

CLAIMS

1. An aging analysis method comprising:

acquiring a feature vector of a subject which is related to a plurality of morphological features correlated to age;

determining a factor expression pattern indicating expressed states of a plurality of common aging factors in the subject by using the plurality of common aging factors extracted by performing factor analysis on a set of feature vectors related to a population including a plurality of persons and the feature vector of the subject; and

acquiring aging information of the subject based on the factor expression pattern of the subject.

2. The aging analysis method according to claim 1,

wherein the determining of the factor expression pattern includes calculating respective factor scores of the subject which are related to the plurality of common aging factors by using the feature vector of the subject, and

the factor expression pattern of the subject is determined based on the respective factor scores of the common aging factors of the subject.

3. The aging analysis method according to claim 2,

wherein the determining of the factor expression pattern includes

determining expressed states of the common aging factors in an individual sample or the subject by comparing a threshold indicating a predetermined position in a factor score distribution of the population and the factor score of the individual sample included in the population or the subject with respect to each of the plurality of common aging factors, and

determining the factor expression pattern indicating at least one common aging factor determined to be expressed as the expressed state for the subject or the individual sample.

4. The aging analysis method according to claim 2 or 3,

wherein, in the calculating of the factor scores of the subject, the feature vector of the subject is applied to the respective multiple regression equations acquired by respectively applying multiple regression analyses of the respective common aging factors using the feature vector related to the plurality of morphological features as an

explanatory variable group and the factor score as an objective variable to a set of feature vectors related to the population.

5. The aging analysis method according to claim 4,

wherein the population does not include the subject, and the aging analysis method further includes

applying the multiple regression analyses of the respective common aging factors to the set of feature vectors related to the population and the feature vector of the subject, and

replacing the original multiple regression equations acquired from the population with multiple regression equations which are respectively acquired by performing the multiple regression analyses of the respective common aging factors.

6. The aging analysis method according to claim 2 or 3,

wherein the population includes the subject, and

in the calculating of the factor scores of the subject, the respective factor scores of the common aging 5 factors related to respective individual samples of the population are calculated by using the set of feature vectors related to the population, a correlation coefficient group between the plurality of morphological features, and a factor loading group acquired through the factor analysis.

7. The aging analysis method according to claim 2,

wherein the factor expression pattern is determined for each of the individual samples of the population depending on the respective factor scores of the common aging factors of the individual sample,

the determining of the factor expression pattern includes acquiring representative values of the feature vectors of the individual samples having the same factor expression pattern for the plurality of respective factor expression patterns determined for the population, and

calculating distances between the feature vector of the subject and the respective representative values of the factor expression patterns, and

the factor expression pattern of the subject is determined based on the distances.

8. The aging analysis method according to any one of claims 2 to 7,

wherein correlation coefficients between the age and the factor scores related to the respective common aging factors in the individual samples included in the

population are respectively greater than a limit value having a significance level of 1% in the number of samples of the population.

9. The aging analysis method according to any one of claims 2 to 8,

wherein the acquiring of the aging information includes selecting a group corresponding to the factor expression pattern of the subject from a plurality of groups acquired by classifying all factor expression patterns corresponding to all combinations of the respective expressed states of the common aging factors according to commonality of the aging information.

10. The aging analysis method according to claim 9,

wherein the factor expression pattern is determined for each of the individual samples of the population depending on the respective factor scores of the common aging factors of the individual sample, and

all the factor expression patterns are classified into the plurality of groups based on at least one of the age, the factor scores, and the number of expressed factors of each of the samples having the same factor expression pattern.

11. The aging analysis method according to claim 9 or 10,

wherein the plurality of groups are formed according to age groups, and

the factor expression patterns in which the common aging factors are not expressed or only one common aging factor is expressed are classified into the youngest age group of the plurality of groups, and the factor expression patterns in which all the common aging factors are expressed and the factor expression patterns in which the number of common aging factors which is one less than that of all the common aging factors is expressed are classified into the oldest age group of the plurality of groups.

12. The aging analysis method according to any one of claims 9 to 11,

wherein the acquiring of the aging information further includes acquiring aging information assigned to the group selected depending on the factor expression pattern of the subject.

13. The aging analysis method according to any one of claims 1 to 12,

wherein the plurality of morphological features correlated with the age includes at least two elements of: at least one of a philtrum length and a thinness of a lip; a size of an eye; a slant of the eye; a slant of an eyebrow; and swelling of a lower jaw.

14. The aging analysis method according to any one of claims 1 to 13,

wherein the age is a perceived age,

the number of common aging factors is 5, and

the feature vector related to the plurality of morphological features correlated to the perceived age includes a plurality of feature quantities indicating the philtrum length 5 and the thinness of the lip, a plurality of feature quantities indicating a relative size of the eye with respect to a cheek breadth, a plurality of feature quantities indicating slants of the eye in a vertical direction and a forth and back direction, a plurality of feature quantities indicating drooping of the eyebrow with respect to the cheek breadth, and a plurality of feature quantities indicating a size of a mandible breadth with respect to the cheek breadth, and the positional relationship between a chin, an ear and a mandibular angle point.

15. The aging analysis method according to any one of claims 1 to 14,

wherein the plurality of morphological features correlated to the age is selected from many morphological features on a head surface of a person, based on multiple correlation coefficients of morphological features acquired by multiple regression analyses using a feature vector related to the many morphological features as an explanatory variable group and the age as an objective variable.

16. An aging care counseling method that includes the aging analysis method according to any one of claims 1 to 15.

17. An aging analysis apparatus comprising:

an acquisition unit that acquires a feature vector of a subject related to a plurality of morphological features correlated to age; a determination unit that determines a factor expression pattern indicating expressed states of a plurality of common aging factors in the subject by using the plurality of common aging 5 factors extracted by performing factor analysis on a set of feature vectors related to a population including a plurality of persons and the feature vector of the subject; and

an output unit that outputs aging information of the subject based on the factor expression pattern of the subject.

18. The aging analysis apparatus according to claim 17,

wherein the output unit outputs the aging information indicating names which are respectively assigned to the plurality of common aging factors and the factor expression pattern of the subject.

19. The aging analysis apparatus according to claim 17 or 18,

wherein the output unit outputs the aging information assigned to the group selected depending on the factor expression pattern of the subject.

20. The aging analysis apparatus according to any one of claims 17 to 19, further comprising:

an analysis processing unit that performs factor analysis using the number of common aging factors on feature groups of a plurality of individual samples, which are related to the plurality of morphological features,

wherein the acquisition unit further acquires a feature vector of a new individual sample which is not included in the population, which is related to the plurality of morphological features, and the analysis processing unit performs the factor analysis on the feature vector of the new individual sample and the set of feature vectors of the population,

newly calculates factor scores of common aging factors related to the respective individual samples of a new population acquired by adding the new individual sample to the population by using a factor loading group newly acquired through the factor analysis, and updates original information acquired from the population by the newly acquired factor loading group and the factor scores related to the respective individual samples of the new population.

21. A program causing at least one computer to execute the aging analysis method according to any one of claims 1 to 15.