skill in the art would have looked at the techniques disclosed in Belkin to perform the specific patter recognition for identifying those points on a 3D representation of the 3D character. *See* Final Act. 8.

Accordingly, we are not persuaded by Appellant's arguments that the Examiner erred in finding the disclosures of Lin, Isner, and Petrov, in combination with Lim and Belkin teach or suggest the disputed features of claim 7.

Summary

For the above-stated reasons, we are not persuaded by Appellant's arguments that the Examiner erred in finding the combination of the references teaches or suggests the disputed features of claims 1, 7, 8, and 13. Therefore, we sustain the 35 U.S.C. § 103(a) rejection of claims 1, 7, 8, and 13, as well as the remaining claims which are not argued separately or with sufficient specificity.

CONCLUSION

We affirm the Examiner's decision to reject claims 1 and 4–22.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv).

In summary:

Claims Rejected	**Basis**	**Affirmed**	**Reversed**
1 and 4–22	§ 103	1 and 4–22	
Overall Outcome		1 and 4–22	

AFFIRMED