

CLAIMS

1. A method comprising:
 - determining a three-dimensional (3D) model of a face of an individual based on a plurality of different images of the individual;
 - extracting two-dimensional (2D) patches from the 3D model; and
 - generating a plurality of signatures of the face using different combinations of the 2D patches, wherein the plurality of signatures correspond to respective views of the 3D model from different angles;
 - determining a plurality of attributes of the individual that semantically describe characteristics of the individual; and
 - indexing the plurality of signatures based on the plurality of attributes.
2. The method of claim 1, wherein the determining the 3D model comprises:
 - identifying elements of the 3D model lacking information from the plurality of images; and
 - providing the information for the identified elements using domain knowledge compiled from individuals having attributes similar to those of the individual.
3. The method of claim 1, further comprising modifying the 3D model by normalizing lighting variations in the 3D model.
4. The method of claim 1, further comprising neutralizing a facial expression resulting from the plurality of different images of the individual.
5. The method of claim 1, further comprising modifying the 3D model based on an age of the individual.

6. The method of claim 1, further comprising determining respective uncertainty values for the plurality of signatures, wherein the uncertainty values are based on a quality of respective 2D patches included in the plurality of signatures.

7. The method of claim 1, further comprising determining that a face image matches at least one of the plurality of signatures.

8. The method of claim 7, wherein the determining that the face image matches comprises modifying a resolution of the plurality of signatures based on a resolution of the face image.

9. The method of claim 7, wherein the determining that the face image matches comprises matching using a plurality imaging modalities.

10. The method of claim 1, wherein the plurality of signatures of the face are iteratively refined using a number of additional face images of the individual.

11. The method of claim 10, wherein the plurality of signatures of the face has a fixed size irrespective of the number of additional face images.

12. The method of claim 1, further comprising:
determining uncertainty metrics corresponding, respectively, to the plurality of signatures;
associating the plurality of signatures with the corresponding uncertainty metrics.

13. The method of claim 1, further comprising determining which of the plurality of signatures corresponds to a portion of the face having a greatest number of

discriminative features.

14. A facial recognition system comprising:

a processor;

a storage system;

program instructions stored on a computer readable hardware storage device for execution by the processor, the program instructions comprising:

program instructions that determine a three-dimensional (3D) model of a face of an individual based on a plurality of different images of the individual;

program instructions that extract two-dimensional (2D) patches from the 3D model; and

program instructions that generate a plurality of signatures of the face using different combinations of the 2D patches, wherein the plurality of signatures correspond to respective views of the 3D model from different angles;

determining a plurality of attributes of the individual that semantically describe characteristics of the individual; and

indexing the plurality of signatures based on the plurality of attributes.

15. The system of claim 14, wherein the determining the 3D model comprises:

identifying elements of the 3D model lacking information from the plurality of images; and

providing the information for the identified elements using domain knowledge compiled from individuals having attributes similar to those of the individual.

16. The system of claim 14, further comprising modifying the 3D model by normalizing lighting variations in the 3D model.

17. The system of claim 14, further comprising normalizing a facial expression resulting from the plurality of different images of the individual.

18. The system of claim 14, further comprising modifying the 3D model based on an age of the individual.

19. The system of claim 14, further comprising determining respective uncertainty values for the plurality of signatures, wherein the uncertainty values are based on a quality of respective 2D patches included in the plurality of signatures.

20. The system of claim 14, further comprising determining that a face image matches at least one of the plurality of signatures.

21. The system of claim 20, wherein the determining that the face image matches comprises modifying a resolution of the plurality of signatures based on a resolution of the face image.

22. The system of claim 20, wherein the determining that the face image matches comprises matching using a plurality imaging modalities.

23. The system of claim 14, wherein the plurality of signatures of the face are iteratively refined using a number of additional face images of the individual.

24. The system of claim 14, wherein the plurality of signatures of the face has a fixed size irrespective of the number of additional face images.

25. The system of claim 14, further comprising:

determining uncertainty metrics corresponding, respectively, to the plurality of signatures;

associating the plurality of signatures with the corresponding uncertainty metrics.

26. The system of claim 14, further comprising determining which of the plurality of signatures corresponds to a portion of the face having a greatest number of discriminative features.