

# Key-word data base used in communication system with disabled people

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**Abstract** — In order to communicate with patients with severe neuro-motor disabilities, a system – ASISTSYS – was developed, which uses a key-word data base. The key words are shown to the patients via both the visual and audio channels, and the patients can select the necessary word or phrase by operating a switch. The word or phrase is then transmitted to a caretaker who takes the necessary action. The key words are organised hierarchically in the open data base, to which new items can be added.

*Keywords - data base, communication with disabled people*

## I. INTRODUCTION

The communication system ASISTSYS has three units (Figure 1): *Asistsys Patient*, *AsistsysNurse* and *AsistsysServer*, linked via radio. The key-word data base is kept on a laptop

The first stage of communication consists in generating the key words or phrases and displaying them on a laptop screen. This is done using an application which allows the displaying of written words and icons. The application includes two modules: “administrator” and “users”. The “administrator”

module allows the operator to generate new key words and/or to delete them without modifying the programme. The administrator also defines the “users” with their names, passwords and locations in the data base. The “users” module is for the patients to access the key words in the data base.

The data base is made up of four unrelated tables:

1. The “words” table consists of all options created by the users and includes sound fields and images for the key words.
2. The table “projects” is used to store arborescent menus, according to the hierarchy of the key words;
3. The table “indices”, with one row and one column, contains the next free index for an option required by the user; updating takes place automatically;
4. The table “users” includes all users who can use the programme and is accessible only to the administrator.

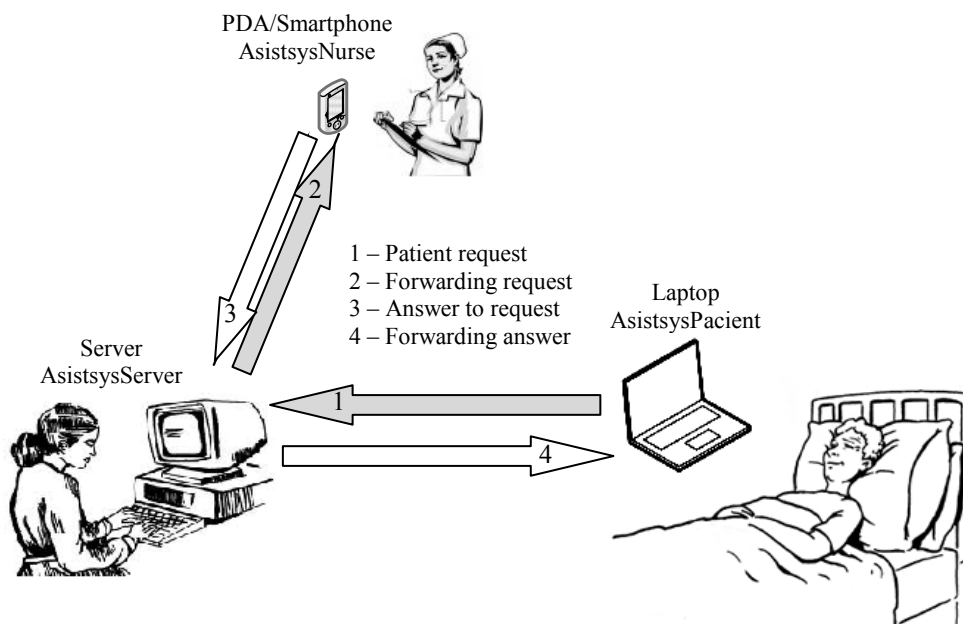


Figure 1. ASISTSYS system structure

## II. DATA BASE: GENERAL CHARACTERISTICS

The list of key words which *AsistsysPatient* displays on the patient's screen is a text file. Each word or phrase of the list is accompanied by supplementary information regarding the matching background colour, the name of the image file and that of the sound file. The arborescent organisation is done using the XML and JSON standards

A first version of the data base is given by the designers of ASISTSYS. However, as every patient has specific medical difficulties which need to be taken into account and attended to, the list of words and phrases needs to be personalized. This list must also be constantly adjusted to the changing condition of the patients and their needs and wishes. These requirements impose the inclusion of the possibility for the medical staff and caregivers to modify the key-word list. As the members of

the staff and the caregivers may not possess proper knowledge of XML or JSON, and errors may occur, a software application, *AsistsysKeyword* has been developed.

This can assist the medical staff and caregivers in designing a personalised key-word list and generating it in one of the two formats mentioned above. The possibility of managing such lists having the right access privileges, the existence of given formats for various categories of disabilities have proved to be useful facilities. All these require the presence of a data-base server which can be accessed via a computer network.

The server component and *AsistsysKeyword* application constitute a subsystem of ASISTSYS. The architecture of this subsystem is of a client – server type (as shown in Figure 2), known as a „three-ties architecture” [1].

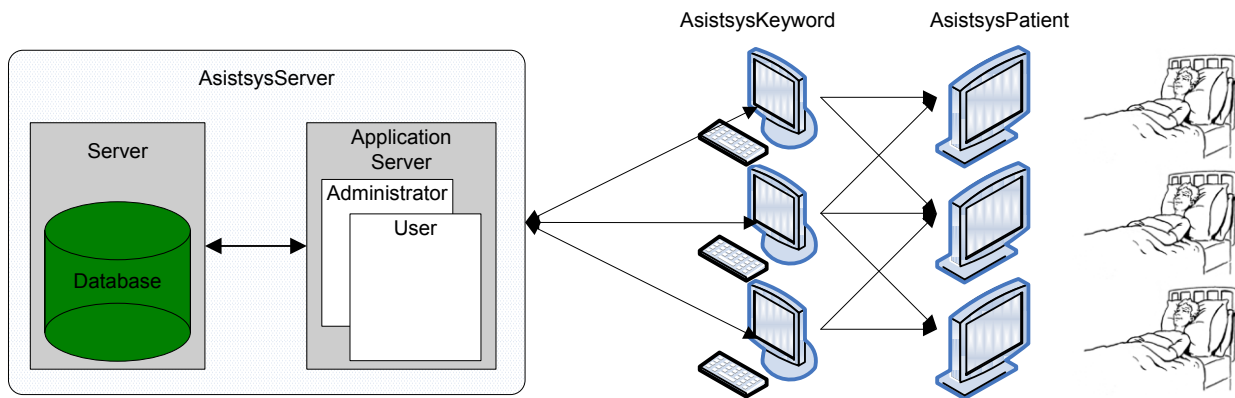


Figure 2. *AsistsysKeyword* subsystem architecture

## III. DATA BASE STRUCTURE AND OPERATION

The data base contains four tables: *users*, *projects*, *list* and *keywords*, connected as shown in Figure 3. The *users* table contains information about the users that can access the application. The *projects* have unique identifications and contain information about the author and the keyword list. The arborescent structure of a list is given by the *list* table depending on the value of an *ID\_WORD*. Consequently, a

word can be either a parent or a son according to whether *ID\_PARENT* is zero or the id of an existing word. Its belonging to a list is determined by the *list ID*. The *keyword* table contains all the keywords, both the predefined ones and those defined by the user. The definition of a word is unique to avoid confusion. The addition of a word is allowed only when the word already exists and the editing can be performed by either author or administrator.

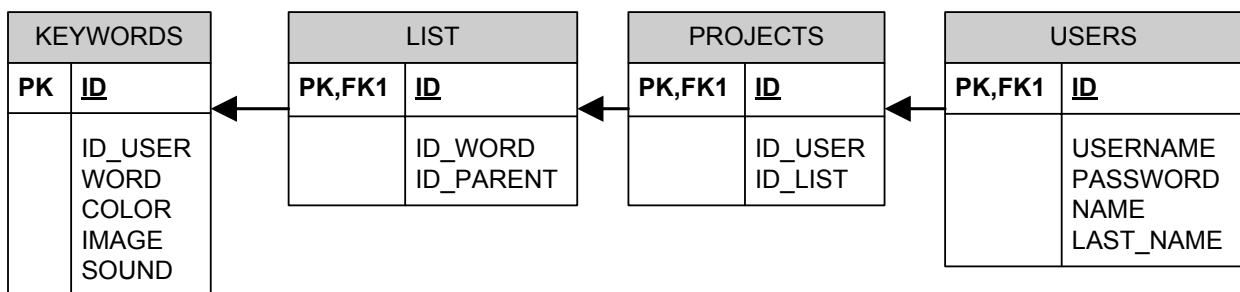


Figure 3. Data base structure

The user interface (Fig. 4) has two areas:

- An area for the creation and administration of keywords (marked by a broken line) (1);
- An area for the creation and administration of projects (word lists), marked by a solid line (2).

Defining a new word menu File → *New word* has as consequence permission of access to area 1 controls. The operator is assisted in choosing a background colour, a matching image and sound. The image and the sound can be either imported or created and stored by the programme. Once

all the word attributes have been defined, the word can be saved in the data base. The system generates automatically a new unique identity index for the new word and attaches the identity index to the author in order to prevent editing by other users. The added words cannot be deleted by the authors but only modified. It is only the administrator who can delete an existing word from a project; however, that project cannot be exported until a new word is defined or chosen.

In order to have access to the data base, the operator (medical staff or caregiver) needs to authenticate their

password. Once accepted by the system via *AsistsysKeyword*, the operator gains access to both his/her own projects (the word lists s/he authored) and other projects (in the read only mode). A new list of words can be created from scratch by choosing words from the database or by defining new words. One can also start from one of the given formats or from someone else's project/list. The arborescent organisation of the words in the list is intuitive and can be done using the *drag and drop* technique (Figure 4).

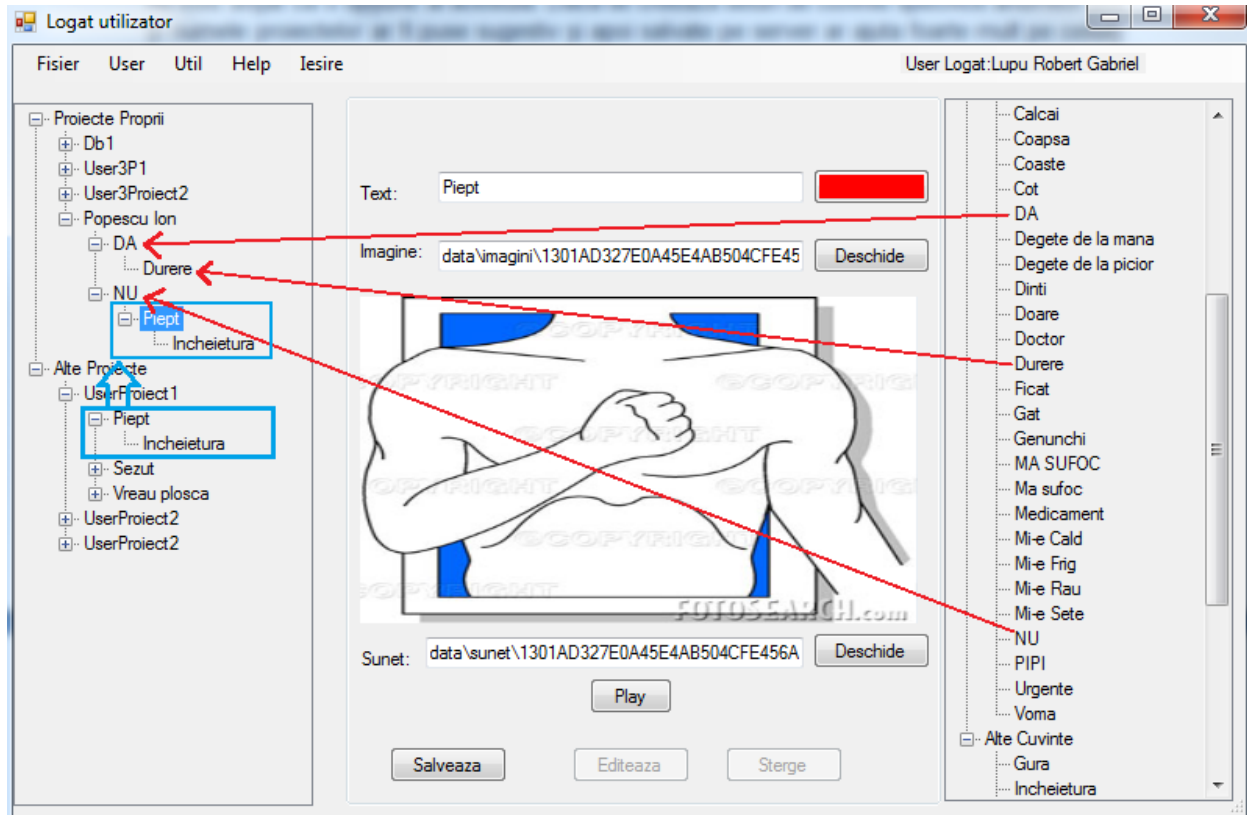


Figure 4. *AsistsysKeyword* interface - *drag and drop* technique

All the projects (word lists) are saved in the database. From here they can be exported in XML/JSON formats together with the image and sound files. The directory which contains all these data can then be copied onto the patient's laptop.

The definition of a new project menu *File* → *Project* determines the addition to the project list of a new empty project, together with the author identification index. The addition of words to the database or that of existing lists or branches is done using the *drag and drop* technique. As shown in Fig. 4, the word „DA” (YES) is dragged with the mouse onto the project with the name „Popescu Ion”. The word „NU” (NO) was added in the same way. Word order can be modified using the mouse. If the word „Durere” (pain) is dragged and dropped on top of the word „DA” (YES), the system will interpret and set the word DA as a parent for the word „durere”. This is how the list of words gets and

arborescent structure. Any modification is saved automatically.

In the project window are shown one's own projects, the other projects and the formats. For one's own projects the author has both writing and reading privileges and for the other categories read-only rights. The access to format or existing projects allows the quick construction of a new list, starting from an existing one. The author only needs to start a new project and then drag with the mouse an existing project or a branch of an existing one (as in Fig. 2) over the new project or a branch of the latter and then the author can organise the key words by moving, adding or deleting.

For an easy download of projects with their sound and image files, these are stored on the work station (in the local cache memory) after being read from the database. Any modification of the words or word lists is saved both in the database and in cache.

Unlike the caregivers or the medical staff, the administrator has full privileges over all the keywords in the database. The administrator can edit, modify, delete or assume the authorship of a word. These privileges are extended to existing projects, both those based on formats and those generated by the users.

User removal is more complex than the adding in of a user. If the user has definite projects, the removal makes impossible the connection to the system and the access of other users to the former user's projects. The list is stocked elsewhere and can be reused. After the removal or the redistribution of the list and the change of the author index the user is removed from the database. Figure 5 shows the administrator's interface.

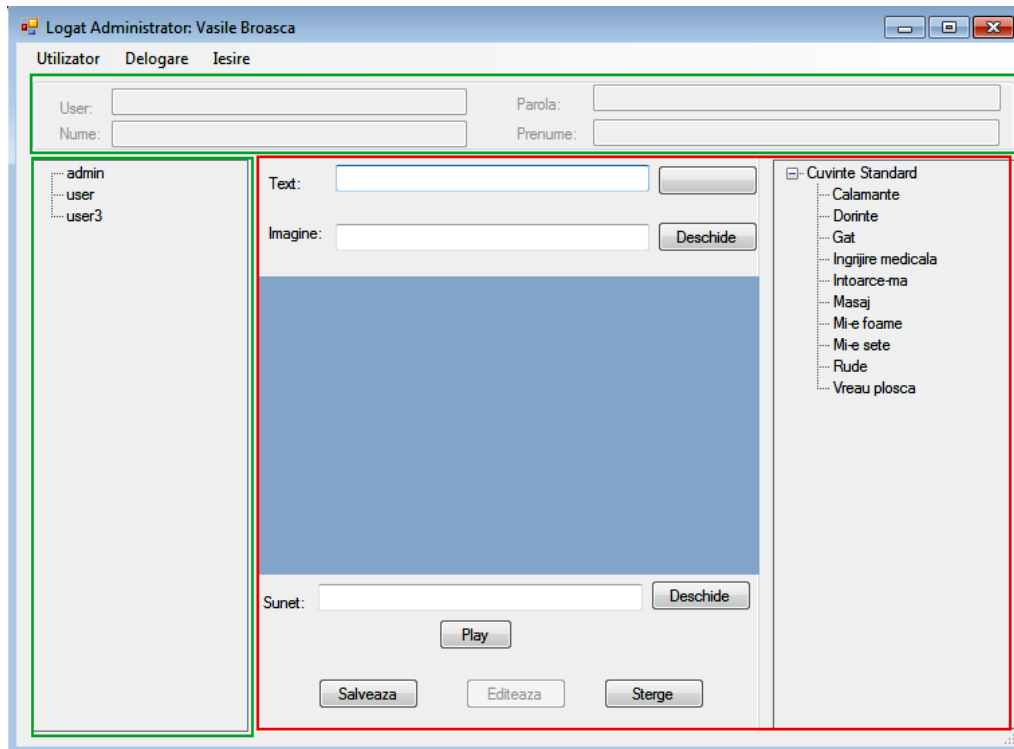


Figure 5. Administrator's interface

#### IV. CONCLUSIONS

The whole system, including the data base, has been tested repeatedly and exhaustively in our laboratories, in an elderly people's home and at "Arseni Bagdasar" Hospital of Bucharest with excellent results.

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