

REMOTELY SUPPORT FOR DIAGNOSIS AND TREATMENT

Baha Chbani¹, Petr Novak²

^{1,2}Faculty of Electrical Engineering, Prague, Czech Republic

Abstract

The effort is to create a "framework" for supporting, using diagnostic and treatment computer applications. Therefore, the possibility of easily create both desktop and web applications representing particularly rehabilitation, monitoring and testing tasks. Nowadays, move the location of many activities to home or to any remote environments is major problem in total, which may be common to many and widely different fields, not only medical. One very important motivation is saving labor and cost of doctors. Many medical problems have to adapt to the changing condition of the patient, thereby providing a constant efficiency of treatment methods and the ongoing appointments with the doctor. According to patient identification, these data are processed and passed to the workplace responsible physician (control). The results are first automatically evaluated to detect adverse conditions and then present a suitable doctor in graphical form.

Keywords

Mobile, Diagnostics, Home, Treatment, Defect Detection

Background

Nowadays variety of disorders appreciably increasing, such as strabismus, dyslexia, dysgraphia, dyscalculia and others. Many of them are not only very difficult to detect (especially in the doctor's office), but also very hard to treat. It always depends on the correct and well-timed diagnosis then on the available treatment. However, most patients are young children. Method of diagnosis and treatment of these disorders must be based on that information.

Objectives

The main purpose is, to provide diagnostic tools / applications to public by appropriate form, but at the same time under the supervision of experts. The task of these applications is to detect the child's disorders in normal activities such as writing, reading or playing games. The same principle applies to the treatment of the following detected defect. Concept of applications is very important due to the age of the users.

Methods

The first access to diagnostic applications will be given to the parents. Those applications are formed by kit of games (according to the age) focused on the detection of a defect. The results will sent to the automatic processing, and it is recommended that parents visit the doctor during the deviations detecting from the normal state. Only the doctor will decide the actual statement of the patient. By providing particular treatment process the patient gains access to a set of therapeutic applications. They also provide updated results for continuous evaluation to available doctor. Moreover, according to their opinion they can modify the process of treatment

Tasks / tests work principle

Different medical fields' projects are different in fact only by which set of tests were used. For this reason, the project is designed as universal framework, which will have two sides, in patient/user side are the required tasks, which will be created and inserted, in the doctor side, inserted algorithms for the evaluation of specialized display case.

Most used tasks are designed in the form of appropriate games, especially for pediatric patients. Created framework will include the ability to create these jobs or games using pre-built components and rules. Components are suitable in terms of re-usability of some basic sub-task in many tasks such as tracing a shape or location of the point to point. Conversely, rules are suitable for joining subcomponents, modification tasks by the patient and the overall assessment. If we manage to create a task using only the sub-components and rules, you can create completely experimental tasks directly to medical facilities and this is one of the main goals of this project. A similar situation exists on the part of the doctor. Each task includes a unique identification and the evaluating module therefore provides data / information derived only from this job. Also, the evaluation module not only the computational parts, but also the graphic part will be generated using normal mathematical notation and rules for displaying the results. Therefore, this will be created directly in the medical environment.

Results

Medical examination is random and defects may not be detected properly. Almost the absolute majority of children have home access to a personal computer, or to tablet. Therefore it is possible create appropriate specific applications for these devices. However, touch devices are preferable for very young children. Parents can download the Necessary application (for tablets Independent on WWW), enter the identification code and then sends the stored results / provide for valuation. In contrast to doctor's visits, it can be used repeatedly beyond a certain time and thereby increase the probability defect detection. The same principle applies for therapeutic applications.

In addition to the results stemming from a specific task are other possible treatment sent this following information:

- Identification of the patient / user. Unique code under which the information about the test / task is available for further evaluation.

- Date and time of the duration of the task. These data are used not only as an absolute time range for 0 to MAX and for 0-24 hours, but at the same time as the days of the week and daily periods for the detection of recurrent reality.

- Times of user actions. Each task according to their specialization produces a log of events. These events and their times are also sent. They can be suitably used for the evaluation of the patient's sensory processes that are largely independent of those jobs.

- The whole movement of the mouse or pen user. Most jobs use a pointing tool such as a mouse, joystick

or tablet. The speed and fluidity of movement of the patient can be evaluated quite independently of the type of task and thus detect such composure, determination, deliberation and many other traits as well as user / patient.

- Images facial or environment. You can also use ordinary web camera and the required moments by sending the image or the environment and hence from the perspective of a physician or psychologist to evaluate other additional information.

- If necessary, they can be recorded and transmitted doctors need more information flowing from the concentration of some special tests or tasks.

The current use of the treatment of strabismus and reached results

The prototype of this project is currently being used in home treatment / rehabilitation of strabismus. However, this is not only a test condition. Created tasks use doctors in three large hospitals and home treatment uses over 200 patients.

The following images, see Fig 1, Fig 2 contain tasks during one home therapy for about four weeks. The first image contains only the days of the week (black) and time of day (gray), the second image contains three rated the task parameters (green, red blue).

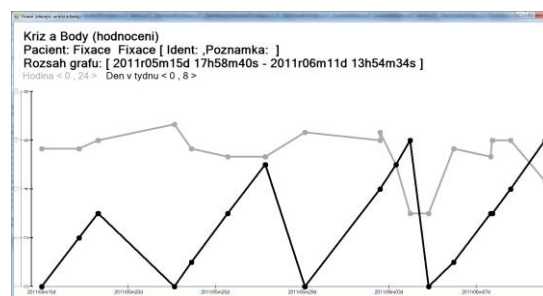


Fig. 1: Using task during one home therapy for about four weeks.

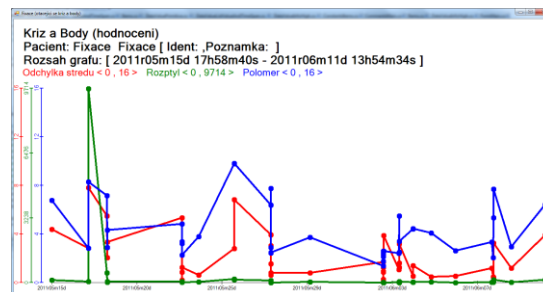


Fig. 2: Three parameters of task during home therapy for about four weeks.

For the continuous development of the project and thus improve its ability is considered the foundation of the "foundation" where patients would use for this

project (home therapy) once contributed a certain amount.

This post, not the total payment, would be added to the Foundation and used for the development of this project. In particular, for the purchase of computer equipment, for a physician and developer and at the same time as a reward for the creator of this project. Because it is expected over 1000 basis of potential users suffering from some form of strabismus and the appropriate fee amount can be a noticeable support for the development of this project. Just for the record, in our population is estimated at around 16% of people with strabismus.

If one in ten patients (total 16%) took this project and contributed to its development, so you can create / fund high-quality tool for home treatment of this disorder.

Very similar solutions form the foundation and rewards for creators of the project could be used for any other intended area of medicine. The overlap of patients across several medical areas is minimal.

Examples of already implemented and proposed tests

Using the described framework has been created some basic tests and tasks. Here are examples with their descriptions. The first include essentially normal questionnaire based on textual matters, see Fig 3. The result provided framework contains not only questions from the user, but also the entire record of user actions (movement, processing times of items and many more). From this, we can evaluate the complexity of the issues for users, uncertainty in the repair and partly his current mental state.

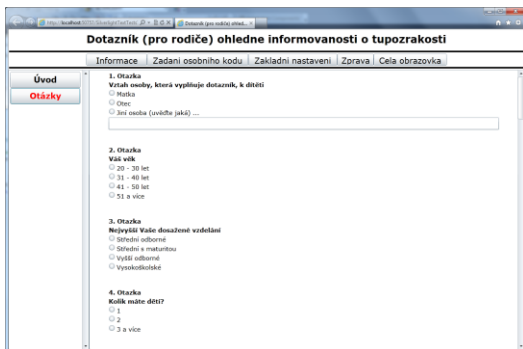


Fig. 3: Example of questionnaire forms in a Web application.

The following group consists of tests aimed at the exposure point accuracy at the target location, see Fig4. The output is not only illustrative graphic evaluating the success of the patient, but also his actions such as

recording tracks mouse (line from black to white, fat indicates slow motion and fast motion thin vice versa). It can thus detect in which direction (the field of view) the patient responds faster and vice versa.

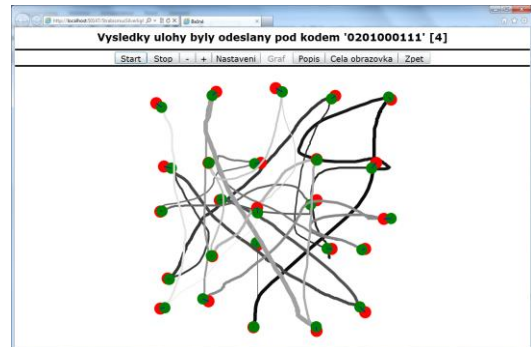


Fig. 4: Tasks on the exact placement of points, locating the position.

Another group of tasks is to recognize shapes or colors, see Fig 5. The task is modeled at the bottom indicate the shape(s) in the upper part. The output is also overall record of user activities. For it suggests what shapes / colors are problematic for users (wrong destination, time delay). These jobs are suitable for long-term assessment of the patient's development, such as improving visual acuity and color vision.

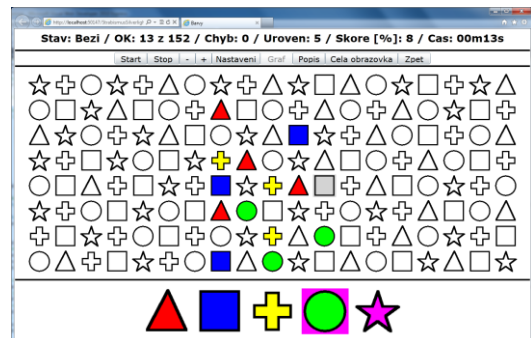


Fig. 5: Tasks for recognition or adding shapes or colors.

The last group are the exemplary role of the movement of the hand, or more precisely, the coordination of eye - hand, see Fig 6. They are mainly based on the tracing of various complex images

(classified according to the type of lines: straight, curls, wavy lines, ...) or even the current estimate of the distance from the depicted objects (pass through a maze of middle of the road). Mathematical evaluation of the accuracy of drawings (the degree of compliance with the pattern drawing the patient) or the distance from the depicted objects (real middle path through the maze) can detect many conditions the patient from simple inattention, despite insufficient to estimate such symptoms of Parkinson's disease.

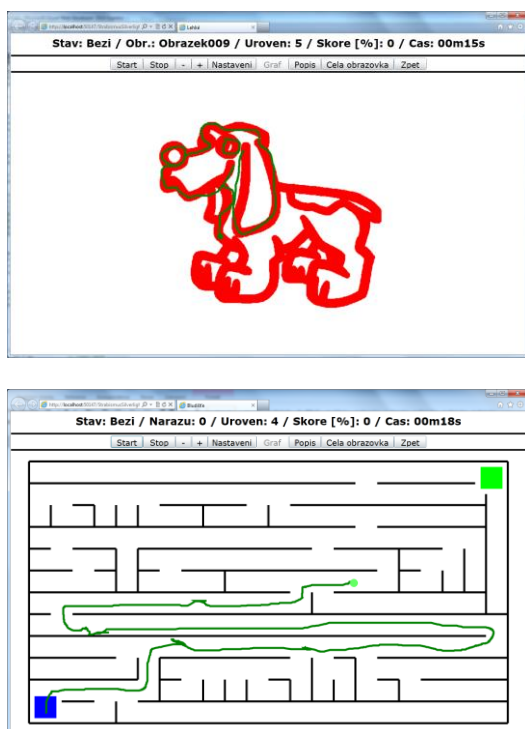


Fig. 6: Tasks with drawing and labyrinths.

Conclusion

At present, there are developed applications for partial detection and main treatment of strabismus, which patients have access by identification code. Intensive treatment, even in the home environment, not only contributes to the satisfaction / calm the patient, but also mainly to reduce the time of treatment. The same principle will be used to detect dyslexia, dysgraphia, dyscalculia and similar disorders.

Nowadays, the file is created jobs for home rehabilitation of visual impairments, which is already used on more than 5 medical centers and over 200 patients at home. Both in terms of doctors and in terms of patients, it is of great benefit. Already the initial results from the use provide a very surprising information. It also initiated a project for the rehabilitation of musculoskeletal home using special sensors. Furthermore, it is considered the addition of special algorithms to create a universal task such as

tracing properly prepared files, compiling mathematical equations, text and puzzles in order to use this framework for the early detection of many types of disorders such as dyslexia, problems with color vision, Parkinson's disease and many others.

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Baha Chbani
Petr Novák
 Department of Cybernetics
 Faculty of Electrical Engineering
 Czech Technical University in Prague
 Technická 2, CZ-166 27 Prague
 E-mail: engbahachbani@gmail.com
 novakpe@labe.felk.cvut.cz