URIS - An Universal Information System

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Abstract **- An universal storage/retrieval information system has been designed to improve the control of (urological) data streams. In the near future these data have to be controlled in a more intelligent manner by coupling this universal storage/retrieval information system with an expert system, a neural network or a combination of these two.**

I. Introduction

In an urological department all kinds of data is obtained by, for example, questionnaires, patient-intakes and urodynamics. The general approach is to collect data by different database systems on different computers and this induces problems when data from different systems have to be combined. Therefore, an universal storage/retrieval information system was developed by the biomedical engineering group of our department. This system is called URIS, which is acronym for **UR**ological **I**nformation System. With URIS the (medical) information is controlled by one master system, the main subsystem of URIS, and this simplifies the exchange of information, obtained at different places by different URIS subsystems.
In the near future URIS should also be able to control data in a more intelligent manner, to support medical decisions and to improve medical trials. Therefore URIS will be connected to an expertsystem and/or neural network (**UR**ological **EX**pertsystem: **UREX**). A main problem of artificial intelligence is the integration of such systems into existing information environments [1]. Because URIS has been developed by engineers of the biomedical engineering group of our department, every detail of URIS is known and can be changed if necessary. This implies that a flexible coupling between URIS and UREX is possible. URIS/UREX will be used during routine clinical practice.

II. Materials and Methods

URIS is an **universal** storage/retrieval system, because with URIS all kinds of data can be stored and processed. To be able to control all kinds of data, URIS has been designed from an object-oriented approach and therefore the terms **class** and **object** are introduced. An **object** is something unique, for example a patient, a x-ray or a slide. A **class** is a group of objects, which all can be identified in the same way, for example the whole group of patients of the department. Between different classes of objects connections can be made. For example a connection can be made between the class of patients and the class of x-rays. This makes it possible to retrieve in a fast way all the x-rays, which belong to one particular patient.
URIS is a **distributed** information system, which has been developed in a PC-environment and most of the URIS software is implemented in FOXPRO™. Subparts of URIS, called **projects**, can be located on different computers and these subparts are organized in a systemtree. Therefore every project of URIS, except for the **main system**, has one **parent project**. This URIS systemtree can grow and shrink, actions which are controlled by the main system of URIS. Fig.1 shows an example of the URIS systemtree.
To store specific information about objects of different classes, every URIS project contains two types of subsystems. These systemtypes are the **project system** (PS) and the **information storage system** (ISS). A **PS** represents a certain project, for example a patient-intake, and is the parent system of other PS's and/or one or more ISS's. In a **ISS** (parts of the) data are stored, which are important for this project. For example to collect data for a medical trial in an automated way, one PS and one or more ISS's have to be generated by the URIS mainsystem. Fig. 2 gives an overview of an URIS project. In the example of the medical trial, every ISS corresponds with a questionnaire of this medical trial and is used to store and

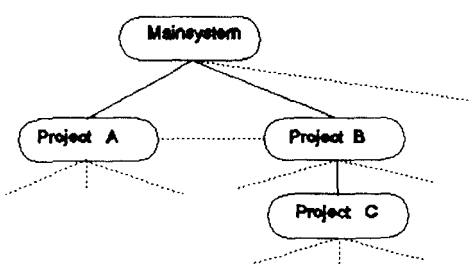

Fig. 1. An example of the URIS systemtree.

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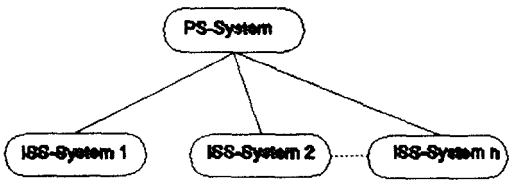

Fig. 2. Graphical presentation of an URIS project.

process the actual information retrieved by its corresponding questionnaire. The PS is the entrance of this automated medical trial. And with the PS it is possible to combine information stored in the different ISS's. To return to the systemtree, the ISS's are the endpoints of the URIS systemtree.

Everytime a new information system is needed to store and process data, a new project is defined and the needed PS and ISS's will be generated and inserted into the systemtree, in a simple, fast and automated way. After defining the data, which have to be stored and processed in the different ISS's, an URIS user can work with this project on a (own) computer. In the future URIS will not be restricted to personal computers only. Parts of URIS should be able to run on all kinds of computers.

A project can be located on different computers, which makes it possible to use a project at different places. For example a project of URIS can be used on a computer at the university hospital of Nijmegen, while the same project is used on a (portable) computer in another hospital at the same time. Between the different computers a coupling can be made by for example telephone cables, networks or diskettes. The coupling is also necessary to avoid inconsistency of data stored in URIS. Special update software has been developed to handle this inconsistency problem.

III. Results

At this moment the development of URIS is almost finished. Results show that with using URIS it is possible to generate new projects automatically and in a fast way. For these projects URIS generates own databases, which can be used to store and process (urological) data. URIS also simplifies the exchange of information between different projects. The development of update software avoids inconsistency of data of a project which is located on more than one computer. At this moment different projects are implemented and successfully used for different tasks. It is obvious that the use of URIS leads to a better control of (medical) information.

This previous part described shortly the results of URIS. In the near future URIS should be connected to an expertsystem and/or neural network (**UR**ological **EX**pertsystem: **UREX**) to control data in a more intelligent manner. At this moment the development of URIS/UREX is in a starting phase. Investigated is the possibility to combine the advantages of an expertsystem with the advantages of a neural network. A doctor always wants to know in what way an intelligent system derived a diagnosis, according to given medical data as input. An artificial intelligent system which does not have this feature will not be accepted in the medical world. With an expertsystem it is always possible to give an explanation of the reasoning [2]. But it is not possible to let an expertsystem learn from examples, which is an advantage of neural networks [3]. To avoid the need to expand the knowledge of UREX in the way of expertsystems, UREX should also have a learning capability. This is the reason for the investigation of the possibility to combine advantages of an expertsystem with the advantages of an neural network. Because this investigation is still in the starting phase, results can not be given. During the development of URIS/UREX there will be a close multi-disciplinary co-operation, between a physician and a computer scientist.

IV. Conclusions

An universal storage/retrieval information system has been developed, which can grow with new projects in a flexible way. This system can be used for (multicentre) trials, patient-intakes etc. Data of different (urologic) fields can be combined in a simple manner. This universal system will be an important source of information for an artificial intelligent system, which will be implemented in the near future.

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