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(54) **SENSITIVITY ENHANCEMENT UNIT FOR AN ANALYSIS SYSTEM BASED ON CHAOS-THEORY**

VORRICHTUNG ZUR VERBESSERUNG DER SENSITIVITÄT EINES ANALYSESYSTEMS BASIEREND AUF CHAOS-THEORIE

UNITE D'AMELIORATION DE SENSIBILITE D'UN SYSTEME D'ANALYSE SELON LA THEORIE DU CHAOS

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(56) References cited:
WO-A1-97/34293 **WO-A1-02/085215**
JP-A- 8 292 788 **JP-A- 2003 079 602**
JP-B2- 3 151 489

- **MIYASHITA, WADA: 'Fukusu washi ni yoru renzoku onseichu no onso o target to shita chaos-sei no hitokaiseki' DAI 11 KAI INTELLIGENT SYSTEM SYMPOISUM KOEN RONBUNSHU 24 September 2001, pages 33 - 36, XP002968499**
- **SHIOMI ET AL.: 'Hatsuwa onsei ni yoru hirodo kaiseki sochi' INFORMATION PROCESSING SOCIETY OF JAPAN DAI 64 KAI ZENKOKU TAIKAI KOEN RONBUNSHU (1) 12 March 2002, page 1-253, XP002968500**
- **SHIOMI ET AL.: 'Chaos ronteki hiro kaiseki shuho to nokino model' INFORMATION PROCESSING SOCIETY OF JAPAN DAI 64 KAI ZENKOKU TAIKAI KOEN RONBUNSHU (1) (2D-02) 12 March 2002, pages 1-209 - 1-212, XP002968801**

EP 1 496 498 B1

Description

TECHNICAL FIELD

[0001] The present invention relates to a preprocessing apparatus connected to an apparatus for diagnosing a psychosomatic state on the basis of uttered voice uttered by a human being, anapparatus for diagnosing the brain function, an apparatus for diagnosing a human factor, an apparatus for diagnosing affinity, an apparatus for diagnosing a vocational aptitude, and so on. The present invention belongs to the field of the medical diagnosis technique.

BACKGROUND ART

[0002] In the conventional chaos theoretical diagnosis system or apparatus using uttered voice, a numerical value obtained by mechanically dividing continuous uttered voice into specific processing unit time intervals, such as voice signals each having a temporal length of one second, calculating the first Lyapunov exponent in each processing unit time interval, and conducting statistical processing such as moving average calculation on the calculated first Lyapunov exponent is used as diagnosis subject data.

[0003] If voice data of the processing unit time interval to be used in the chaos theoretical diagnosis is mechanically cut out from an input voice, then a subtle difference in cutout point in time exerts influence upon the calculated first Lyapunov exponent and causes variation in the diagnosis value.

[0004] For reducing the variation in the diagnosis value, it is necessary to set a time that is sufficiently long as compared with the cut out time, for example, set an average time in the range of several tens of seconds to several minutes in the case when the processing unit time is set equal to one second, calculate a temporal average value from the first Lyapunov exponent calculated in respective processing units, and use the temporal average value as a diagnosis value.

[0005] When making a chaos theoretical diagnosis from the uttered voice, for example, continuous uttered voice ranging over at least several minutes is needed as input data in order to get a high diagnosis precision, such as to reduce an error in diagnosis value to several percents or less.

[0006] In addition, in the conventional voice signal processing method, it has been impossible to make a significant diagnosis by using a voice signal taken for an interval of approximately several times as long as the processing unit time, such as a voice signal taken for several seconds in the case when the processing unit time interval is one second.

[0007] Even if the processing unit time is made shorter, merely the number of the first Lyapunov exponent that must be calculated increases. For example, if the processing unit time is shortened from one second to 0.1 second, the number of the first Lyapunov exponent that must be calculated increases to ten times. Even if a time interval as long as ten times or more is spent for computation processing, the variation in Lyapunov exponent caused by deviation in point in time at which each diagnosis data is cut out can not be effectively reduced. It is impossible to make a significant diagnosis by using voice taken for an interval of several seconds.

[0008] In the conventional technique heretofore described, it has become an important problem to clarify a method for reducing the variation in the calculated first Lyapunov exponent caused by a difference in point of time at which diagnosis data is cut out from voice data used in the chaos theoretical diagnosis. In conventional apparatus such as the one described in JP 3151489 B2 this problem occurs as these apparatus always genrate unit voice data having a predetermined time length. Furthermore, a method for calculating a comparatively highly reliable diagnosis value from comparatively short voice data has become an important problem in the same way.

[0009] The present invention has been achieved in order to solve the above-described problems. An object of the present invention is to provide an apparatus that reduces the variation in the first Lyapunov exponent calculated using a chaos theoretical diagnosis by cutting out unit voice data used in the chaos theoretical diagnosis while taking a phoneme as the unit, and that calculates a diagnosis value having a reliability equal to or higher than that obtained by using the conventional technique, on the basis of voice data shorter than that in the case using the conventional technique.

DISCLOSURE OF THE INVENTION

[0010] In order to achieve these obj ects, the invention according to a first aspect provides a sensitivity enhancement apparatus with the features of claims 1.

[0011] As a result, unit voice data cut out in a phoneme or phoneme sequence form can be output to the chaos theoretical diagnosis apparatus as diagnosis data. Therefore, the variation in the first Lyapunov exponent calculated by using the chaos theoretical diagnosis can be remarkably reduced. Moreover, it is possible to grasp the psychosomatic state, brain function, human factor, affinity, and vocational aptitude more accurately, by limiting phoneme and/or phoneme sequence data stored in the phoneme and phoneme sequence database to phoneme as phoneme sequence data respectively, of a specific speaker.

[0012] In accordance with a second aspect of the invention, in addition to the configuration according to the first aspect, the voice data cutout apparatus starts voice data cutout from the voice data stored in the internal memory at a moment utterance of a preset vowel or consonant is started, and finishes the voice data cutout at a moment utterance of at least one phoneme is finished, and thereby cuts out unit voice data formed of a phoneme or phoneme sequence.

[0013] As a result, in addition to the effect of the first aspect, voice data of one phoneme or more from the moment the utterance of a vowel or consonant is started is cut out, and consequently it becomes possible to output more accurate diagnosis data while taking a phoneme as the unit.

[0014] In accordance with a third aspect of the invention, in addition to the configuration according to the first aspect, the voice data cutout apparatus includes a phoneme discrimination section for arbitrarily selecting and setting a phoneme or phoneme sequence, and cuts out unit voice data formed of a phoneme or phoneme sequence that coincides with a specific phoneme or phoneme sequence set by the phoneme discrimination section, from the voice data stored in the internal memory.

[0015] As a result, in addition to the effect of the first aspect, a phoneme sequence arranged regularly such as a daily used phrase can be set to unit voice data, and consequently it becomes possible to eliminate an error caused by a mixed presence of a plurality of irregular phonemes. Therefore, diagnosis data required to obtain a diagnosis value having reproducibility can be obtained in a minute.

[0016] In accordance with a fourth aspect of the invention, in addition to the configuration according to the second or third aspect, the voice data cutout apparatus includes offset providing means capable of providing a cutout start moment and a cutout end moment with an offset value equal to one phoneme or less, and when cutting out unit voice data formed of a phoneme or phoneme sequence from the voice data stored in the internal memory, the cutout start moment and the cutout end moment can be adjusted by the offset providing means.

[0017] As a result, in addition to the effect of the second or third aspect, it becomes possible to correct an apparatus error by conducting fine adjustment of one phoneme or less and it is ensured to provide more accurate diagnosis data.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018]

FIG. 1 is a system configuration diagram showing an example of a system configuration of a preprocessing apparatus according to an embodiment of the present invention.

FIG. 2 is a flow chart showing an example of a process flow of a preprocessing apparatus according to the embodiment.

FIG. 3 is a diagram showing a concept of acquiring a phoneme and utterance time from voice data in a preprocessing apparatus according to the embodiment.

FIG. 4 is a diagram showing a conventional concept of acquiring a phoneme and utterance time from voice data.

FIG. 5 is a diagram showing a concept of acquiring a phoneme and utterance time from voice data in a preprocessing apparatus according to the embodiment.

BEST MODE FOR CARRYING OUT THE INVENTION

[0019] Hereafter, an embodiment of the present invention will be described with reference to the drawings.

[0020] FIGS. 1 to 5 show embodiments of the present invention.

[0021] FIG. 1 is a schematic diagram showing a system configuration example of a preprocessing apparatus for chaos theoretical diagnosis according to an embodiment of the present invention.

[0022] In FIG. 1, a preprocessing apparatus 1 for chaos theoretical diagnosis (hereafter referred to as "invention apparatus") includes a voice input apparatus 2, an analog-digital conversion apparatus 3, a comparator 4, an internal memory 5, a phoneme collation apparatus 6, a phoneme sequence collation apparatus 7, a phoneme database 8, a dictionary database 9, a voice data cutout apparatus 10 and a voice data output apparatus 11.

[0023] The voice input apparatus 2 is a microphone or a tape recorder for acquiring uttered voice of a speaker as analog voice.

[0024] The analog-digital conversion apparatus 3 is an apparatus for sampling and quantizing analog voice acquired by the voice input apparatus 2 at a constant sampling frequency and thereby converting the analog voice to digital voice data.

[0025] The comparator 4 selects voice data having a level which is equal to or higher than a certain input level, from the digital voice data output from the analog-digital conversion apparatus 3, and outputs the voice data thus selected.

[0026] The internal memory 5 is an internal storage apparatus for buffering the voice data output from the comparator 4. The internal memory 5 has a capacity sufficient for the invention apparatus.

[0027] The phoneme collation apparatus 6 collates the voice data buffered in the internal memory 5 with a phoneme database 8, which stores phoneme data for each phoneme, and outputs a coincident phoneme as unit phoneme data.

[0028] The phoneme sequence collation apparatus 7 collates the voice data as a phoneme sequence, if there are a plurality of phonemes in the voice data, with the dictionary database 9, which stores word dictionary for each phoneme sequence, and outputs a coincident phoneme sequence, and a phoneme sequence width ranging from a voice data start moment to a voice data end moment of the coincident phoneme sequence as second processing data.

[0029] The voice data cutout apparatus 11 is an apparatus for acquiring a phoneme or a phoneme sequence as unit voice data. The phoneme or a phoneme sequence is cut out from the internal memory 5 as coincident one and output from the phoneme collation apparatus 6 and

the phoneme sequence collation apparatus 7.

[0030] The voice data cutout apparatus 11 includes a phoneme discrimination section 12 capable of selecting and setting a phoneme, a phrase to be used in daily conversation, or a phoneme sequence formed of a combination of arbitrary phonemes as unit voice data.

[0031] The voice data output apparatus 10 outputs unit voice data as diagnosis data acquired from the internal memory 5 by the voice data cutout apparatus 11. The unit voice data are given to a chaos theoretical diagnosis apparatus following the invention apparatus.

[0032] FIG. 2 is a flow chart showing a process flow in the invention apparatus.

[0033] Voice uttered by a speaker is acquired as analog voice by using the voice input apparatus 2 (S100).

[0034] In the analog-digital conversion apparatus 3, voice acquired from the voice input apparatus 2 is sampled and quantized at a constant sampling frequency, and analog voice is thus converted to digital voice data (S110).

[0035] The digital voice data output from the analog-digital conversion apparatus 3 is supplied to the comparator 4 (S120), and only voice data having an input level which is equal to or higher than a certain input level is acquired (S130) and buffered in the internal memory 5 (S140) . If the voice data is less than the constant input level, then the voice data is returned to the comparator 4 and the processing is repeated.

[0036] If the buffered volume has become at least a certain volume (S150), then voice data in the internal memory 5 is collated in the phoneme collation apparatus with phoneme data stored in the phoneme database 8 (S160) . If the buffered volume is less than the certain volume, then the processing is returned to the comparator 4 and repeated.

[0037] If there is a phoneme that coincides with a phoneme in the internal memory 5 in the phoneme database 8 (S170), then the phoneme is output from the internal memory 5 (S180). If there is not a coincident phoneme, then the processing is returned to the comparator 4 and repeated.

[0038] If there are a plurality of phonemes, then voice data regarded as a phoneme sequence is collated in the phoneme sequence collation apparatus with word dictionary data stored in the dictionary database 9 (S190).

[0039] If there is a phoneme sequence that is coincident with a phoneme sequence stored in the dictionary database 9, then a range between a moment at which utterance of the coincident phoneme sequence is started and a moment at which the utterance is finished is set as a cutout range, and a phoneme sequence contained in the range is output (S200).

[0040] In the phoneme discrimination section 12 in the voice data cutout apparatus 11, a diagnosing person arbitrarily selects a phoneme or a phoneme sequence to be used as diagnosis data, in advance (S210).

[0041] If a phoneme or a phoneme sequence output from the phoneme collation apparatus 6 or the phoneme sequence collation apparatus 7 coincides with the arbitrarily selected phoneme or phoneme sequence (S220), then the voice data cutout apparatus 11 cuts out the coincident phoneme or phoneme sequence as unit voice data from the internal memory 5 (S230). If there is no coincident phoneme or phoneme sequence, then the processing is returned to the comparator 4 and repeated.

[0042] The voice data output apparatus 10 acquires this unit voice data and outputs the unit voice data to the chaos theoretical diagnosis apparatus following the invention apparatus as diagnosis data (S240).

[0043] Means shown in the embodiment are only divided logically in function, but they may form the same region physically or substantially.

[0044] A difference between the invention apparatus and the conventional method is shown in FIGS. 3 and 4.

[0045] FIG. 3 is a diagram showing the concept of outputting a phoneme and utterance time on the basis of voice data in the method of the invention apparatus.

[0046] For example, when uttered voice data for outputting diagnosis data to be used in the chaos theoretical diagnosis is in the range of A110 to A130. The cutout start moment of diagnosis data is set to A110 where the utterance of an /o/ sound is not yet started. The cutout end moment of the diagnosis data is set to A120 where the utterance of a /yo/ sound has been finished. Accordingly, it becomes possible to output voice data ranging from A110 to A120 in the form of a phoneme or phoneme sequence as diagnosis data without being cut in the middle of a phoneme.

[0047] As a result, voice data can be output as diagnosis data in the form of a phoneme or phoneme sequence without being cut in the middle of a phoneme. Therefore, it also becomes possible to decrease the variation in diagnosis values, which exert influence on the value of the first Lyapunov exponent calculated by making a chaos theoretical diagnosis.

[0048] FIG. 4 is a diagram showing the concept of outputting a phoneme and utterance time on the basis of voice data in the conventional method.

[0049] For example, when voice data of a speaker for calculating diagnosis data to be used in the chaos theoretical diagnosis is in the range of B110 to B130. In the case where the time intervals to be processed of diagnosis data to be used in the chaos theoretical diagnosis is one second, the cutout start moment of diagnosis data is set to B110 and the cutout end moment of the diagnosis data is set to B120 that is a moment one second later than B110. Under these conditions, data between B110 and B120 is output as diagnosis data, and there is a possibility that the diagnosis data will be cut in the middle of a phoneme.

[0050] As a result, there is a possibility that the diagnosis data will be cut in the middle of a phoneme. Therefore, the variation occurs in diagnosis values, which exert influence on the value of the first Lyapunov exponent calculated by making a chaos theoretical diagnosis.

[0051] FIG. 5 is a diagram showing the concept of set-

ting an offset when cutting out a phoneme in the invention apparatus.

[0052] For example, it is supposed that voice data of a speaker for outputting diagnosis data to be used in the chaos theoretical diagnosis is in the range of C110 to C170. The cutout start moment is set to C110 and the cutout end moment is set to C120. In order to prevent a phoneme from being cut in the middle of the phoneme, an offset value equal to or less than one phoneme is set for the cutout end moment C120 by offset providing means. Thus, the cutout end moment is shifted to C130, being able to prevent a phoneme from being cut in the middle of the phoneme.

[0053] Furthermore, when the cutout start moment is set to C150 and the cutout end moment is set to C160, and an offset value equal to or less than one phoneme is set for the cutout start moment C150 as a minus value by offset providing means. Thus, the cutout start moment is shifted to C140, being able to output diagnosis data containing voice data uttered before the diagnosis data.

INDUSTRIAL APPLICABILITY

[0054] The present invention relates to a preprocessing apparatus, which belongs to the field of the medical diagnosis technique, connected to an apparatus for diagnosing a psychosomatic state on the basis of uttered voice uttered by a human being, an apparatus for diagnosing the brain function, an apparatus for diagnosing a human factor, an apparatus for diagnosing affinity, an apparatus for diagnosing a vocational aptitude. The present invention provides an industrially useful apparatus capable of reducing the variation in the first Lyapunov exponent calculated using a chaos theoretical diagnosis by cutting out unit voice data used in the chaos theoretical diagnosis while taking a phoneme as the unit, and capable of calculating a diagnosis value having a reliability equal to or higher than that obtained by using the conventional technique, on the basis of voice data shorter than that in the case using the conventional technique.

Claims

1. A sensitivity enchancement apparatus adapted to be used as a preprocessing apparatus connected to a chaos theoretical voice diagnosis apparatus, which voice diagnosis apparatus is adapted to analyze voice uttered by a speaker by using a chaos theory technique, to calculate a Lyapunov exponent, and to measure and evaluate a change state of the calculated Lyapunov exponent, the sensitivity enhancement apparatus to comprising:

a voice input apparatus (2) that acquires uttered voices;
an analog-digital conversion apparatus (3) that converts the uttered voice acquired by the voice input apparatus (2) to digital voice data;
a comparator (4) that selects voice data having a level which is equal to or higher than a certain level, from the digital voice data converted by the analog-digital conversion apparatus (3) and outputting the voice data thus selected;
an internal memory (5) that stores the digital voice data, **characterized in that** the sensitivity enhancement apparatus further comprises:

a phoneme collation apparatus (6) that detects a phoneme being contained in the digital voice data by comparing the digital voice data stored in the internal memory (5) to one or more phonemes stored in a phoneme database (8);
a phoneme sequence collation apparatus (7) that detects a phoneme sequence being contained in the digital voice data, in the case where the phoneme collation apparatus (6) detected plural phonemes, by comparing the phoneme sequence constituted of the detected phonemes to one or more phoneme sequences stored in a phoneme sequence database (9);
a voice data cutout apparatus (11) that cuts out plural unit voice data, each of which corresponds to a phoneme or a phoneme sequence detected from the digital voice data, from the digital voice data stored in the internal memory (5);
a voice data output apparatus (10) that outputs the unit voice data cut out by the voice data cutout apparatus (11) to the chaos theoretical voice diagnosis apparatus.

2. The sensitivity enhancement apparatus according to claim 1, wherein the voice data cutout apparatus starts voice data cutout from the voice data stored in the internal memory at a moment utterance of a preset vowel or consonant is started, and finishes the voice data cutout at a moment utterance of at least one phoneme is finished, and thereby cut outs unit voice data formed of a phoneme or phoneme sequence.

3. The sensitivity enhancement apparatus according to claim 1, wherein the voice data cutout apparatus comprises a phoneme discrimination section for arbitrarily selecting and setting a phoneme or phoneme sequence, and cuts out unit voice data formed of a phoneme or phoneme sequence that coincides with a specific phoneme or phoneme sequence set by the phoneme discrimination section, from the voice data stored in the internal memory.

4. The sensitivity enhancement apparatus according to claim 2 or 3, wherein the voice data cutout appa-

ratus comprises offset providing means capable of providing a cutout start moment and a cutout end moment with an offset value equal to one phoneme or less, and when cutting out unit voice data formed of a phoneme or phoneme sequence from the voice data stored in the internal memory, the cutout start moment and the cutout end moment can be adjusted by the offset providing means.

Patentansprüche

1. Empfindlichkeitsverbesserungsvorrichtung, die eingerichtet ist, um als Vorverarbeitungsvorrichtung verwendet zu werden, die mit einer chaostheoretischen Sprachdiagnosevorrichtung verbunden ist, wobei die Sprachdiagnosevorrichtung eingerichtet ist, um durch Verwendung eines Chaostheorieverfahrens eine von einem Sprecher geäußerte Sprache zu analysieren, einen Lyapunov-Exponenten zu berechnen und einen Änderungszustand des berechneten Lyapunov-Exponenten zu messen und zu bewerten, umfassend:

   eine Spracheingabevorrichtung (2), die geäußerte Sprache erfasst;
   eine Analog-Digital-Umwandlungsvorrichtung (3), die die von der Spracheingabevorrichtung (2) erfasste geäußerte Sprache in digitale Sprachdaten umwandelt;
   eine Vergleichseinrichtung (4), die aus den von der Analog-Digital-Umwandlungsvorrichtung (3) umgewandelten digitalen Sprachdaten Sprachdaten mit einem Pegel auswählt, der gleich oder höher als ein bestimmter Pegel ist, und die so ausgewählten Sprachdaten ausgibt;
   einen internen Speicher (5), der die digitalen Sprachdaten speichert,
   dadurch gekennzeichnet, dass die Empfindlichkeitsverbesserungsvorrichtung weiterhin umfasst:

      eine Phonemkollationsvorrichtung (6), die ein Phonem erkennt, das in den digitalen Sprachdaten enthalten ist, indem sie die in dem internen Speicher (5) gespeicherten digitalen Sprachdaten mit einem oder mehreren Phonemen vergleicht, die in einer Phonemdatenbank (8) gespeichert sind;
      eine Phonemsequenzkollationsvorrichtung (7), die in dem Fall, dass die Phonemkollationsvorrichtung (6) mehrere Phoneme erkannt hat, eine Phonemsequenz erkennt, die in den digitalen Sprachdaten enthalten ist, indem sie die aus den erkannten Phonemen gebildete Phonemsequenz mit einer oder mehreren Phonemsequenzen vergleicht, die in einer Phonemsequenzdatenbank (9) gespeichert sind;
      eine Sprachdatenausschneidvorrichtung (11), die aus den in dem internen Speicher (5) gespeicherten digitalen Sprachdaten mehrere Einheitssprachdaten herausschneidet, von denen jedes einem Phonem oder einer Phonemsequenz entspricht, die aus den digitalen Sprachdaten erkannt wurden; und
      eine Sprachdatenausgabevorrichtung (10), die die von der Sprachdatenausschneidvorrichtung (11) herausgeschnittenen Einheitssprachdaten an die chaostheoretische Sprachdiagnosevorrichtung ausgibt.

2. Empfindlichkeitsverbesserungsvorrichtung nach Anspruch 1, wobei die Sprachdatenausschneidvorrichtung das Herausschneiden von Sprachdaten aus den in dem internen Speicher gespeicherten Sprachdaten in einem Moment beginnt, in dem die Äußerung eines voreingestellten Vokals oder Konsonanten begonnen wird, und das Herausschneiden von Sprachdaten in einem Moment beendet, in dem die Äußerung wenigstens eines Phonems beendet wird, und **dadurch** Einheitssprachdaten herausschneidet, die aus einem Phonem oder einer Phonemsequenz gebildet sind.

3. Empfindlichkeitsverbesserungsvorrichtung nach Anspruch 1, wobei die Sprachdatenausschneidvorrichtung einen Phonemunterscheidungsabschnitt zum willkürlichen Auswählen und Einstellen eines Phonems oder einer Phonemsequenz umfasst und aus den in dem internen Speicher gespeicherten Sprachdaten Einheitssprachdaten herausschneidet, die aus einem Phonem oder einer Phonemsequenz gebildet sind, der/die mit einem bestimmten Phonem oder einer bestimmten Phonemsequenz übereinstimmt, die von dem Phonemunterscheidungsabschnitt eingestellt sind.

4. Empfindlichkeitsverbesserungsvorrichtung nach Anspruch 2 oder 3, wobei die Sprachdatenausschneidvorrichtung Versatzbereitstellungsmittel umfasst, die in der Lage sind, einen Startmoment des Herausschneidens und einen Endmoment des Herausschneidens mit einem Versatzwert, der gleich einem Phonem oder weniger ist, bereitzustellen, und wobei der Startmoment des Herausschneidens und der Endmoment des Herausschneidens durch die Versatzbereitstellungsmittel eingestellt werden kann, wenn Einheitssprachdaten herausgeschnitten werden, die aus einem Phonem oder einer Phonemsequenz gebildet sind, die in dem internen Speicher gespeichert sind.

Revendications

1. Appareil d'amélioration de sensibilité adapté pour être utilisé comme appareil de prétraitement raccordé à un appareil de diagnostic vocal fonctionnant sur la théorie du chaos, lequel appareil de diagnostic vocal étant adapté pour analyser une voix prononcée par un locuteur en utilisant une technique reposant sur la théorie du chaos, pour calculer un exposant de Lyapunov, et pour mesurer et évaluer un état de changement de l'exposant de Lyapunov calculé, l'appareil d'amélioration de sensibilité comprenant :

un appareil d'entrée vocale (2) qui acquiert des voix prononcées ;
un appareil de conversion analogique-numérique (3) qui convertit la voix prononcée acquise par l'appareil d'entrée vocale (2) en données vocales numériques ;
un comparateur (4) qui sélectionne des données vocales, ayant un niveau qui est supérieur ou égal à un certain niveau, parmi les données vocales numériques converties par l'appareil de conversion analogique-numérique (3) et qui délivre en sortie les données vocales ainsi sélectionnées ;
une mémoire interne (5) qui stocke les données vocales numériques, **caractérisé en ce que** l'appareil d'amélioration de sensibilité comprend en outre :

un appareil de collecte de phonèmes (6) qui détecte un phonème contenu dans les données vocales numériques en comparant les données vocales numériques stockées dans la mémoire interne (5) à un ou plusieurs phonèmes stockés dans une base de données de phonèmes (8) ;
un appareil de collecte de séquence de phonèmes (7) qui détecte une séquence de phonèmes contenue dans les données vocales numériques, dans le cas où l'appareil de collecte de phonèmes (6) a détecté plusieurs phonèmes, en comparant la séqucence de phonèmes constituée des phonèmes détectés à une ou plusieurs séquences de phonèmes stockées dans une base de données de séquences de phonèmes (9) ;
un appareil de suppression de données vocales (11) qui supprime plusieurs données vocales unitaires, qui correspondent chacune à un phonème ou une séquence de phonèmes détectés des données vocales numériques, des données vocales numériques stockées dans la mémoire interne (5) ;
un appareil de sortie de données vocales (10) qui délivre en sortie les données vocales unitaires supprimées par l'appareil de suppression de données vocales (11) à l'appareil de diagnostic vocal fonctionnant sur la théorie du chaos.

2. Appareil d'amélioration de sensibilité selon la revendication 1, dans lequel l'appareil de suppression de données vocales débute la suppression de données vocales des données vocales stockées dans la mémoire interne à un moment où débute la prononciation d'une voyelle ou d'une consonne fixée à l'avance, et termine la suppression des données vocales à un moment où se termine la prononciation d'au moins un phonème, et supprime ainsi une donnée vocale unitaire formée d'un phonème ou d'une séquence de phonèmes.

3. Appareil d'amélioration de sensibilité selon la revendication 1, dans lequel l'appareil de suppression de données vocales comprend une section de discrimination de phonème destinée à sélectionner et fixer arbitrairement un phonème ou une séquence de phonèmes, et supprime une donnée vocale unitaire formée d'un phonème ou d'une séquence de phonèmes qui coïncide avec un phonème ou une séquence de phonèmes spécifique fixé par la section de discrimination de phonème, des données vocales stockées dans la mémoire interne.

4. Appareil d'amélioration de sensibilité selon la revendication 2 ou 3, dans lequel l'appareil de suppression de données vocales comprend des moyens de fournir un décalage aptes à fournir un instant de début de suppression et à un instant de fin de suppression avec une valeur de décalage égale à un phonème ou moins, et lorsque l'on supprime une donnée vocale unitaire formée d'un phonème ou d'une séquence de phonème des données vocales stockées dans la mémoire interne, l'instant de début de suppression et l'instant de fin de suppression peuvent être réglés par les moyens de fournir un décalage.

FIG.1

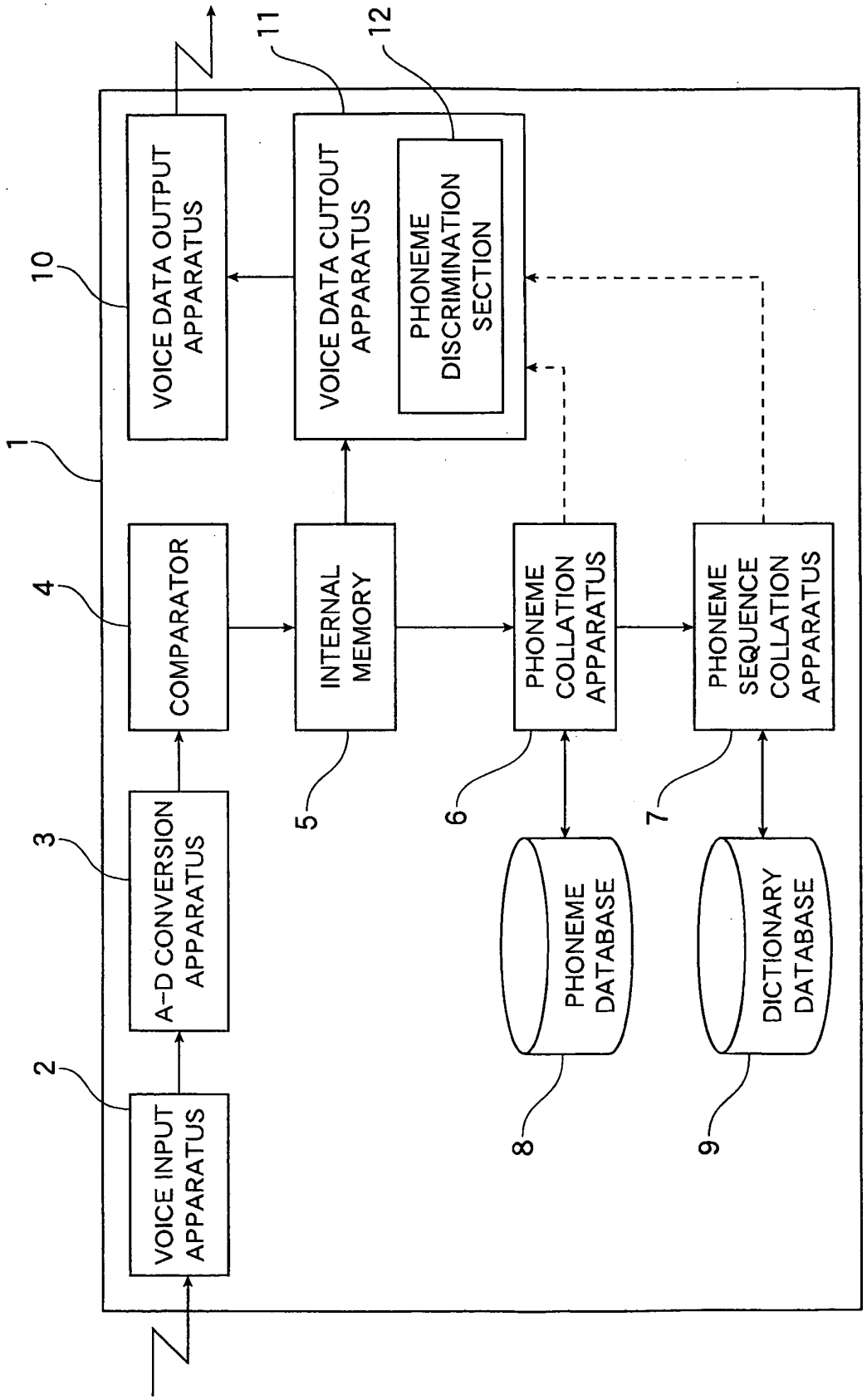

1
2
VOICE INPUT APPARATUS
3
A-D CONVERSION APPARATUS
4
COMPARATOR
5
INTERNAL MEMORY
6
PHONEME COLLATION APPARATUS
7
PHONEME SEQUENCE COLLATION APPARATUS
8
PHONEME DATABASE
9
DICTIONARY DATABASE
10
VOICE DATA OUTPUT APPARATUS
11
VOICE DATA CUTOUT APPARATUS
12
PHONEME DISCRIMINATION SECTION

FIG.2

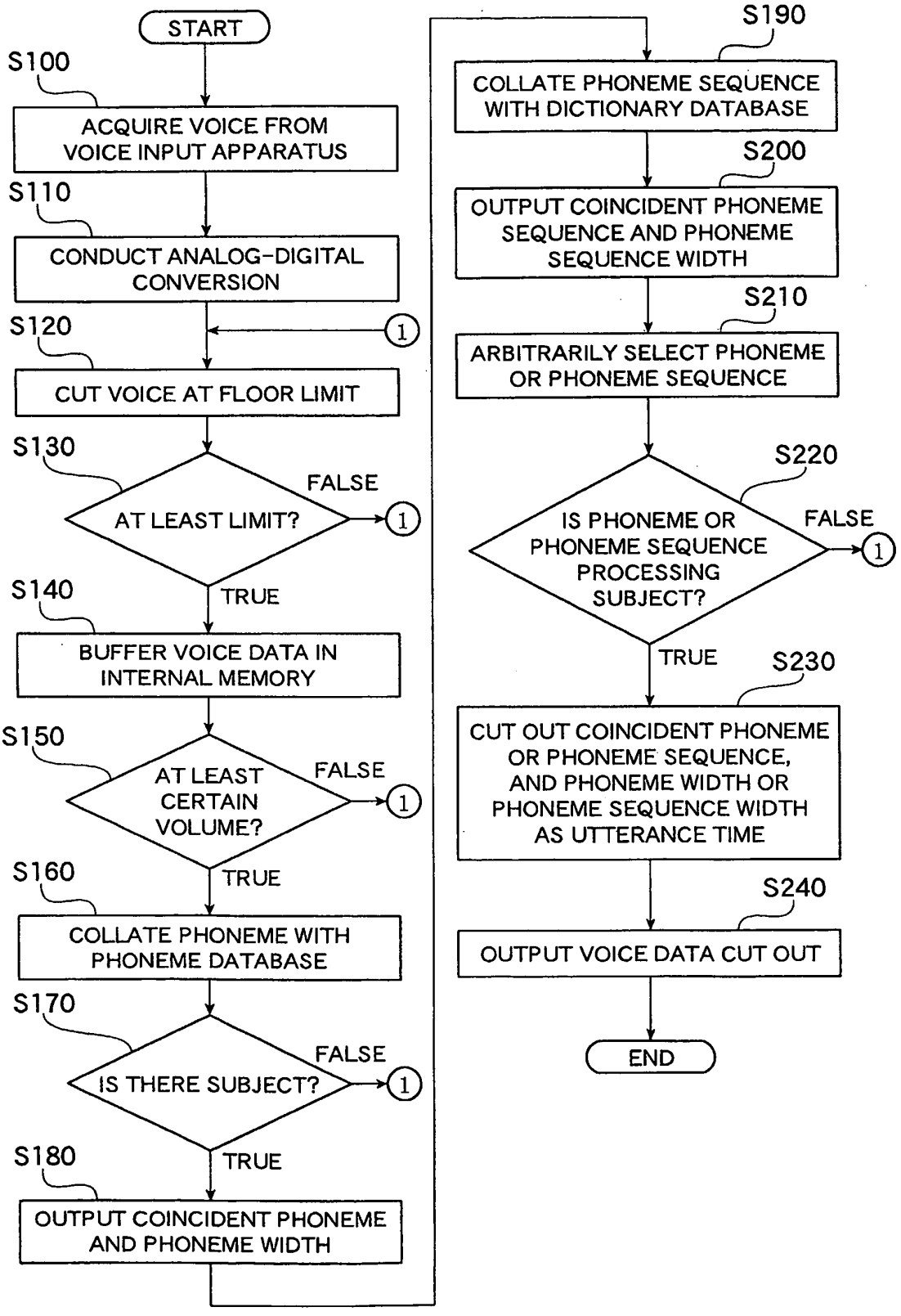

START
S100
ACQUIRE VOICE FROM VOICE INPUT APPARATUS
S110
CONDUCT ANALOG-DIGITAL CONVERSION
S120
CUT VOICE AT FLOOR LIMIT
S130
AT LEAST LIMIT?
FALSE
TRUE
S140
BUFFER VOICE DATA IN INTERNAL MEMORY
S150
AT LEAST CERTAIN VOLUME?
FALSE
TRUE
S160
COLLATE PHONEME WITH PHONEME DATABASE
S170
IS THERE SUBJECT?
FALSE
TRUE
S180
OUTPUT COINCIDENT PHONEME AND PHONEME WIDTH
S190
COLLATE PHONEME SEQUENCE WITH DICTIONARY DATABASE
S200
OUTPUT COINCIDENT PHONEME SEQUENCE AND PHONEME SEQUENCE WIDTH
S210
ARBITRARILY SELECT PHONEME OR PHONEME SEQUENCE
S220
IS PHONEME OR PHONEME SEQUENCE PROCESSING SUBJECT?
FALSE
TRUE
S230
CUT OUT COINCIDENT PHONEME OR PHONEME SEQUENCE, AND PHONEME WIDTH OR PHONEME SEQUENCE WIDTH AS UTTERANCE TIME
S240
OUTPUT VOICE DATA CUT OUT
END
1

FIG.3

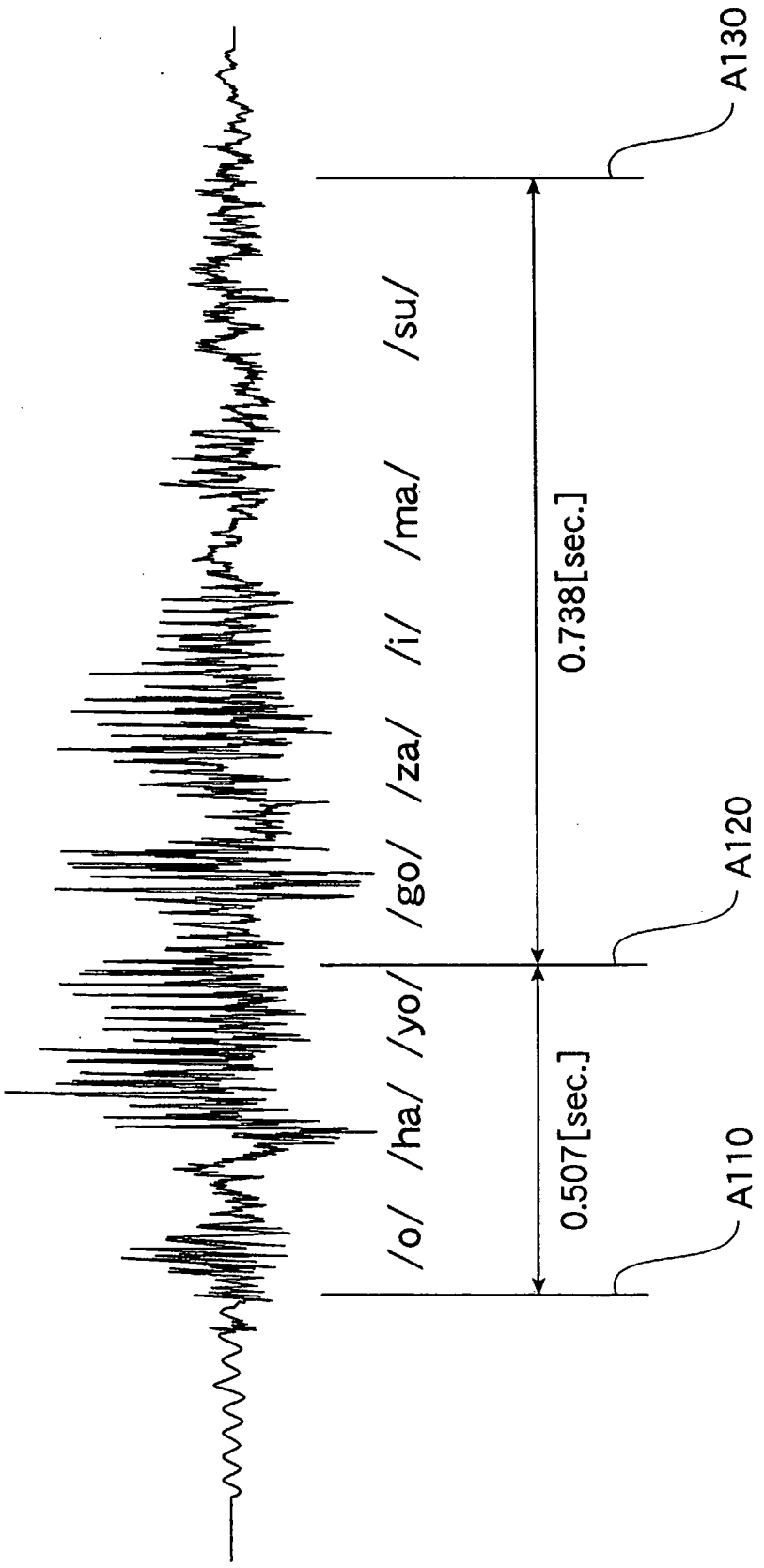
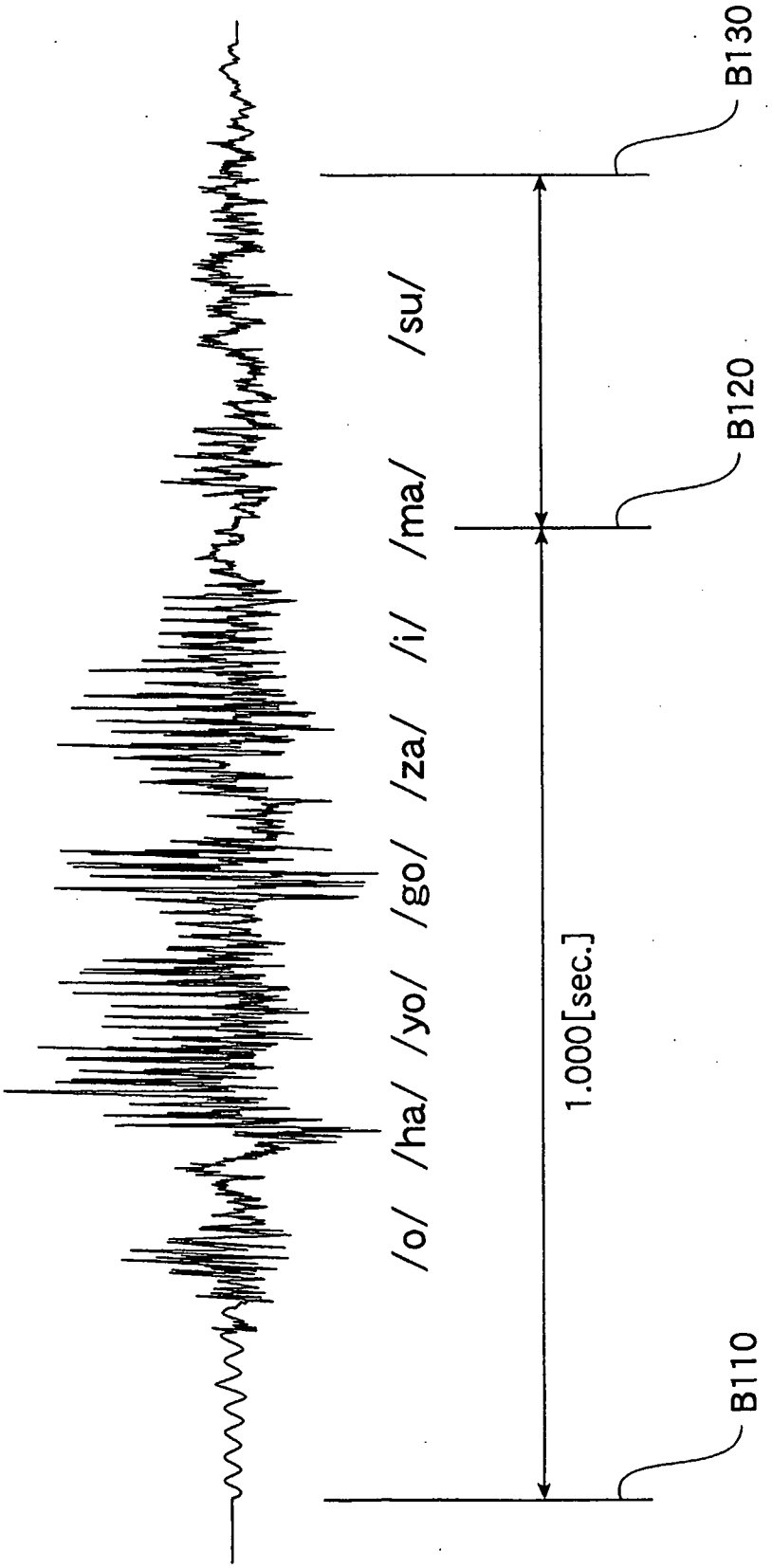
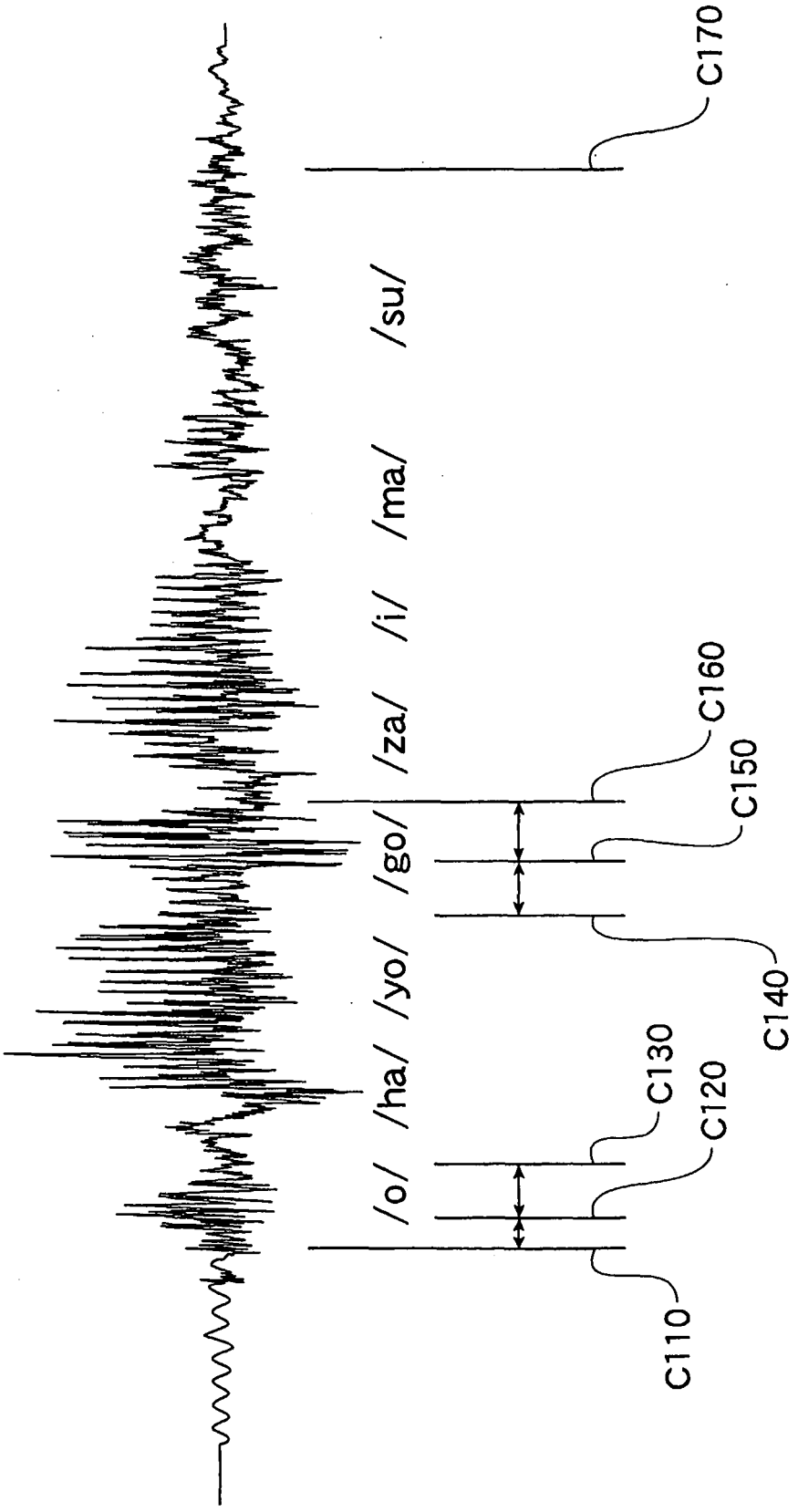


FIG.4



PRIOR ART

FIG.5



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 3151489 B **[0008]**