MEDMANAGER: Knowledge-Based Medical Telenetworking with Image-Based Access to Clinical Data and Knowledge

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Background. In the last decade we often heard about the dream of the "Medical Super Workstation" integrating all information and images on a high-end supercomputer. The physician would have to move to the location of that machine. Today high-speed networks, fast personal computers and low-end workstation at relatively low cost change this picture. Physicians don't have time to go to a specialized single workstation, they need to get all required information at their actual working place using their multipurpose personal computer or workstation and a web browser which they are familiar with. They need "information at their fingertips".

System. MEDMANAGER is designed as multimedia computer system with extensive use of telecommunication means and knowledge-based system control. Starting point is the 3-D visualization of a patient's medical images. Various kinds of extensions are introduced to the virtual 3-D patient, which are, on the one hand, transfer of medical data of that patient. The range of data types runs from patient history, biochemical and clinical data, and biosignals to additional medical images (ultrasound, endoscopy, etc.), as well as navigation data for surgery. On the other hand, aggregation and interpretation of the patient's data is enabled by use of knowledge-based and expert system components. To decrease the resulting excess of information, one of the core elements of the project is knowledge-based filtering of medical data and knowledge-based control of the system.

The user interface of MEDMANAGER and communication between single modules are realized with Internet and World Wide Web technologies (e.g., HTML, JAVA, VRML, etc.) by use of "component based software" methods.[1] All needed data come from external information systems interconnected to this system via a high-speed network (ATM). Data is not stored permanently in MEDMANAGER. Medical knowledge is handled by the knowledge-base server MEDFRAME.[2]

The main server of the system is a Silicon Graphics ONYX workstation which is a graphics supercomputer. MEDFRAME runs on an IBM RS/6000-590 workstation.

Practical Impact. Radiologists, for example, report that sometimes it takes half the time during case analysis to retrieve additional information about patient history and clinical status. But more information will not necessarily lead to better diagnosis, because the result of the integration may yield excess of information. The physician has more problems to sort and filter additional data than to make diagnoses without it. To solve these problems, methods are required to reduce the amount of detailed information to essential facts. We anticipate new methods for use of knowledge-based system control for information systems, for knowledge representation, and for integration of information using the World Wide Web.

Conclusions. Because of the rapidly growing importance of the Internet, of medical information, and of virtual reality, an integrated medical system which is based on Internet and World Wide Web technology and which is controlled by a knowledge-base component will become most important in the future.

References

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