experimental data structure / / Proceedings of the Tomsk Polytechnic University, 320(5): 125-130.

8. Воловоденко В.А. Визуализация и анализ многомерных данных с использованием пакета «NovoSparkVisualizer». [Электронный ресурс]. – Режим доступа:

http://www.tsu.ru/storage/iro/k020410/s4/s4.doc

9. Берестнева О.Г., Осадчая И.А., Немеров Е.В. Методы исследования структуры медицинских данных// Вестник науки Сибири. 2012. URL: http:// http://sjs.tpu.ru/journal/article/view/245/250

SOFTWARE SYSTEM TO ASSIST IN RECOVERY OF LOST MEMORY

A.V. Matvienko, V.N. Osin, A.S. Vaytsehovsky

Tomsk Polytechnic University

Lenina Avenue, 30, 634050, Tomsk, Russia

E-mail: resolutn@gmail.com

Introduction

Nowadays, memory loss is an urgent social problem. Now there are only two recognized methods of memory retrieval: a method of Sigmund Freud and hypnosis. Each of them is very complex and requires special training of specialists and patients.

"Total Recall" is the software solution that was designed to help people, who had lost their memory.

This solution is based on the method of associations. Sometimes, people suffering from amnesia, can get a chance to remember some moments of their lives being in familiar surroundings. People get 90% of the information through their eyes. That's why the represented solution is based on the work of the patient's eyes.

Application session

During the session, a patient is viewing a collection of images that is based on the principle "from general to specific".

There is a probability that during the session, the patient will see the familiar images and his memory will recover. Ideally, after viewing the collection, the patient will remember a few key points. This will provide invaluable material for psychologists that will significantly reduce the time of rehabilitation of the patient.

Patients should register in the system to start work with the application. Registration is a simple process and does not require a large amount of data about a patient. After logging into account, a patient chooses the category of images. Next, the program synchronizes the local database of images in the Windows Azure cloud and downloads the missing images on a computer. Further, the screen displays multiple images (2 or 4). Webcam tracks which of the images the patient looks at in the first place (Fig. 1).

The results are written in a special profile. Thereafter, depending on the previous images selection, the next set of images connected with the common aspects of the previous set will be displayed.

Thus, the overall picture of the object, which the patient is trying to remember, is formed. All selected pictures are included in E-profile. The Profile includes not only images but also short descriptions and a set of keywords for each picture.

When a session is complete, the created E-profile is sent to a psychologist for analyzing (using the cloud Windows Azure – Pic. 2). A Psychologist views the profile and draws conclusions by a particular case.
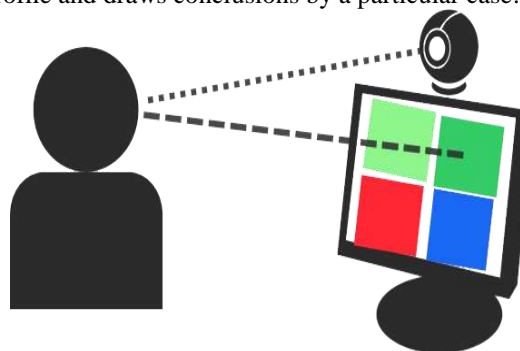
Pic.1. Tracking of patient's gaze direction with webcams
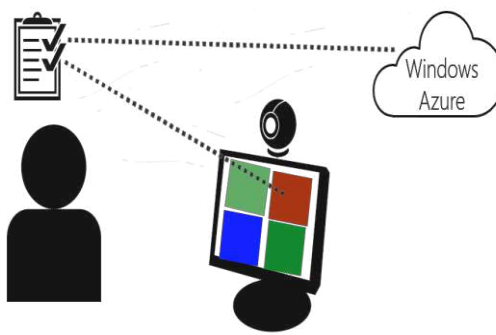
Pic. 2. Adding images to a form and sending profiles to the Windows Azure cloud

Using technology

The program is a WPF application for Windows platform, implemented by framework NET 4.5 and a library EmguCV 2.4. The basic part of the program is devoted to tracking the direction of the user's gaze. Special libraries help to simplify the task and optimize the structural integrity of the application.

To work with the video of a webcam the EmguCV library based on OpenCV library is used. EmguCV is a cross platform .Net wrapper to the OpenCV image processing library that gives access to OpenCV functions to be called from .NET compatible languages such as C#, VB, VC++, Iron Python etc.

First, face recognition is performed by using the **DetectMultiScale** function. This function recognizes

a face in the image and returns the coordinates of the corresponding rectangle.

Next, the eye area is highlighted in the resulting rectangle with a special face metric (Fig. 3).
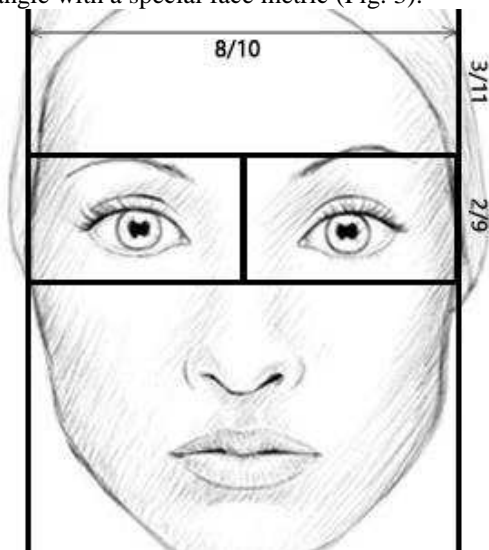
Pic. 3. Proportions of the face to highlight the eyes area

To highlight the pupil searching for the dark section of an image starting from the center of the selection of each eye separately is used. The recognition quality strongly depends on the lighting, so for a more accurate determination, sharpening filter is applied for resulting image with the standard function library EmguCV **CvInvoke.cvFilter2D**. In addition, the user can set sensitivity to improve recognition accuracy.

Conclusion

Thinking is the process based on associations. To recall a particular fragment the human brains simulate a rather long chain of associations. People, who have lost their memories, have the broken chain, to restore it sometimes only a few units are enough.

This project is aimed at being used in departments of psychiatry and neuropsychology of different hospitals and clinics. The program will be used by psychologists and psychiatrists to test patients. Joint efforts should lead to a qualitative result.

References

1. Психология бессознательного. Фрейд Зигмунд, Издательство: АСТ, 2011г., Серия: Philosophy, ISBN: 978-5-17-045566-9, 608 стр.

2. Беккио Ж., Росси Э. Гипноз XXI века, Издательство: Класс, 2003 г., 272 страница, ISBN: 5-86375-051-0 3. Cloud Computing with the Windows Azure Platform. 2009, Wiley Publishing Inc., Indianapolis, Indiana, US. ISBN-13: 978-0470506387.

4. Теория распознавания образов. Вапник В.Н., Червоненкис А.Я. 1974г. М.: Наука 416 с.

5. Методы компьютерной обработки изображений. Под редакцией Сойфера В.А., М.: Физматлит, 2001г. 784 с.

6. Быстрые алгоритмы в цифровой обработке изображений Хуанг Т.С. М: Радио и связь 1984г. 224 с.

CREATING SIMULATOR FOR ELECTROCARDIOGRAMS DECRYPTION

A.V. Prisakar
Scientific supervisor: O.G. Berestneva
Language supervisor: I.L. Pichugova
Tomsk Polytechnic University
Lenina Avenue, 30, 634050, Tomsk, Russia
E-mail: nastyaprisakar@mail.ru

Nowadays there is a large-scale introduction of information technologies in the field of medicine. This process is connected with significant changes in medical theory and practice. These changes are associated with making adjustments for medical worker training. The main purpose of any medical information system (MIS) is a complex problem solving of information collection and analysis, as well as and control problems of therapeutic-and-preventive and financial activities of institutions [1].

There is a functional classification of information systems (IS); which include five functional IS classes:
1. Medical and technological IS.
2. Directory system.
3. Statistical IS.
4. Search IS.
5. Educational IS.

Educational ISs are designed for information support of training processes in medical institutions. According to pedagogical principles of assessing knowledge level these systems are divided into the following types:
1. Educational ISs based on the principle "question-answer" controlling students' knowledge due to the answers to the systems' questions, selected from possible options.
2. Educational ISs providing knowledge as e-learning courses and study guides. They control acquisition of knowledge on the principle "question-answer".
3. Educational ISs based on knowledge bases and containing information about problem-solving methods, including expert and inference systems [1].

The article is focused on the problem of creating software for instructive MIS. Software includes math-