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RESEARCH AND ANALYSIS OF MAN VOICE CHARACTERISTICS RELATIONSHIPS WITH HIS EMOTIONAL STATE

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У статті розглядається запис і аналіз фізичних характеристик голосу людини, взаємозалежність між фізичними характеристиками голосу і емоційним станом людини, вплив емоцій на характеристики голосу

Ключові слова: звукова хвиля, обробка даних, аналіз емоцій, клієнт-серверна система

В статье рассматривается запись и анализ физических характеристик голоса человека, взаимозависимость между физическими характеристиками голоса и эмоциональным состоянием человека, влияние эмоций на характеристики голоса

Ключевые слова: звуковая волна, обработка данных, анализ эмоций, клиент-серверная система

Recording and analysis of the physical characteristics of the human voice are shown in the article, the interdependence between the physical characteristics of the voice and the emotional state of man, the influence of emotions on voice characteristics

Keywords: acoustic wave, data processing, emotions analysis, client-server system

1. Introduction

The problem of high emotional level is worthy of special attention and is not only the difficulty of eliminating the negative factors, but also in the complexity of the analysis and identification of the problem. Analysis of the emotional level is two-way process in which, on the one hand, the doctor tries to deal with the problem of the patient, on the other hand, a person who needs to find time and means to conduct an appropriate analysis of the level of influence of emotions on the man himself.

Recently, however, due to unfavorable financial and political situation, the cases of stress and nervous breakdowns. The past financial crisis has brought even more difficult conditions for the people and the opportunity to complete a full analysis of the mental health status and level of emotion has become almost impossible for most people in developing countries.

A number of people in need of professional medical is growing every day.

For detection of negative factors that affect the rights have already developed many techniques. But the general flaw or drawback for all methods is the presence of trained physician, a certain amount of money, usually a fairly large sum, and the presence of an indefinite amount of time will be spent on the analysis and treatment. The positive result is not guaranteed. In fact, the human brain is not fully understood and to guarantee anything in this area is almost outright quackery. One can only speculate that this technique will help to a certain group of people with a certain percentage.

Weighing all these factors, we can conclude that for most people the problem is the state of moral health, and will remain open, relevant and not solved a long time.

Based on the foregoing, the system of measuring the level of emotional state cannot give absolute results for all people, but it has some very significant advantages, namely: decentralization, the ability to use at any suitable time and low cost.

2. Related work

This person sends the most subtle, delicate emotions. The rate of speech depends on the individual qualities and intentions of the speaker. Timbre depends on what the person says, what a feeling and mood feels so irritated with a broken voice, scratching, with apathy, lazy-deaf, with joy-ringing sound, with a loss of tin-indecisive, angry at a broken-rending [6].

Revealed three important facts about emotions:

- There is a set of unchanging reaction of each of the emotions;
- Emotions are in a specific order from the depressing to the sublime;
- There are layers of constraints of emotion.

Each emotion corresponds to a complete, unchanging set of features of speech and behavior. Division of Communication Technology Institute of Electronic Systems (Denmark) studies were conducted in which people showed various emotions. Studies have drawn these emotional reactions in the form of the scale, with a more joyful at the top and bottom

of the negative emotions. It became obvious that everyone at any time is somewhere on this scale, moving up and down on it. Each emotional position is called "tone." Each "tone" on the emotional scale contains characteristics unique to him.

Below each band is expressed emotion a repressed emotions:

- Expressed enthusiasm: enthusiasm, interest;
- Restrained enthusiasm: conservatism, boredom, antagonism;
- Hostility expressed by: pain, anger;
- Restrained hostility: the lack of empathy, the latent hostility;
- Expressed fear: fear;
- Fear restrained: compassion, coaxing;
- Expressed grief: grief;
- Hill restrained: Smoothing of guilt, apathy.

With the discovery of these, the subtle emotions that lie exactly between the expressed emotions, we can predict the responses of the speaker. Knowing the basic characteristics of each emotion, we can see how successful collaboration with a man as he is truthful.

The most important thing you need to know about emotions - is that people change their position on the scale "of tones." The person experiencing the emotion, the appropriate circumstances.

Important information are the sounds of the speaker's rights:

1. Discrepancy time of laughter - stress;
2. Unexpected spasms votes - voltages;
3. Permanent cough - mendacity, self-doubt, concern.

The basis for the analysis of the background mood of your interlocutor is the following information:

1. Awareness its strength (confidence). Decisiveness and brevity of speech. Parsimony in the transfer of business information. A calm tone of voice and intonation.

2. Awareness its weaknesses (lack of confidence). Doubts about the selection of words and interrupted speech. The haste and readiness to issue the information. Fussiness.

3. Willpower to resist. The average volume of the voice, hard, cold tone, clear articulation, slow tempo and rhythmic speech over, the precise diction.

4. Internal stress. Changes in voice, forcing the sound, the creaking of teeth, stuttering, inappropriate laughter of the time, constant interrupting others. Increasing the number of template sentences expressed by faster than usual, neglecting speech by pauses, the use of words in the speech of endearment and diminutive suffixes.

5. Tiredness or depression. Delayed speech is soft and muffled voice from falling intonation at the end of a single phrase.

6. Hostility. Interruption of speech of the interlocutor. Low voice volume.

7. Nervousness and uncertainty. High and shrill voice, rapid speech, saying thoughts out loud.

8. Bad mood (negative emotions). Slow speech, sullen silence, angry voice. Carping to a completely innocuous words and provoking a quarrel, hostility, non-contact.

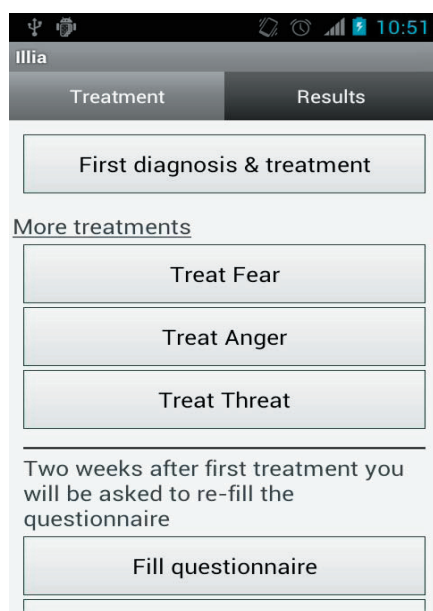
9. Good mood (positive emotions). Sociability, clear voice with an increase in tone by the end of phrases.

Voice of the person develops gradually, sometimes abruptly, to the extent of formation of the body. The timbre of voice, some features of intonation, tempo, rhythm and fluency, voice characteristics are determined by individual properties and give a speech rights of every human identity. These features, particularly voice, as a rule, do not change throughout life. Therefore, the individual peculiarities of speech and voice with high reliability can identify the speaker [7].

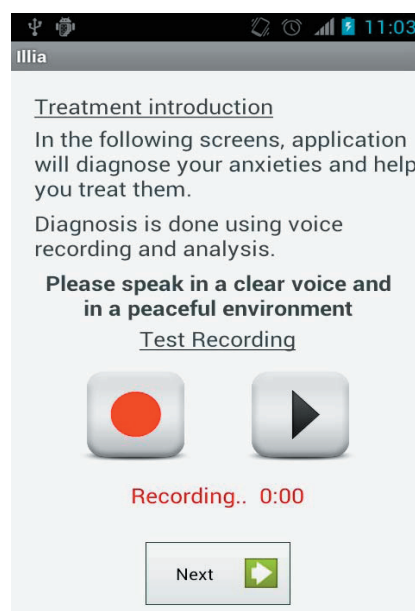
3. Overview of FFT: Fast Fourier Transform algorithm

A fast Fourier transform (FFT) is an efficient algorithm to compute the discrete Fourier transform (DFT) and its inverse. There are many distinct FFT algorithms involving a wide range of mathematics, from simple complex-number arithmetic to group theory and number theory.

A DFT decomposes a sequence of values into components of different frequencies. This operation is useful in many fields but computing it directly from the definition is often too slow to be practical. An FFT is a way to compute the same result more quickly: computing a DFT of N points in the naive way, using the definition, takes $O(N^2)$ arithmetical operations, while an FFT can compute the same result in only $O(N \log N)$ operations. The difference in speed can be substantial, especially for long data sets where N may be in the thousands or millions—in practice, the computation time can be reduced by several orders of magnitude in such cases, and the improvement is roughly proportional to $N / \log(N)$. This huge improvement made many DFT-based algorithms practical; FFTs are of great importance to a wide variety of applications, from digital signal processing and solving



a)



b)

Fig. 1. Screenshots from app: a) Home screen; b) Voice Recording Screen

partial differential equations to algorithms for quick multiplication of large integers.

The most well known FFT algorithms depend upon the factorization of N , but there are FFTs with $O(N \log N)$ complexity for all N , even for prime N . Many FFT algorithms only depend on the fact that is an n th primitive root of unity, and thus can be applied to analogous transforms over any finite field, such as number-theoretic transforms. Since the inverse DFT is the same as the DFT, but with the opposite sign in the exponent and a $1/N$ factor, any FFT algorithm can easily be adapted for it.

The FFT has been described as “the most important numerical algorithm of our lifetime”.

4. Created system

There was a system that automates the process of analysis of human emotions.

The system uses a mobile client for the mobile operating system Android, and the server for data analysis and storage statistics, written in Java.

Users of mobile customers use their phone as a voice recording. The user displays a different image, playing music. This is all done in order to enter the user into a state of emotional arousal. The user utters a code phrase, and recorded

his voice. Then the data is sent to the server and the analysis occurs. Upon completion of the analysis of the user returns the result as a text which indicates emotion, which the user is subject to most of all.

5. Conclusion

In this article, we present the results of our study of the automation system analysis of emotion on voice.

User recording your voice using the mobile client and send data to the server for analysis. upon completion of the analysis phase, the user receives the result from the server computing in which emotion was shown that people exposed to most often.

As a result of a comprehensive system was developed by analyzing the human voice and to determine the relationship between physical characteristics of the human voice and its emotional state. This system allows you to record and analyze the human voice on the server, returning the result to the user.

The work was analyzed analogous systems, their advantages and disadvantages. The developed system has several advantages such as cost-effective data exchange protocol and fast user interface. Among the shortcomings can be identified limitations of the platform Android.

Bibliography

1. Emotions [electronic resource] / Moscov. “Emotions” - Mode of access: \www/ URL: <http://www.zipsites.ru> - 05.02.2012, the - Title from the screen.
2. Psychology emotions [electronic resource] / Moscov. “Emotions” - Mode of access: [www / URL: http:// www.big-library.info](http://www.big-library.info) - 05.02.2012, the - Title from the screen.
3. The Everlasting Gospel [electronic resource] / NY. «Galactic» - Mode of access: \www/ URL: [http:// www.galactic.org](http://www.galactic.org) - 05.02.2012, the - Title from the screen.
4. Jaime C. Acosta and Nigel G. Ward «Responding to User Emotional State by Adding Emotional Coloring to Utterances» [Text] / S. Vladimir. - Apress, NY, 2009. - 343s.
5. International Speech Communication Association [electronic resource] / Franch. «ISCA» - Mode of access: \www/ URL: <http://www.isca-speech.org> - 05.02.2012, the - Title from the screen.
6. L. Ron Hubbard's “Free Man”, magazine “capacity», № 232 [Text] / L. Ron Hubbard - Moscov, 2001. - 127p.
7. Speech [electronic resource] / Berlin. «Expressive Speech» - Mode of access: \www/ URL: [http:// www.expressive-speech.net](http://www.expressive-speech.net) - 05.02.2012, the - Title from the screen.
8. Nogueiras A., Moreno A., Bonafonte A., Marino J. B., “Speech emotion Recognition Using Hidden Markov Models”, Eurospeech [Text] / J. B. Marino - Belgia, 2001. - 639s.
9. Frijda, N. H. The emotions. Cambridge: Cambridge University Press. [Text] / N. H. Frijda, - Apress, NY, 1986. - 343p.
10. Dzheyms V. Psychology, Part II. [Text] / B. James - St. Petersburg, 1986. - 343s.
11. Manerov B. X., Schneider EM Automatic recognition of emotion in spectral and intonation features // Proceedings of the report and the reports of the 5th All-Union Conference-Symposium series “Acoustics of speech and hearing.” [Text] / EM Schneider - Odessa, 1989. - 421s.
12. Uilson «Klineberg» [Text] / Wilson - «Apress», NY 1948, p. 194.