Emotion Recognition System

VibraImage

7SL   Version

Manual

ELSYS Corp.

Saint-Petersburg

2009

CONTENT

1. Introduction

1.1. Basic applications

VibraImage 7L_ (lite) software achieves the following goals:

- Emotion recognition and detection;
- Human vibraimage visualization;
- Human aura visualization;
- Personal compatibility

Every person has some aggression level and low aggression level is the same pathology as high aggression level. Aggression is one of the base human emotions and now, every **VibraImage7LA** user could control his own aggression level, or aggression of friends, partners and any video controlled person.

Nowadays stress is one of the most popular word characterizing human mental state. **VibraImage7LS** program allows fairly analyze stress level for yourself or others, that is important for regular mental health control, also as precautions, rehabilitation and care for depression states.

Anxiety (fear, tension) presents physical emotion realization, produced by any alarm, independently from conscious or unconscious of this state by person. **VibraImage7LT** program intends for anxiety level analyzing, allows to indicate unconscious alarm and fear, so assists in it medical treatment.

With the help of **VibraImage7LC** program every user could check personal physical and emotional compatibility level with friends and family at any moment.

Every emotional parameter is calculated in the range from 0 up to 100 %, the greater value of calculated parameter corresponds to the greater emotional level.

1.2. Specifications

1.2.1. Vibraimage system data

- Resolution, TVL, more than   400
- VibraImage noise level, bit, less than   0,1
- Frame speed, frame/s, more than   12
- Frequency range, Hz, more than   0,1 ÷ 10

1.2.2. Web camera requirements

- Sensor   CCD or CMOS Sensor
- Resolution, pixel.   From 640 x 480 till 1280 x 1024
- USB compatible   USB 1.0, USB 2.0
- Frame speed, f/s, more than   10
- Microphone   external
- Exposition control   auto and manual
- Color mode   color and B/W switch
- Flicker mode   Flicker 50Hz and 60Hz

1.2.3. System requirements for local module computer

Operation System	Windows XP Prof/Vista with DirectX 9.0 or later
Processor	PC with Pentium Core Duo2 2000 or better
RAM	1024Mb or better
HDD	10GB or more free space
USB port	1free USB ports version USB 2.0
Video capture	WDM-compatible video device

1.3. Package contents

1.	VibraImage Lite software	-	1
2.	Internet Code	-	1
2.	User manual	-	1
3.	Digital USB camera (options)	-	1
4.	Microphone (options)	-	1
5.	Personal computer (options)	-	1

2. VibraImage software installation

It is necessary to execute the following actions for installation of VibraImageLite program on your computer:

1. Go to Web page http://www.elsys.ru/downloads_r.php#Vibraimage7LC.msi

2. Load file http://www.elsys.ru/downloads/Vibraimage7LC.msi

3. Run file Vibraimage7LC.msi

4. Press button «Next» in the appeared window of the beginning installation;

5. Accept the license agreement and to press button «Next» in the appeared window;

6. In the appeared window specify a way to the catalogue where files of the program will be written down, then to press button «Next»;

7. Press button «Next» in the appeared window, allows installation of software files on your computer;

8. Press button «Close» at the end of installation.

9. VibraImageLiteC program pictograms appears after the end of installation in system menu and on desktop of your computer;

10. To reboot a computer;

2.1. VibraImageLite software activation

Attention!

1. Procedure of activation is made once at the first start of the program.

2. The received serial key for activation can be used only on the one PC.

3. Activation procedure requests Internet access for key confirmation from server.

4. Each key of activation is intended for work with its "version" of the program.

Code type	Software "version"
VI7_xxxxxxxxx_C	VibraImage7LC software is intended for compatibility testing of two persons
VI7_xxxxxxxxx_A	VibraImage7LA software is intended for recognition of person anger level
VI7_xxxxxxxxx_S	VibraImage7LS software is intended for recognition of person stress level

VI7_xxxxxxxxx_T	VibraImage7LT software is intended for recognition of person tension level

Activation procedure:

1. For the activation beginning it is necessary to start the program VibraImage7Lite.exe.

2. At the first start of the program the activation window (Fig. 1) will be displayed.

Fig. 1. Activation window

3. In field "Request" it is necessary to enter the serial number of a key received by e-mail or specified by the seller. After input of a key to press the button " Get Answer code using HTTP ".

4. The activation key will be checked up through the Internet and, in case of successful end of activation procedure, the acknowledgement code (Fig. 2) will be sent.

Fig. 2. Successful activation

5. Press button " OK ". Program VibraImage7LiteC will be automatically started.

6. Start operation with system.

3. VibraImageLite. User manual

Connect web camera to your PC and start VibraImageLite program .

3.1. Main window

Main window (Fig. 3) includes the following parts:

- Image area (on right side);
- Information window (on left side).

On information column (at the left side on the screen) is displayed, calculated by the program, values of emotion level parameters. Note, the type of the displayed parameter depends on the running program.

Running program	Parameter
VibraImage7LC	In an information column the compatibility level of two people is displayed
VibraImage7LA	In an information column the person anger level is displayed
VibraImage7LS	In an information column the person stress level is displayed
VibraImage7LT	In an information column the person tension level is displayed

In heading of the basic window the following information is deduced:

- type of video source: Video camera or AVI file;
- model of video source: Video camera model or AVI file name;
- Name of running VibraImage module

Fig. 3. VibraImageLite.*exe main window*

Note, double click by the left button of a mouse in the image field of makes **RESET** of all saved up information and statistics about frames and start new cycle collection of information.

3.2. Main menu

For a call of the program menu it is necessary to click in a working window the mouse right button. The appeared main menu will consist of the following items (Fig. 4):

- **Preset** – choice of the basic modes of display of the information

- **Video –** adjustment of a videocamera parameters or loading of an external videofile.

- **Language** – Choice of language of the interface and help system.

- **White background** – white background using

- **About Vibraimage -** view the information about software version, license type and registered user name.

- **Help** – call the help system about full version VibraImage software/
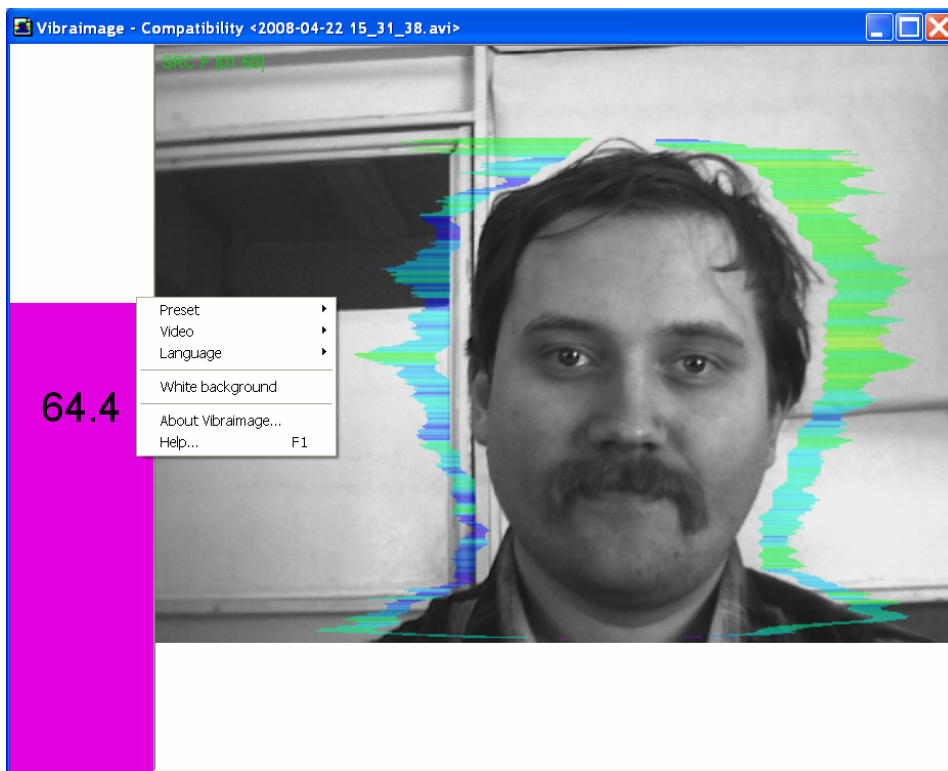
Fig. 4. Main menu

Submenu **«Video»** contains options of video modes. Its can differ depending on connected devices. For example this menu contains the following items (Fig. 5). You can choose as video source one from many installing in PC video-devices or load external video file.
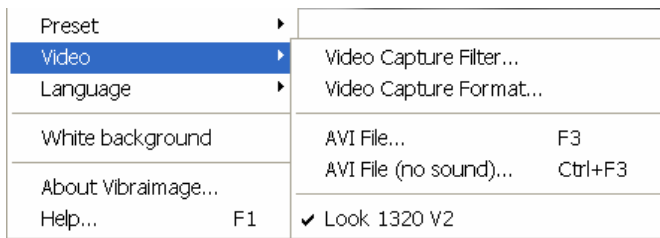

Fig.5. Submenu « Video»

«Video Capture Filter…» - by pressing the window of video device setting (contrast, exposition, brightness) opens. Each device has the especial window of settings.

«Video Capture Format…» - change video capture format.

VibraImage System allows to processing as the "alive" video signal acting from a videocamera, and the videodata, before written down and saved as a AVI-file. On default the system works with a signal from a videocamera. Subitems **« AVI File … F3 »** and **« AVI File (no sound) … Ctrl+F3 »** are intended for a choice for the analysis of an external videofile.

Mode **«File (no sound)…»** - use for load AVI files without audio support. This mode designed for work with VibraSound mode

3.3. Image area control

Vibraimages, images and external vibraimages (auras) are displayed in the image area.

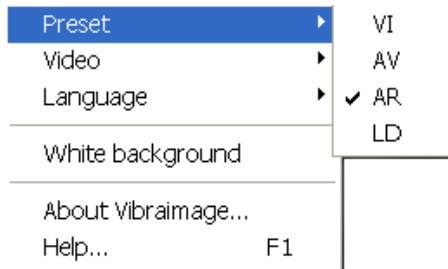The VibraImageLiteC.exe basic window can be configured for surveillance in several operating modes.

Fig. 6. Work mode select

Item **«Presets»** menu designed to choice one basic mode in image area.

- In **«VI»** mode [«VibraImage mode»] displays vibraimage of person. Color for every image pixel depends on its amplitude or frequency of vibrations (Fig. 9). In VibraImageLite version color for every image pixel depends on its vibrations frequency.

- In **«AV»** mode [«Aura Vibraimage mode»] external vibraimage (aura) allocated around the internal vibraimage or simple vibraimage. Aura line size depends on medium line vibration amplitude. Aura line color depends on maximum line vibration frequency inside vibraimage contour (Fig. 7).

- In **«AR»** mode [«Aura on the Real image»] the aura of the person is shown around his real image (Fig. 8).

- In **«LD»** mode [«Lie Detector mode»] image area shows real object image.

Note, at a displayed of the image in VI and AV modes it is possible to change color of a background of the image, having chosen main menu item « White background ».
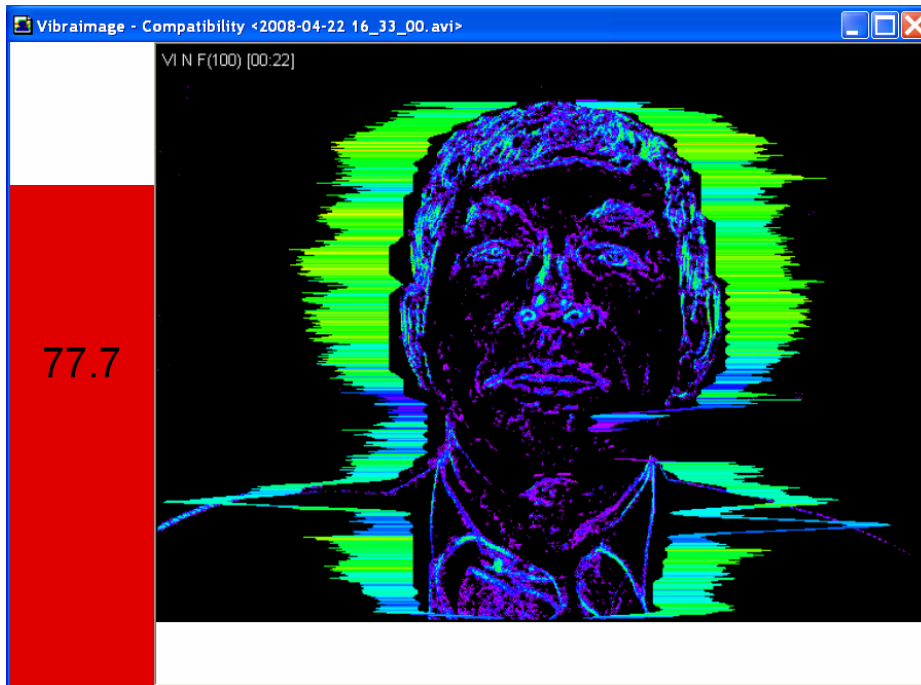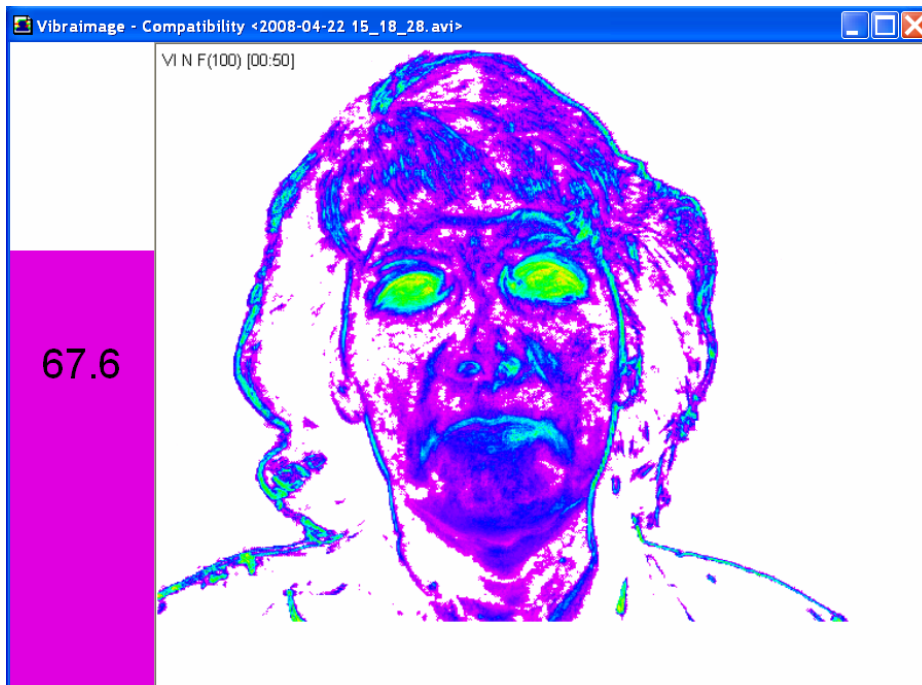
Fig. 7. AV mode on black background.

Fig. 8. AR mode.

Fig. 9. VI mode on white background.

Note, in the left top corner of a image window the image processing mode (Fig. 10) and time from the beginning of viewing AVI file are showed.
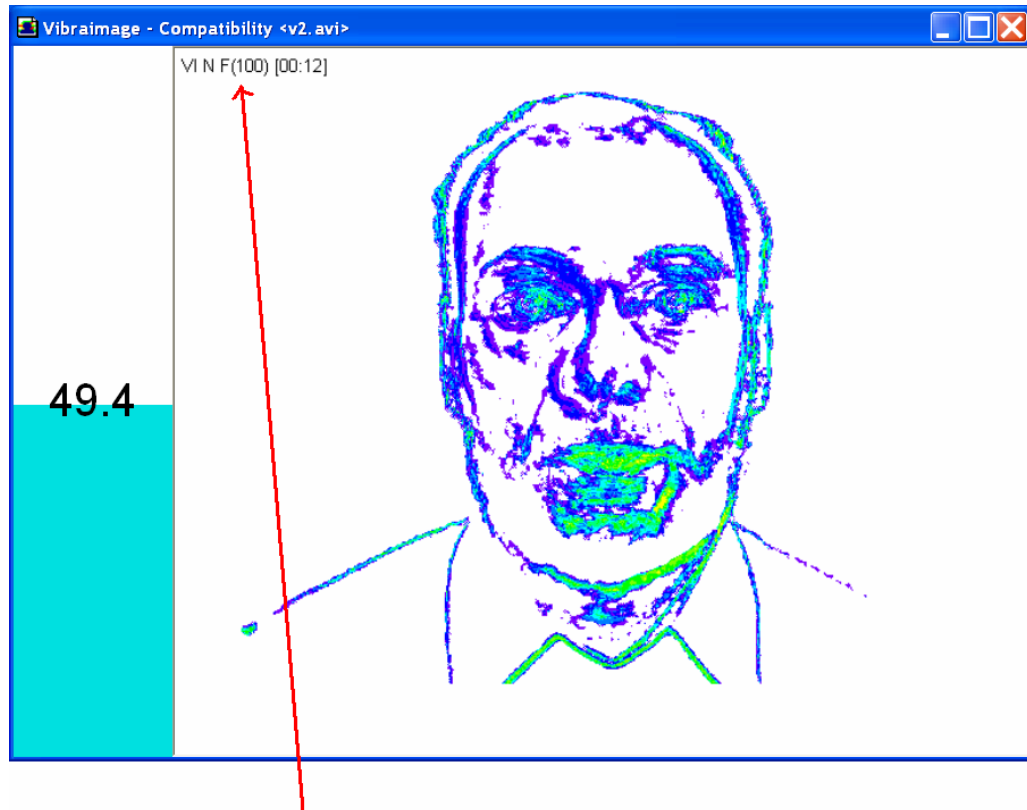

Fig. 10. Image example. Use VI mode with point frequency analysis(F)and average on N=100 frames.

3.4. VibraImage system operation

3.4.1. VibraImage parameters

Values of amplitude and frequency of vibrations of a person head differ in each point of space and are displayed as pseudo color image. Integrated processing of parameters values of vibration in each point can give the general information on parameters of the person movement. Vibraimage the person heads displaying amplitude (see Fig. 11) and frequency (see Fig. 12) the distributions of vibrations modulated by a color scale (see Fig. 13), are resulted below:
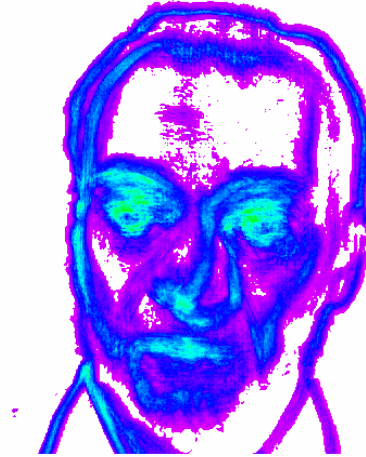

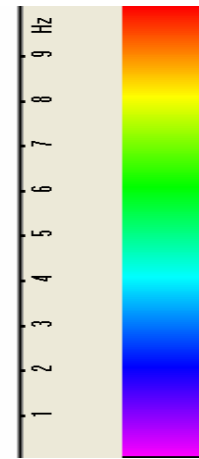Fig.11. Amplitude vibraimage   Fig. 12. Frequency vibraimage   Fig. 13. Pseudo color scale
of frequency distributions

Each point (pixel) amplitude vibraimage (Fig. 11) reflects the relative moving of an element of the image saved up for determined time as it is known, that at insignificant movings the interframes difference is proportional to movement of object. For transformation of this relative moving in absolute, it is necessary to have the exact information on distance up to object and a working corner of an objective of the chamber, then a color scale (see Fig. 13) can be scaled in millimeters or microns.

As against amplitude analyses, each point frequency vibraimage has physical dimension frequencies (Hz) as really displays frequency of signal change in each element of the image. Therefore the resulted color scale (see Fig. 13) scaling in Hz, i.e. violet color frequency vibraimage displays a range of vibrations (0-1) Hz, dark blue displays a range of vibrations (1-4) Hz, green the range of vibrations displays (4-8) Hz, red displays a range of vibrations (8-10) Hz.

3.4.2. Aura-VibraImage

External (around of a head) interline display of the maximal frequency and average amplitude vibraimage looks as aura and more informatively displays a condition of the person, than internal vibraimage. Color of aura is coded by the same color scale, as vibraimage (Fig. 14), and displays the maximal frequency in each line. The size of aura is defined by average amplitude for the given line. Any non-uniformity in color and the size of aura characterizes movements of object and its emotion condition. The normal condition of the person is characterized more uniform external vibraimage (aura), and for an intense condition of the person are characteristic the big space and color non-uniformity of aura.

Fig. 14. External vibraimage (aura) of person in normal condition
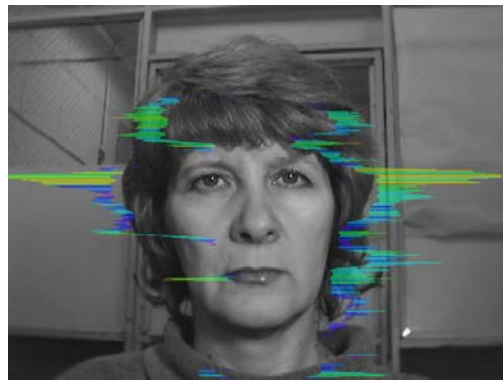

Fig. 15. External vibraimage (aura) of person in tension condition

Obvious distinctions between images on Fig. 14 and Fig. 15 illustrate advantages of the visual analysis of the person condition on external aura in comparison with the visual analysis initial vibraimage. The vibraimage method gives significant freedom of a choice of registration of a condition, and visual supervision of aura allows to estimate quickly and evidently practically all emotion parameters of the person. Brief interpretation of the form and color of aura is resulted below. This brief information does not limit, and sets to the user of system the basic directions of the analysis of person condition. Getting experience and taking into account the specificity of application, each user of system can diversify and deepen essentially results of the analysis of aura, open secret secrets of soul and a body of the person.
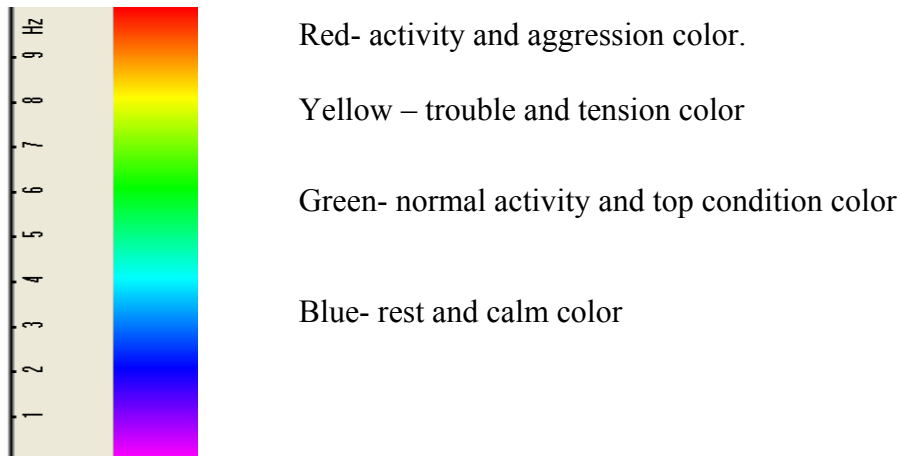
Fig. 16. Brief aura color interpretation.

Red- activity and aggression color.

Yellow – trouble and tension color

Green- normal activity and top condition color

Blue- rest and calm color

Brief aura form analysis

- Any aura asymmetry (form, color) characterized deviation from mental or physiological norms.

- Any breaks in aura uniformity characterized deviation from mental or physiological norms.

- Ideal aura has mono color, symmetrical and uniform. Any real aura differs from ideal and the question of interpretation is to characterized real aura deviations.

Note

This brief aura interpretation correspond default vibraimage system settings and based on main rules for right vibraimage scanning:
- uniform and stable object illumination;
- high quality and low nose camera application;
- frontal plane object before camera;
- maximum facial image size on monitor;
- mechanical stabilization of camera.

3.4.3. Human aura visualization

Normal and top emotional state

Normal condition characterized by aura color and form uniformity around the head, relevant monochrome color in the middle of suggested color scale. Activity level is about 0,3–0,6. Stress level is about 0,2–0,5. Tension level is not more than 0,4. Every emotion level measured in the range from 0 till 1,0 and minimal value coordinates with minimal emotion intensity.

Frequency distribution histogram is near normal (Gauss) distribution and spectrum of high speed vibraimage signals is near exponential distribution.

Fig. 17. Aura photos samples for normal condition of persons.

Stress

Stress state characterized by amount gaps in aura form and greatly aura colors non uniformity. Aura includes every scale colors and sharp color transfer, like red color could transfer to blue (Fig 18). Stress level more than 0,7. Aggression or activity level is low, not more than 0,5 and tension level is high and usually more than 0,4.

Frequency distribution histogram has several modes and high speed vibraimage signals spectrum presents superposition of exponential and uniform distributions.
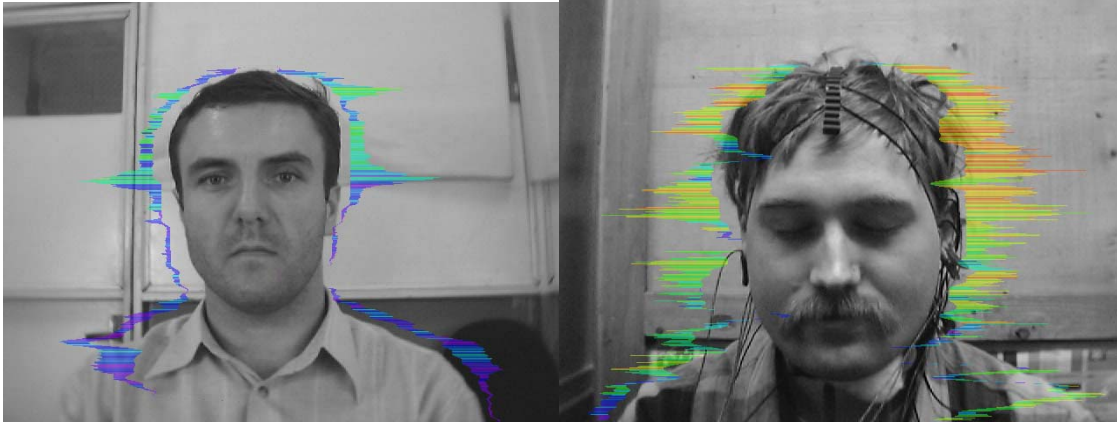
Fig. 18. Aura photos samples for stress condition of person.

Aggression and/or tension state

Aggression state is not every time coordinates with tension, and tension state is not always coordinates with aggression. But often these two emotions accompany each other. Aggressive state obligatory characterized by high frequency vibrations and red colors in aura. Aura size is more than normal and gaps could absent, but color and form non uniformity must present (Fig 104, 105). Stress level could be low, less than 0,3. Anger level more than 0,7 and tension level more than 0,4.

Frequency histogram distribution has maximum in right part of the range and distribution has amount dispersion. High speed signals spectrum envelope looks like uniform distribution.
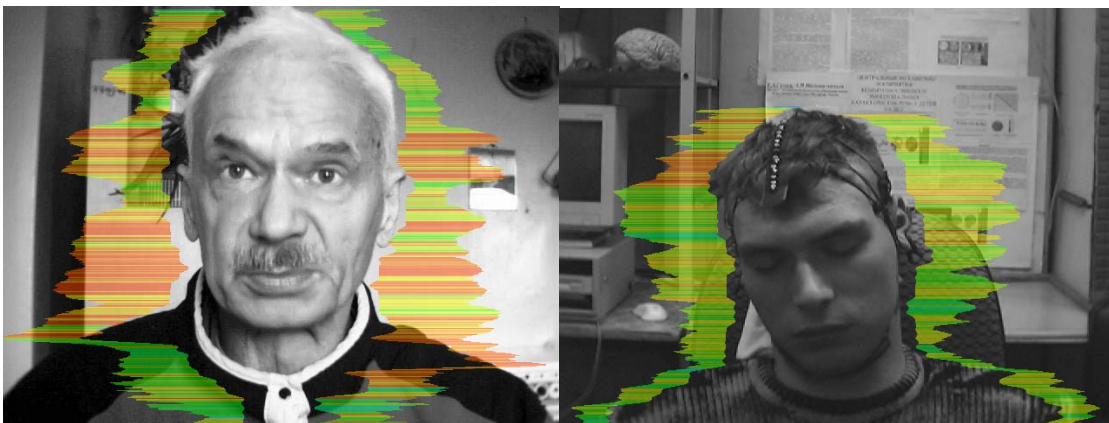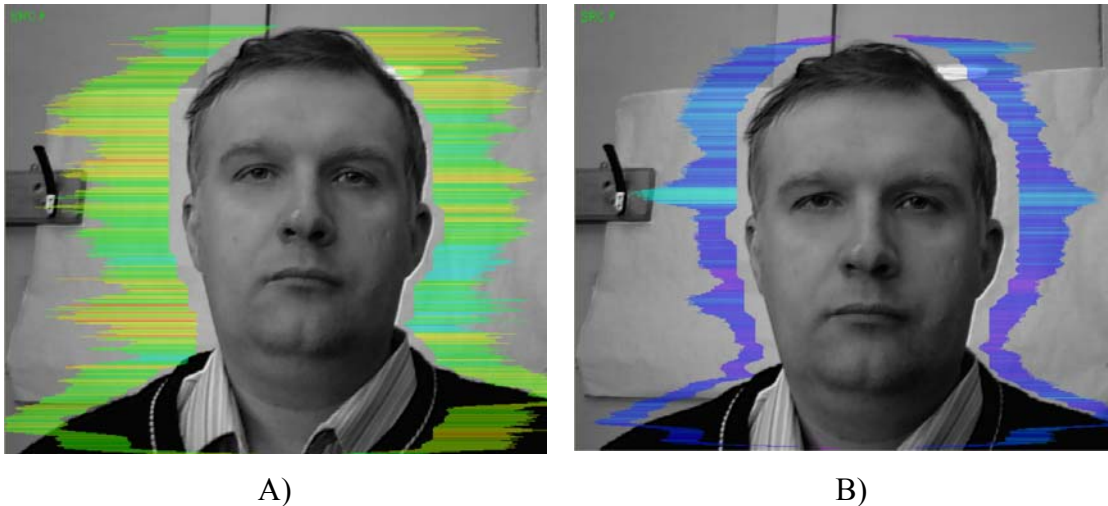

Fig. 19. Aura photos samples for aggression condition of persons.

Meditation

VibraImage system application allows to register distinction not only between the aggressive (abnormally excited) and normal condition of the client, but also and to register a degree of condition change of the person when the person calms down (see Fig. 20) or meditates.

A)   B)

*Fig. 20. Example of person meditation. A - 10 seconds after meditation start.
B - 100 seconds after meditation start*

3.4.4. Personal compatibility

VibraImage system allows registering people compatibility on the basis of their vibraimage analysis (see Fig. 21). For correct compatibility recognition it is necessary execute the rules for qualitative vibraimage capturing:

- Two persons are sit down beside as it is possible closely more to each other.
- Web camera stands opposite and adjusts so that the computer image of two persons completely entered in the screen.
- The distance from each person to screen edge must be identical and approximately 10% from width of the monitor screen.
- Light exposure of pair should be sufficient and uniform.
- Don't touch each other by head.
- Any other physical contact of pair, (embraces, pressings and other) is welcome and raised measurement accuracy.
- The background should be uniform and has high optical contrast concerning pair.
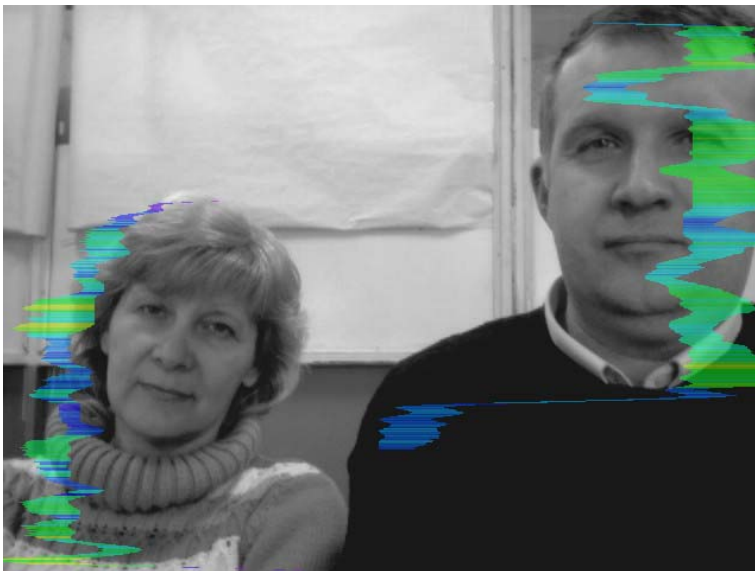
Fig. 21. Correct position of people pair

Fig. 22. Wrong position of people at check of their compatibility. People are on different distance from the camera and far apart.

Compatibility Recognition

Ideal pair compatibility (100%) characterized by completely aura symmetry. Any asymmetry of aura, characterizes the certain problems in compatibility, more asymmetry, indicates more problems in compatibility.

Maximal compatibility corresponds to the following aura parameters:
1. Symmetry form of aura from both sides of the researched pair
2. Symmetry aura colors from both sides of the researched pair