Poster 449

Implementation of Input Interface using General Data Transmission Methods for Digitalized BioSignal Data Management

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Abstract

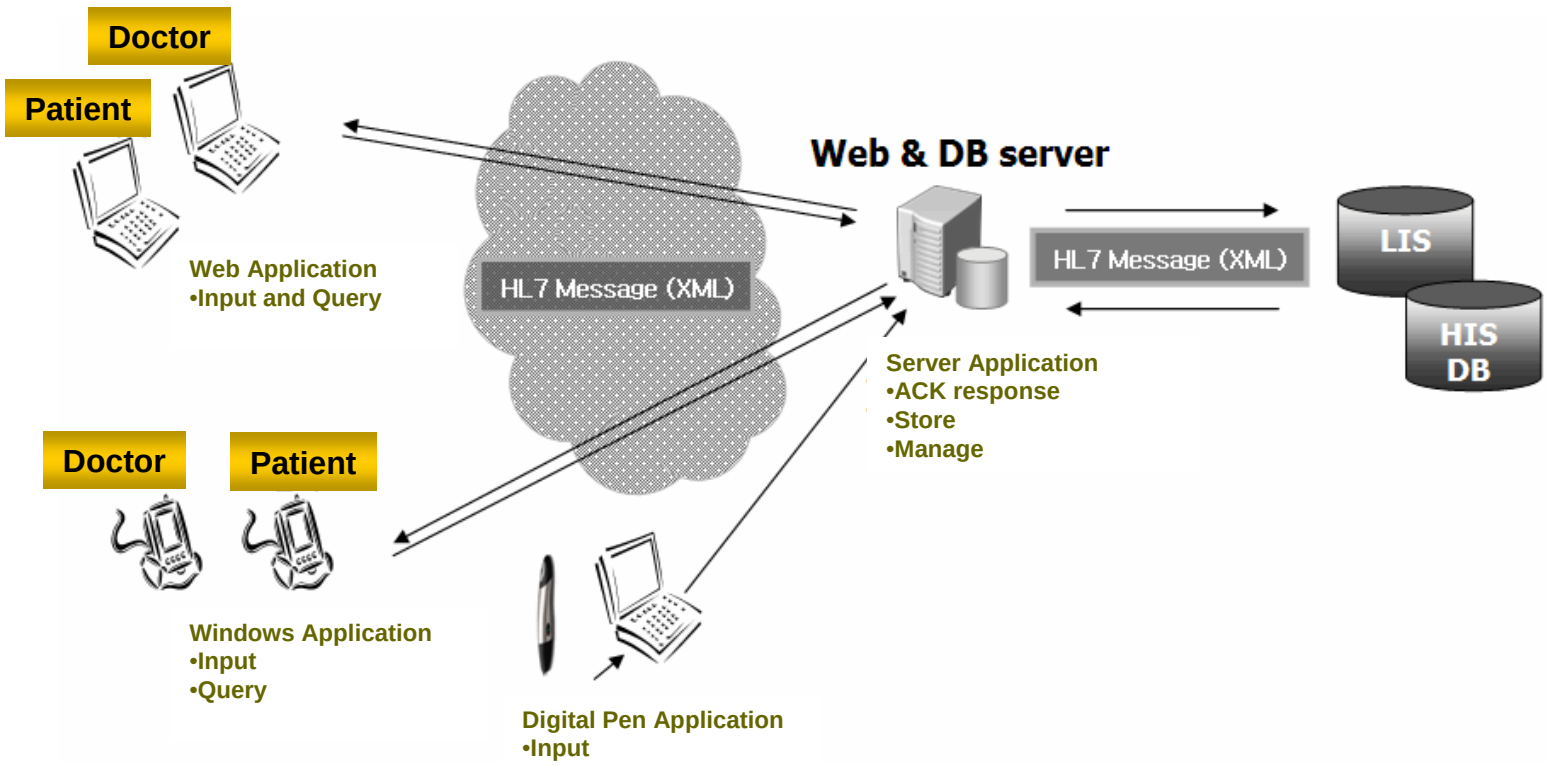
- The u-Healthcare is a new healthcare paradigm based on the Internet and ICT. Healthcare service using mobile devices includes sensor devices using measured biosignal data and home health network.
- The biosignal monitoring service is one of the monitoring services in ubiquitous healthcare. Methods of inputting, transferring, and managing biosignal data are so various that device interfaces need to be expanded. A transferred data format also needs a data transmission standard like Health Level 7.
- We implemented the sender/receiver interface using three devices including a PDA, a desktop computer, and a digital pen. Also the HL7-based biosignal message template and its database were designed. In the user input interface, patient/doctor's interfaces were developed separately and they enabled the user to review graphically the accumulated data. We adopted a digital pen having a powerful user-friendly input interface to develop the self-record manage application.

- ***Keywords:*** Biosignal, Interface, Transmission, Database, HL7, XML

Introduction

- The healthcare services using mobile devices include various devices using measured biosignal data, home health network, electronic home appliances, etc.
- The biosignal data management system usually monitors, analyzes and manages the biosignal data of wireless medical devices like blood pressure, pulse and ECG data, etc.
- We tried to find how to input the wireless biosignal data and how to send them to the management system by an efficient data transfer method.
- We referred to common data formats and transfer methods. To full use of recent data input devices, we decided to expand input interfaces in ubiquitous environment.
- We considered several standards for EHR and applied Health Level 7(HL7) Version 3.0 to our application. The preliminary study had implemented the web-based patient monitoring system using HL7 Version 2.5 in 2005.
- This research was the improvement of the previous study and it was n ew approach by adding user interface devices and applying the new v ersion of standardized data transmission protocol.

System Architecture

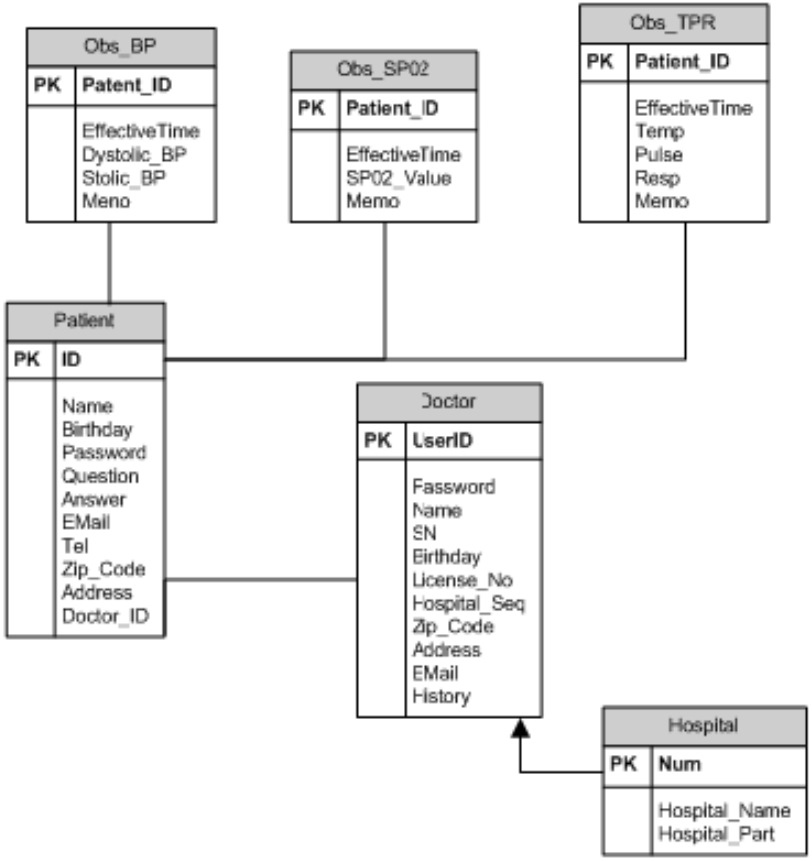


4 major parts:
the client input interface of three devices, the server interface of sending/receiving data, the user interface including a graphic view and a digital pen interface

Methods

1. Design and implementation of HL7 Message Sender/Receiver Interface for sending/receiving biosignal data and standardization
   - Message sending module of biosignal data
   - Message receiving module
   - Developed by MS Windows 2003 Server, Visual C#, SQL Server 2000 and XML
2. Web-based personal biosignal data management in a desktop computer
   - Standardized messages in user login and new user creation at the web-based interface
3. Application program for the home self-recording with digital pen
   - ioPen produced by Logitech was used

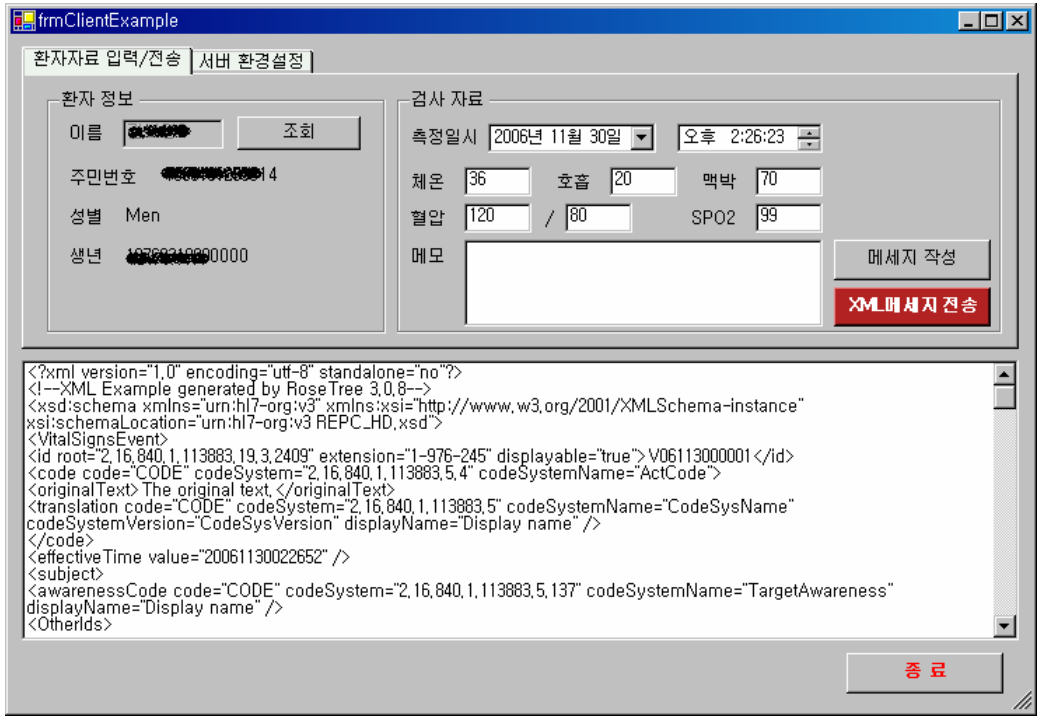
HL7 V3.0 RIM-based Biosignal Database



- The cMET schema for the measured data with texts, REPC_RM000130(ObservationVital Signs.xsd) was applied.
- The tables for other information were added.

Message sending/receiving interface

1. HL7 Message Sender Interface in the desktop computer



- The user interface of data input and sends the data into an each device and shows the converted XML files to the user.
- When the user presses the red button, the converted data can be confirmed in the lower box and are sent to server.

Message sending/receiving interface

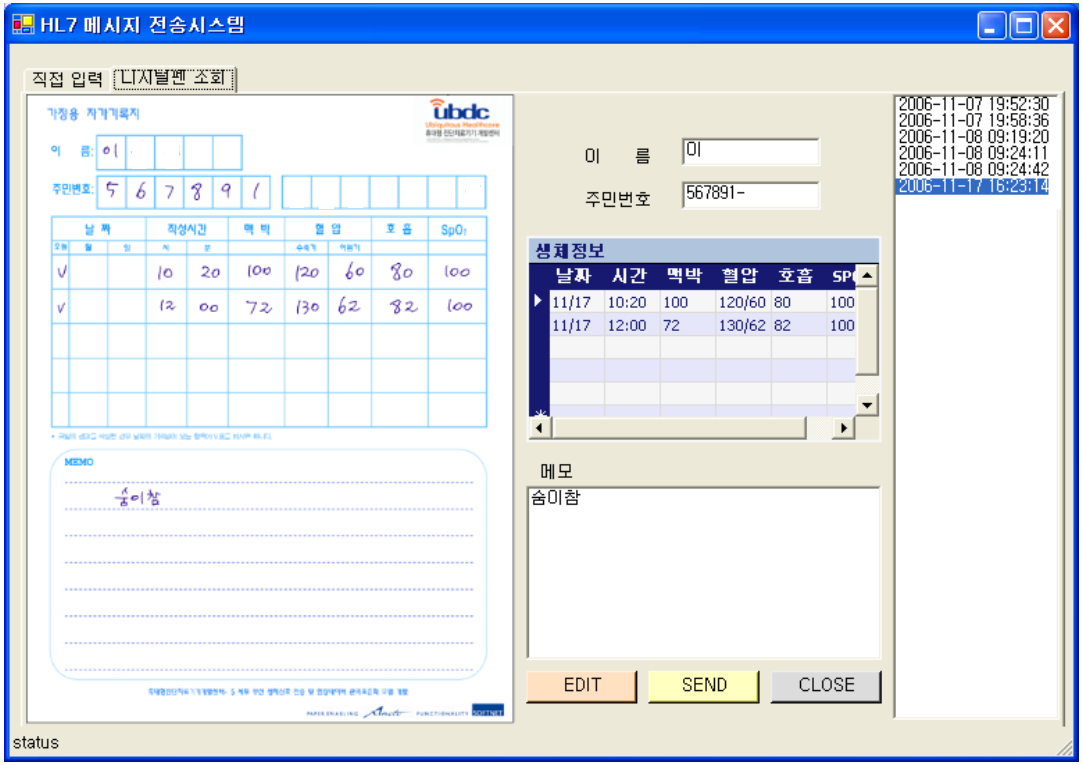
2. HL7 Message User Interfaces in the PDA phone

Inserting of Data

Inquiry of Data

- When the user enters his name and password for login on a PDA, the sender converts the written biosignal data to XML files and sends to the server database.
- The server sends an acknowledge message to the PDA application, and sends the data within XML files to the database.

Self-recording Manager by the Digital pen



- The written digital pen data is converted to selected image types (jpg, png, pdf) and is stored.
- Self-records at home were composed with personal identification items, biosignal data input items, and a memo item that the patient could input any comment or any question to his doctor.

Discussion

- The points of this study were the wireless biosignal data transmission and the application of standardized transmission protocols.
- During the implementation of the applications, items of HL7 message tags were so detailed that we weren't easy to apply these items to the real message.
- The biosignal data were continuously generated by mobile devices or wearable sensors.
- We started from pre-assumption that the data were already measured by sensors and the user wanted to enter them on his screen interface in this study. The types of data are limited in this study.
- We have a plan to expand them and to expand applications of data transmission standards to other related studies.
- The database inquiry will also use the standardized message format.

Conclusion

- By minimizing medical equipments and making the users (patients, doctors and nurses, etc) to carry them all the time. Our team is looking for the technology of standardizing and interfacing body information.
- The standards are not easy to implement real situation but they will be a trend in healthcare delivery system. But they are so essential to share the healthcare data and they can make software applications simplify.
- The technology-assisted application with a new device is convenient and potentially powerful complement to user-led management.
- The device easy to use can encourage users to self-manage their healthcare information.

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