Traumastation, a Telemedicine tool

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What is Traumastation?

- Traumastation is a portable medical device which covers the mobility of the doctors as well as integrates the diversity of Telemedicine.

- Traumastation demonstrates how several different medical devices can be integrated on one single case and support a wide variety of applications utilising thereby one single data transportation protocol.

- The medical TraumaStation is a light portable tele-medical first-aid device, which provides the physicians with an ultrasound, electrocardiogram, blood pressure, oxygen meter apparatus all in a suitcase.
Devices are used from Traumastation.

- **OEM 12-Kanal-ECG-Module** is a miniaturized module providing 12 leads ECG
  - The device has an open communication protocol and can very easily be integrated into patient monitoring devices.
  - For the communication, the EKG12-UART/RS232 utilizes the standard UART port and also an RS232 port.
  - The device can be powered via the UART port and no additional source power is needed. The power consumption is less than 140 mA and a voltage of 5V is needed. Sampling rate per channel is: 100 Hz, 500 Hz and 1000Hz. The resolutions is 19bits.
Devices are used from Traumastation.

- iPod module is a miniaturized module providing information on patient’s blood oxygen level and pulses. The device is able to be connected over RS232 and external power is needed for the operation. The sampling rate is 1 Hz with resolutions of 24 bits.
Advantage OEM BP Model 2 is a blood pressure module that uses oscillometric method of blood pressure measurement, a non-invasive method that monitors the amplitude of cuff pressure changes during cuff deflation to determine arterial blood pressure.
Devices are used from Traumastation..

- Echo Blaster 128 is an ultrasound scanner.
  - The beamformer can be connected to an PC via USB port.
  - The ultrasound scanner works with 256 colours in gray scale In addition it supports full-motion and full-size real-time ultrasound imaging, up to 120 fps as well as cineloop recording/play (several thousands frames depending on computer memory size and scan mode).
Protocols

- Traumastation makes use of two medical standards for storing and transmitting medical information:
  - DICOM
  - SCP-ECG (In the figure we can see the structure of the SCP-ECG)
Data Repository & exchange methods

- The repository stores information that is being used in the context of the application. Due to the fact that the application uses various types of information, the repository consists of various databases, which could be combined in the same physical DB or be distributed if needed. Specifically, information used in the application is categorized as follows:
  - Medical Data Repository (MDR) which is a database, which stores all patient’s vital data, as transmitted from the medical devices.
  - Patient Profile Database (PPD) which is the database storing all information about the registered patients.
  - Medical Staff Database (MSD) which is a database that holds information about doctors and paramedics.
Data Repository & exchange methods

- TraumaStation provides two type of collaboration:
  - Online collaboration
  - Offline messaging

- The messaging is utilized with the help of jabber/XMMP protocol. The application makes use of the jabber communicator to send and receive messages to/from other users.

- Online collaboration:
  - the two physicians have to be online at the same time.
  - is used to transfer and discuss the case in an interactive manner by means of two connected workstations which display the remote actions (like mouse movements) in real-time.

- Offline messaging:
  - In offline mode the software is used to acquire and collect medical images. The data can be attached to a query message and sent to a remote consultant center which can answer either online or by an offline reply.
Transmission of medical images would require more bandwidth. However, tele-consultations of ultrasound images require only a few megabytes of data. On the other side, transmission of biosignals might also need adequate bandwidth.

The bandwidth needed for biosignals and ultrasound images is depicted in the table.

<table>
<thead>
<tr>
<th>Signals measurements</th>
<th>Bandwidth</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECG 1 lead</td>
<td>3,6 kb/s</td>
</tr>
<tr>
<td>ECG 12 leads</td>
<td>43,2 kb/s</td>
</tr>
<tr>
<td>Pulse oxymeter (SpO2)</td>
<td>72 B/s</td>
</tr>
<tr>
<td>Heart pulse</td>
<td>24 B/s</td>
</tr>
<tr>
<td>Blood pressure</td>
<td>32 B/s</td>
</tr>
<tr>
<td>Ultrasound imaging</td>
<td>256 Kb/s</td>
</tr>
<tr>
<td>Video conference</td>
<td>25 Kb/s</td>
</tr>
</tbody>
</table>
Medical software used by Traumastation.

- The Medical Imaging GUI is based on TeleConsult application which is a 2D and 3D DICOM viewer with feature reached medical imaging functionalities.
  - TeleConsult is a stand-alone application running on Windows Vista/XP.
  - The application is able to acquire medical images from any ultrasound device through a video grabber attached to the computer.
  - TeleConsult application is a combination of a 2D/3D DICOM viewer, an image grabbing software, medical annotation tools and a medical telecommunication tool.
  - The system provides also easy localization options for Spanish and Portuguese since currently several installations are operative in Brazil and Peru.
Medical software used by Traumastation..

- All operations, a user of the software can operate can be assigned to following eight modules:
  - Database Interface, Image View, File I/O, Geometry menu, Greylevels/Colors menu, Tools menu, Cine menu, Teleconsultation menu
Medical software used by Traumastation..

- VITAL GUI is used to acquire vital signals such as ECG, SPO2 and BP as well as to render and visualize vital medical information.
  - ECG 12 leads traces can be recorded for a specific period and stored into the medical database.
  - The physicians are able to go through the ECG traces by selecting an ECG lead and detect cardiac abnormalities.
  - In addition the software gives the possibility to the physicians to measure QRS and RR time distances.
Medical software used by Traumastation.

- **Medical communication messenger** is an instant messaging module proving adequate tools for store-and-forward as well as real-time communication among physicians.
  - Makes use of Jabber protocol.
  - Physicians having a unique nick-name (Jabber ID) are able to be registered on a jabber server and transmit / receive information.
Medical software used by Traumastation..

- Two physicians are sharing the same view during an on-line session.
Medical cases..

- TraumaStation (or independently the medical software in stand-alone modus) can be used for:
  
  - **Interdisciplinary communication**
    
    In this case, doctors from various specialisations (diagnosis, surgery, radio-oncology) meet together to discuss the case regarding the patient treatment.
  
  - **Electronic Fax**
    
    In this case, doctors send data via standard fax-machine.
  
  - **Second opinion**
    
    It is common practice for a physician facing some uncertainty about a particular case, to think about a medical professional who would offer the most beneficial consultation to determine the diagnosis. But also the patient can get an-other medical advice.
Conclusions..

- The presented medical imaging collaboration platform provides medical doctors with all necessary tools for communicating and exchange medical information over different communication media such internet, ADSL, and conventional phone lines.

- Our application provides a wide spread of possibilities to enrich a given image material with additional information and to send it as a message.

- That can happen in off-line mode or in on-line mode. Moreover, the on-line mode gives the opportunity to communicate over long distances with a given partner in real time.
Thank you for your attention!

Despina Rizou