

EMOTION IDENTIFICATION METHOD, DEVICE, AND STORAGE MEDIUM

This application claims priority to the Chinese Patent Application No. 201711289932.2, filed
5 with the National Intellectual Property Administration, PRC on December 8, 2017, and entitled
"EMOTION IDENTIFICATION METHOD, DEVICE, AND STORAGE MEDIUM", which is
incorporated herein by reference in its entirety.

TECHNICAL FIELD

This application relates to the field of video processing technologies, and in particular, to an
10 emotion identification method and device, and a computer readable storage medium.

BACKGROUND

The comparison question test (CQT), also known as the control question test, was invented by
John Reid from Chicago, USA in 1947. The CQT usually involves three types of questions: neutral
questions, comparison questions, and relevant questions. Neutral questions, also known as unrelated
15 questions, are not related to a test subject and do not cause psychological stress on the test object. The
comparison questions are questions to which the test object is bound to or is likely to make a
dishonest answer. The comparison questions can cause certain psychological pressure on the test
object, but have nothing to do with the test subject and are used to compare with the relevant
questions. The relevant questions, namely the questions related to the test subject, are the questions to
20 be identified by the test. The theoretical basis of the CQT is: honest people are afraid of the
comparison questions, and will have a greater psychological reaction to the comparison questions,
while those who conceal the truth are more afraid of relevant questions and will have a greater
psychological reaction to the relevant questions.

When the test object answers relevant questions, emotions of honest people are genuine, while
25 those who conceal the truth will deliberately hide genuine emotions. However, there is a lack of
objective and effective methods for identifying emotions of the test object. Usually, the identification
of the test object's emotions either depends on a tester's experience or is performed by recording the

test object's physiological response map for each problem by using a multichannel testing instrument. A judgment result of the former is often inaccurate and not objective, and the latter is of a contact type, which easily infringes on the human rights of the test object, and the test object is also prone to conflict, thereby affecting the test result.

SUMMARY

In order to solve the deficiencies of the prior art, this application provides an emotion identification method and device, and a computer readable storage medium. By combining the CQT, an expression feature of a test object when answering different types of questions is analyzed, thereby achieving objective and non-contact type emotion identification.

To achieve the above objective, this application provides an emotion identification method, which is applied to an electronic device, and the method includes:

a question bank construction step: automatically generating a large quantity of neutral questions, comparison questions, and relevant questions according to information of a test object, and constructing a test question bank;

a questionnaire generation step: generating a test questionnaire according to the test question bank;

a video segmentation step: recording a video of the test object answering the test questionnaire, segmenting the video in units of a single question, and obtaining a video segment for each question answered by the test object;

a feature extraction step: extracting an expression feature vector from each video segment, and using the same as the feature vector of the corresponding question;

a calculation step: calculating a feature vector of a center point of the neutral questions, a feature vector of a center point of the comparison questions, a first distance between a feature vector of each relevant question and the feature vector of the center point of the neutral questions, and a second distance between the feature vector of each relevant question and the feature vector of the center point of the comparison questions; and

an identification step: when the first distance is greater than the second distance, determining that the test object concealed genuine emotions when answering the relevant question, and when the

first distance is less than the second distance, determining that the emotions expressed by the test object are genuine when answering the relevant question.

This application also provides an electronic device including a memory and a processor, and the memory includes an emotion identification program. The electronic device is directly or indirectly
5 connected to a photographing device, and the photographing device transmits a recorded video to the electronic device. When the processor of the electronic device executes the emotion identification program in the memory, the following steps are implemented:

a question bank construction step: automatically generating a large quantity of neutral questions, comparison questions, and relevant questions according to information of a test object, and
10 constructing a test question bank;

a questionnaire generation step: generating a test questionnaire according to the test question bank;

a video segmentation step: recording a video of the test object answering the test questionnaire, segmenting the video in units of a single question, and obtaining a video segment for each question
15 answered by the test object;

a feature extraction step: extracting an expression feature vector from each video segment, and using the same as the feature vector of the corresponding question;

a calculation step: calculating a feature vector of a center point of the neutral questions, a feature vector of a center point of the comparison questions, a first distance between a feature vector of each
20 relevant question and the feature vector of the center point of the neutral questions, and a second distance between the feature vector of each relevant question and the feature vector of the center point of the comparison questions; and

an identification step: when the first distance is greater than the second distance, determining that the test object concealed genuine emotions when answering the relevant question, and when the
25 first distance is less than the second distance, determining that the emotions expressed by the test object are genuine when answering the relevant question.

In addition, in order to achieve the above objective, this application further provides a computer readable storage medium including an emotion identification program, and when the emotion

identification program is executed by a processor, any step in the emotion identification method described above is implemented.

According to the emotion identification method and device, and the computer readable storage medium provided by this application, a large quantity of neutral questions, comparison questions, and relevant questions are automatically generated according to information of the test object. Then, a certain number of three types of questions are selected and sorted to generate a test questionnaire. When the test object answers the test questionnaire, an expression feature vector is extracted from each video segment of the test object answering each question, and is used as the feature vector of the corresponding question. Feature vectors of center points of both the neutral questions and the comparison questions, a first distance between a feature vector of each relevant question and the feature vector of the center point of the neutral questions, and a second distance between the feature vector of each relevant question and the feature vector of the center point of the comparison questions are calculated. When the first distance is greater than the second distance, it is determined that the test object concealed genuine emotions when answering the relevant question, and when the first distance is less than the second distance, it is determined that the emotions expressed by the test object are genuine when answering the relevant question. According to this application, an emotional state of the test object when answering the relevant questions can be objectively identified without contact.

BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 is an application environment diagram of an electronic device according to a first preferred embodiment of this application;

FIG. 2 is an application environment diagram of an electronic device according to a second preferred embodiment of this application;

FIG. 3 is a program module diagram of an emotion identification program in FIGs. 1 and 2; and

FIG. 4 is a flowchart of an emotion identification method according to a preferred embodiment of this application.

The implementation, functional features and advantages of this application will be further described in combination with embodiments with reference to the accompanying drawings.

DESCRIPTION OF EMBODIMENTS

The principles and spirit of this application will be described below with reference to a plurality of specific embodiments. It should be understood that the specific embodiments described herein are merely illustrative of this application and are not intended to limit this application.

Referring to FIG. 1, an application environment diagram of an electronic device according to a first preferred embodiment of this application is illustrated. In this embodiment, a photographing device 3 is connected to an electronic device 1 via a network 2. The photographing device 3 records a video of the test object answering the test questionnaire (mainly photographing a face video of the test object), and transmits the video to an electronic device 1 via the network 2. The electronic device 1 analyzes the video using an emotion identification program 10 provided by this application to obtain an emotion identification result for the test object.

The electronic device 1 may be a terminal device having storage and computing functions, such as a server, a smart phone, a tablet computer, a portable computer, and a desktop computer.

The electronic device 1 includes a memory 11, a processor 12, a network interface 13, and a communication bus 14. The photographing device 3 is installed in a specific place, such as an interrogation room, a laboratory, or a credit review place, and configured to record a video of the test object answering the test questionnaire, and then transmit the video to the memory 11 via the network 2. The network interface 13 may include a standard wired interface and a wireless interface (such as a Wi-Fi interface). The communication bus 14 is configured to implement connection communication between these components.

The memory 11 includes at least one type of readable storage medium. The at least one type of readable storage medium may be a non-volatile storage medium such as a flash memory, a hard disk, a multimedia card, or a card-type memory. In some embodiments, the readable storage medium may be an internal storage unit of the electronic device 1, such as a hard disk of the electronic device 1. In some other embodiments, the readable storage medium may also be an external memory 11 of the electronic device 1, such as a plug-in hard disk provided on the electronic device 1, a Smart Media Card (SMC), a Secure Digital (SD) card, or a Flash Card.

In this embodiment, the memory 11 stores a program code of the emotion identification program 10, a video recorded by the photographing device 3, other data applied when the processor 12

executes the program code of the emotion identification program 10, data output finally, and the like.

The processor 12 may be a Central Processing Unit (CPU), a microprocessor or other data processing chips in some embodiments.

FIG. 1 shows only the electronic device 1 with components 11-14, but it should be understood
5 that it is not required to implement all illustrated components, and more or fewer components may be implemented instead.

Optionally, the electronic device 1 may further include a user interface. The user interface may include an input unit such as a keyboard, a voice input device such as a microphone that has a voice identification function, and a voice output device such as a loudspeaker box or a headphone.
10 Optionally, the user interface may also include a standard wired interface and a wireless interface.

Optionally, the electronic device 1 may further include a display. The display may be an LED display, a liquid crystal display, a touch type liquid crystal display, an Organic Light-Emitting Diode (OLED) touch sensor or the like in some embodiments. The display is configured to display information processed by the electronic device 1 and a visualized user interface.

15 Optionally, the electronic device 1 may further include a touch sensor. An area provided by the touch sensor for a user to perform a touch operation is referred to as a touch area. In addition, the touch sensor described herein may be a resistive touch sensor, a capacitive touch sensor, or the like. Moreover, the touch sensor includes not only a contact-type touch sensor but also a proximity-type touch sensor or the like. In addition, the touch sensor may be a single sensor or a plurality of sensors
20 arranged in an array, for example. A user, such as a tester and a test object, can start the emotion identification program 10 by touch.

The electronic device 1 may further include a Radio Frequency (RF) circuit, a sensor, an audio circuit, and the like, and details are not described herein.

Referring to FIG. 2, an application environment diagram of an electronic device according to a
25 second preferred embodiment of this application is illustrated. The test object and the tester remotely execute a test link through a terminal 3, and a photographing device 30 of the terminal 3 records a video of the test object answering a test questionnaire and transmits the video to the electronic device 1 via a network 2, and a processor 12 of the electronic device 1 executes a program code of an

emotion identification program 10 stored in the memory 11 and analyzes the video to obtain an emotion identification result of the test object for reference by the tester.

A reference is made to the introduction of FIG. 1 for components of the electronic device 1 in FIG. 2, such as a memory 11, a processor 12, a network interface 13 and a communication bus 14 shown in the drawings, as well as components not shown.

The terminal 3 may be a terminal device having storage and computing functions, such as a smart phone, a tablet computer, a portable computer, and a desktop computer.

When the emotion identification program 10 in FIG. 1 and FIG. 2 is executed by the processor 12, the following steps are implemented:

a question bank construction step: automatically generating a large quantity of neutral questions, comparison questions, and relevant questions according to information of a test object, and constructing a test question bank;

a questionnaire generation step: generating a test questionnaire according to the test question bank;

a video segmentation step: recording a video of the test object answering the test questionnaire, segmenting the video in units of a single question, and obtaining a video segment for each question answered by the test object;

a feature extraction step: extracting an expression feature vector from each video segment, and using the same as the feature vector of the corresponding question;

a calculation step: calculating a feature vector of a center point of the neutral questions, a feature vector of a center point of the comparison questions, a first distance between a feature vector of each relevant question and the feature vector of the center point of the neutral questions, and a second distance between the feature vector of each relevant question and the feature vector of the center point of the comparison questions; and

an identification step: when the first distance is greater than the second distance, determining that the test object concealed genuine emotions when answering the relevant question, and when the first distance is less than the second distance, determining that the emotions expressed by the test object are genuine when answering the relevant question.

For a detailed description of the above steps, please refer to the following description of a program module diagram of an emotion identification program 10 in FIG. 3 and a flowchart of an emotion identification method according to a preferred embodiment in FIG. 4.

Referring to FIG. 3, a program module diagram of an emotion identification program 10 in FIGs. 1 and 2 is illustrated. In this embodiment, the emotion identification program 10 is segmented into a plurality of modules, and the plurality of modules are stored in the memory 11 and executed by the processor 12 to complete this application. A module as referred to in this application refers to a series of computer program instruction segments that can perform a particular function.

The emotion identification program 10 can be segmented into a question bank construction module 110, a questionnaire generation module 120, a video segmentation module 130, a feature extraction module 140, a calculation module 150, and an identification module 160. The question bank construction module 110 is configured to automatically generate a large quantity of neutral questions, comparison questions, and relevant questions according to information of a test object, and construct a test question bank. Before a test link is officially started, the tester learns about multi-aspect information on the test object in many ways, including basic information such as ID card information, contact number, address information, education, and occupation, as well as personal information related to the test subject, such as credit history and history of crimes. The question bank construction module 110 automatically generates a large quantity of neutral questions, comparison questions, and relevant questions according to the information of the test object. For example, the question bank construction module 110 can generate the following neutral questions:

What is your date of birth?

What is the name of the park closest to your home?

How long is your daily commute on the road?

What is the name of your primary school?

Is there a "Hive-Box" smart delivery locker near your home?

Assuming that the test object is a loan applicant, the comparison questions that the question bank construction module 110 can generate are as follows:

Have you ever borrowed money from a friend and later forgot about it?

Have you ever blamed someone else for your own fault?

Have you been in arrears with utility bills?

Have you ever told a lie?

Have you ever had the experience of covering up the truth in order to avoid being punished?

5 In accordance with the above examples, assuming that the test object is a loan applicant, the relevant questions that the question bank construction module 110 can generate are as follows:

What is the purpose of your loan application this time?

Does your family support you to apply for a loan?

Does your family have a large capital expenditure plan in the coming months? Will it affect your
10 repayment confidence?

Do you have other loan application plans in the near future?

The foregoing introduction to the generation of a large quantity of neutral questions, comparison questions, and relevant questions only provides some examples and is not exhaustive. The generated questions and the material information on which generation of questions is based are stored in the
15 memory 11 of the electronic device 1.

The questionnaire generation module 120 is configured to generate a test questionnaire according to the test question bank. After the construction of the test question bank, the selection and sequence of the questions are important factors affecting the quality of the test questionnaire. The quality of the test questionnaire directly affects the accuracy and reliability of emotion identification
20 results. In this embodiment, the test questionnaire includes at least two comparison questions, the number of the comparison questions is less than the number of relevant questions and the number of neutral questions, respectively, and the same type of questions are not adjacent.

The requirements for that "the same type of questions are not adjacent" are to highlight the change in expression of the test object in the face of different types of questions. In addition, the
25 number of questions in each test questionnaire should be greater than a preset number (for example, 15) to ensure the scope of the test. The first and last questions of the test questionnaire should be set to be neutral questions to help the test object to adjust their emotions and relax.

The video segmentation module 130 is configured to segment a video of the test object

answering the test questionnaire, and obtain a video segment for each question answered by the test object. The photographing device 3 in FIG. 1 or the photographing device 30 of the terminal 3 in FIG. 2 records a video of the test object answering the test questionnaire, and the video segmentation module 130 segments the video in units of a single question, and obtains a video segment for each question answered by the test object. When a video of the test object answering the test questionnaire is recorded, an answering limit time may be set for each question (such as 20 s), and a next question is displayed when the preset answering limit time is exceeded.

The feature extraction module 140 is configured to extract an expression feature vector of each video segment. When the feature extraction module 140 extracts an expression feature vector of a video segment, action features such as a head orientation, an eye orientation and a facial Action Unit (AU) are extracted from the video segment first, and then the number of occurrences of each action feature in the video segment and the duration are counted; high-order expression features of the video segment are constructed according to a statistical result, and then a feature selection algorithm is used to select an optimal feature subset from high-order expression features of the video segment, and finally dimensionality reduction is performed on the optimal feature subset to obtain an expression feature vector of the video segment in a two-dimensional space. Since the video segments have one-to-one correspondence to the questions in the test questionnaire, for ease of expression, an emotion feature vector of the video segment is regarded as the feature vector of the corresponding question.

In this embodiment, the feature screening algorithm may be a Sequential Forward Selection (SFS) algorithm, a Sequential Backward Selection (SBS) algorithm, a Bidirectional Search (BDS) algorithm, or a Filter Feature Selection algorithm, and may also be another feature screening algorithm. The dimensionality reduction uses a t-SNE algorithm to project a high-dimensional (for example, 4710-dimensional) expression feature into the two-dimensional space, and obtains an expression feature vector of the video segment in a two-dimensional space to facilitate visual display.

The calculation module 150 is configured to calculate a feature vector of a center point of the neutral questions, a feature vector of a center point of the comparison questions, a first distance

between a feature vector of each relevant question and the feature vector of the center point of the neutral questions, and a second distance between the feature vector of each relevant question and the feature vector of the center point of the comparison questions. The feature vector of the center point of the neutral questions and the feature vector of the center point of the neutral questions can be calculated by a K-means algorithm, and a mean value of the feature vectors of the neutral questions and a mean value of the feature vectors of the comparison questions may be calculated, and the mean value of the feature vectors is used as the feature vector of the center point. Then, a first distance between the feature vector of each relevant question and the feature vector of the center point of the neutral questions and a second distance between the feature vector of each relevant question and the feature vector of the center point of the comparison questions are calculated.

For example, assuming that a test questionnaire contains n_1 neutral questions, n_2 comparison questions, and n_3 relevant questions, and a feature vector of a center point of the n_1 neutral questions is calculated as (y_i, y_i) , and a feature vector of a center point of the n_2 comparison questions is calculated as (x_c, y_c) , then a first distance between a feature vector (x_r, y_r) of any relevant question and the feature vector of the center point of the neutral questions can be expressed as:

$$d_{ri} = \sqrt{(x_r - x_i)^2 + (y_r - y_i)^2}$$

A second distance between a feature vector (x_r, y_r) of the relevant questions and the feature vector of the center point of the comparison questions can be expressed as:

$$d_{rc} = \sqrt{(x_r - x_c)^2 + (y_r - y_c)^2}$$

The identification module 160 is configured to identify an emotional state of the test object answering each relevant question. When the first distance is greater than the second distance, it is determined that the test object concealed genuine emotions when answering the relevant question; and when the first distance is less than the second distance, it is determined that the emotions expressed by the test object are genuine when answering the relevant question.

According to the above example, when $d_{ri} > d_{rc}$, it indicates that when answering this relevant question, the test object has a psychological stress and mood fluctuations that are quite different from those when answering a neutral question and less different from those when answering a comparison

question, and thus the test object concealed genuine emotions when answering the relevant question. When $d_{ri} < d_{rc}$, it indicates that when answering this relevant question, the test object has a psychological stress and mood fluctuations that are less different from those when answering a neutral question and quite different from those when answering a comparison question, and thus the emotions expressed by the test object when answering this relevant question are genuine. When $d_{ri} = d_{rc}$, it indicates that when answering this relevant question, the test object has a psychological stress and mood fluctuations that have the same difference as those when answering a neutral question and a comparison question, an emotional state of this test object when answering this relevant question cannot be determined, but the possibility of occurrence of this situation is very small. Appropriate adjustments can be made to the test questionnaire, a test link is repeated, and an emotional state of the test object is re-determined.

Referring to FIG. 4, a flowchart of an emotion identification method according to a preferred embodiment of this application is illustrated. The electronic device 1 is started by using a framework shown in FIG. 1 or 2, and the processor 12 executes the emotion identification program 10 stored in the memory 11 to implement the following steps.

Step S10: A question bank construction module 110 is utilized to generate a large quantity of neutral questions, comparison questions, and relevant questions, and a test question bank is constructed. For a mode of generating the neutral questions, comparison questions, and relevant questions, refer to the detailed introduction of the foregoing question bank construction module 110.

Step S20: A questionnaire generation module 120 is utilized to select three types of questions in the test question bank to form a test questionnaire. In this embodiment, the test questionnaire includes at least two comparison questions, the number of the comparison questions is less than the number of relevant questions and the number of neutral questions, respectively, and the same type of questions are not adjacent. In addition, the number of questions in each test questionnaire should be greater than a preset number to ensure the scope of the test. The first and last questions of the test questionnaire should be set to be neutral questions to help the test object to adjust their emotions and relax.

Step S30: A video of the test object answering the test questionnaire is recorded, a video segmentation module 130 is utilized to segment the video, and a video segment for each question

answered by the test object is obtained. The photographing device 3 in FIG. 1 or the photographing device 30 of the terminal 3 in FIG. 2 is utilized to record a video of the test object answering the test questionnaire, and the video segmentation module 130 segments the video in units of a single question, and obtains a video segment for each question answered by the test object.

5 Step S40: A feature extraction module 140 is utilized to extract an expression feature vector from each video segment, and the expression feature vector from each video segment is used as the feature vector of the corresponding question. For a specific method for extracting an expression feature vector, refer to the detailed description of the feature extraction module 140 described above.

10 Step S50: A calculation module 150 is utilized to calculate a feature vector of a center point of the neutral questions, a feature vector of a center point of the comparison questions, a first distance between a feature vector of each relevant question and the feature vector of the center point of the neutral questions, and a second distance between the feature vector of each relevant question and the feature vector of the center point of the comparison questions. For a specific calculation method, refer to the detailed description of the calculation module 150 described above.

15 Step S60: An identification module 160 is utilized to identify an emotional state of the test object when answering each relevant question. When the first distance is greater than the second distance, it is determined that the test object concealed genuine emotions when answering the relevant question; and when the first distance is less than the second distance, it is determined that the emotions expressed by the test object are genuine when answering the relevant question.

20 In addition, the embodiment of this application further provides a computer readable storage medium, which may be any one of or any combination of a hard disk, a multimedia card, an SD card, a flash card, an SMC, a Read-Only Memory (ROM), an Erasable Programmable Read-Only Memory (EPROM), a portable Compact Disc Read-Only Memory (CD-ROM), a USB memory, and the like. The computer readable storage medium includes a test question bank, material information for
25 constructing the test question bank, and an emotion identification program 10, and when the emotion identification program 10 is executed by the processor, the following operations are implemented:

 a question bank construction step: automatically generating a large quantity of neutral questions, comparison questions, and relevant questions according to information of a test object, and

constructing a test question bank;

a questionnaire generation step: generating a test questionnaire according to the test question bank;

5 a video segmentation step: recording a video of the test object answering the test questionnaire, segmenting the video in units of a single question, and obtaining a video segment for each question answered by the test object;

a feature extraction step: extracting an expression feature vector from each video segment, and using the same as the feature vector of the corresponding question;

10 a calculation step: calculating a feature vector of a center point of the neutral questions, a feature vector of a center point of the comparison questions, a first distance between a feature vector of each relevant question and the feature vector of the center point of the neutral questions, and a second distance between the feature vector of each relevant question and the feature vector of the center point of the comparison questions; and

15 an identification step: when the first distance is greater than the second distance, determining that the test object concealed genuine emotions when answering the relevant question, and when the first distance is less than the second distance, determining that the emotions expressed by the test object are genuine when answering the relevant question.

20 The specific implementation of the computer readable storage medium of this application is substantially the same as the specific implementation of the foregoing emotion identification method and the electronic device 1, and details are not described herein again.

It should be noted that the term "comprise", "include", or any other variant thereof is intended to encompass a non-exclusive inclusion, such that a process, device, article, or method that includes a series of elements includes not only those elements, but also other elements not explicitly listed, or elements that are inherent to such a process, device, article, or method.

25 The serial numbers of the embodiment of this application described above are merely for description, and do not represent the advantages and disadvantages of the embodiments. Through the description of the foregoing embodiments, those skilled in the art can clearly understand that the method of the foregoing embodiment can be implemented by using software plus a necessary

universal hardware platform, and certainly, can also be implemented through hardware, but in many cases, the former is a better implementation. Based on such understanding, the technical solution of this application which is essential or a part contributing to the prior art may be embodied in the form of a software product, the computer software product is stored in a storage medium described above
5 (such as an ROM/RAM, a magnetic disk or an optical disc), including a plurality of instructions for causing a terminal device (which may be a mobile phone, a computer, a server, a network device, or the like) to perform the methods described in the various embodiments of this application.

The above are only preferred embodiments of this application, and are not intended to limit the patent scope of this application. Any equivalent structure or equivalent process transformation
10 performed using the specification and the accompanying drawings of this application may be directly or indirectly applied to other related technical fields and similarly falls within the patent protection scope of this application.

CLAIMS

1. An emotion identification method applied to an electronic device, comprising: a question bank construction step: automatically generating a large quantity of neutral questions, comparison questions, and relevant questions according to information of a test object, and constructing a test
5 question bank;

a questionnaire generation step: generating a test questionnaire according to the test question bank;

a video segmentation step: recording a video of the test object answering the test questionnaire, segmenting the video in units of a single question, and obtaining a video segment for each question
10 answered by the test object;

a feature extraction step: extracting an expression feature vector from each video segment, and using the same as the feature vector of the corresponding question;

a calculation step: calculating a feature vector of a center point of the neutral questions, a feature vector of a center point of the comparison questions, a first distance between a feature vector of each
15 relevant question and the feature vector of the center point of the neutral questions, and a second distance between the feature vector of each relevant question and the feature vector of the center point of the comparison questions; and

an identification step: when the first distance is greater than the second distance, determining that the test object concealed genuine emotions when answering the relevant question, and when the
20 first distance is less than the second distance, determining that the emotions expressed by the test object are genuine when answering the relevant question.

2. The emotion identification method according to claim 1, wherein the test questionnaire comprises at least two comparison questions, the number of the comparison questions is less than the number of relevant questions and the number of neutral questions, respectively, and the same type of
25 questions are not adjacent.

3. The emotion identification method according to claim 1, wherein in the feature extraction step, the extracting an expression feature vector from each video segment comprises the following

steps:

extracting action features of each video segment;

collecting statistics about the number of occurrences of each action feature in each video segment and the duration;

5 constructing high-order expression features of each video segment according to a statistical result;

using a feature screening algorithm to screen out feature subsets from the high-order expression features of each video segment; and

10 performing dimensionality reduction on the feature subsets to obtain an expression feature vector of each video segment.

4. The emotion identification method according to claim 3, wherein the action features comprise a head orientation, an eye orientation, and a facial action unit.

5. The emotion identification method according to claim 1, wherein the step of recording a video of the test object answering the test questionnaire specifically comprises:

15 recording a video of the test object answering the test questionnaire on site through an on-site photographing device, or recording a video of the test object answering the test questionnaire remotely through a remote photographing device.

6. The emotion identification method according to any one of claims 2 to 4, wherein the step of recording a video of the test object answering the test questionnaire specifically comprises:

20 recording a video of the test object answering the test questionnaire on site through an on-site photographing device, or recording a video of the test object answering the test questionnaire remotely through a remote photographing device.

7. The emotion identification method according to claim 6, wherein an answering limit time is set for each question, and a next question is displayed when the preset answering limit time is
25 exceeded.

8. An electronic device, comprising a memory and a processor, wherein the memory comprises an emotion identification program, and when the emotion identification program is executed by the processor, the following steps are implemented:

a question bank construction step: automatically generating a large quantity of neutral questions, comparison questions, and relevant questions according to information of a test object, and constructing a test question bank;

5 a questionnaire generation step: generating a test questionnaire according to the test question bank;

a video segmentation step: recording a video of the test object answering the test questionnaire, segmenting the video in units of a single question, and obtaining a video segment for each question answered by the test object;

10 a feature extraction step: extracting an expression feature vector from each video segment, and using the same as the feature vector of the corresponding question;

15 a calculation step: calculating a feature vector of a center point of the neutral questions, a feature vector of a center point of the comparison questions, a first distance between a feature vector of each relevant question and the feature vector of the center point of the neutral questions, and a second distance between the feature vector of each relevant question and the feature vector of the center point of the comparison questions; and

an identification step: when the first distance is greater than the second distance, determining that the test object concealed genuine emotions when answering the relevant question, and when the first distance is less than the second distance, determining that the emotions expressed by the test object are genuine when answering the relevant question.

20 9. The electronic device according to claim 8, wherein the test questionnaire comprises at least two comparison questions, the number of the comparison questions is less than the number of relevant questions and the number of neutral questions, respectively, and the same type of questions are not adjacent.

25 10. The electronic device according to claim 8, wherein in the feature extraction step, the extracting an expression feature vector from each video segment comprises the following steps:

extracting action features of each video segment;

collecting statistics about the number of occurrences of each action feature in each video segment and the duration;

constructing high-order expression features of each video segment according to a statistical result;

using a feature screening algorithm to screen out feature subsets from high-order expression features of each video segment; and

5 performing dimensionality reduction on the feature subsets to obtain an expression feature vector of each video segment.

11. The electronic device according to claim 10, wherein the action features comprise a head orientation, an eye orientation, and a facial action unit.

10 12. The electronic device according to claim 8, wherein the step of recording a video of the test object answering the test questionnaire specifically comprises:

recording a video of the test object answering the test questionnaire on site through an on-site photographing device, or recording a video of the test object answering the test questionnaire remotely through a remote photographing device.

15 13. The electronic device according to any one of claims 9 to 11, wherein the step of recording a video of the test object answering the test questionnaire specifically comprises:

recording a video of the test object answering the test questionnaire on site through an on-site photographing device, or recording a video of the test object answering the test questionnaire remotely through a remote photographing device.

20 14. The electronic device according to claim 13, wherein an answering limit time is set for each question, and a next question is displayed when the preset answering limit time is exceeded.

15. A computer readable storage medium, comprising an emotion identification program, wherein when the emotion identification program is executed by a processor, the following steps are implemented:

25 a question bank construction step: automatically generating a large quantity of neutral questions, comparison questions, and relevant questions according to information of a test object, and constructing a test question bank;

a questionnaire generation step: generating a test questionnaire according to the test question bank;

a video segmentation step: recording a video of the test object answering the test questionnaire, segmenting the video in units of a single question, and obtaining a video segment for each question answered by the test object;

a feature extraction step: extracting an expression feature vector from each video segment, and
5 using the same as the feature vector of the corresponding question;

a calculation step: calculating a feature vector of a center point of the neutral questions, a feature vector of a center point of the comparison questions, a first distance between a feature vector of each relevant question and the feature vector of the center point of the neutral questions, and a second distance between the feature vector of each relevant question and the feature vector of the center point
10 of the comparison questions; and

an identification step: when the first distance is greater than the second distance, determining that the test object concealed genuine emotions when answering the relevant question, and when the first distance is less than the second distance, determining that the emotions expressed by the test object are genuine when answering the relevant question.

15 16. The computer readable storage medium according to claim 15, wherein the test questionnaire comprises at least two comparison questions, the number of the comparison questions is less than the number of relevant questions and the number of neutral questions, respectively, and the same type of questions are not adjacent.

20 17. The computer readable storage medium according to claim 15, wherein in the feature extraction step, the extracting an expression feature vector from each video segment comprises the following steps:

extracting action features of each video segment;

collecting statistics about the number of occurrences of each action feature in each video segment and the duration;

25 constructing high-order expression features of each video segment according to a statistical result;

using a feature screening algorithm to screen out feature subsets from high-order expression features of each video segment; and

performing dimensionality reduction on the feature subsets to obtain an expression feature vector of each video segment.

18. The computer readable storage medium according to claim 17, wherein the action features comprise a head orientation, an eye orientation, and a facial action unit.

5 19. The computer readable storage medium according to any one of claims 15 to 18, wherein the step of recording a video of the test object answering the test questionnaire specifically comprises:

recording a video of the test object answering the test questionnaire on site through an on-site photographing device, or recording a video of the test object answering the test questionnaire remotely through a remote photographing device.

10 20. The computer readable storage medium according to claim 19, wherein an answering limit time is set for each question, and a next question is displayed when the preset answering limit time is exceeded.