Borboleta: A Mobile Telehealth System for Primary Homecare

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Agenda

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Introduction

- Telehealth is the provision of health care using telecommunication technologies (like PDAs)
  - Extension of Telemedicine: it encompasses preventive, promotive, and curative aspects.
- Borboleta is a telehealth system for PDAs that assists healthcare professionals on their daily visits to the patients homes.
• Miller analyzed, in 2004, the Deloitte research survey with 1200 north American physicians:
  – 96% of the physicians use some kind of computer technology on their daily work
  – 21.5% use PDAs on their routine
• Blasser, after an evaluation of hospital discharge letters, concluded:
  – 42% of discharge letters have critical or major problems; most of them related to misunderstanding or mistakes in filling the letters.
  – An IT solution helped the hospital to reduce this problem.
Our Context - SUS

- **Healthcare Center:** unit from the public health service responsible for primary health assistance.
- **Home Attendance Program:** Provision of primary health assistance to low-income patients at home.
  - The healthcare professionals visit the patient's homes providing medical attention and preventing more critical issues, which is better for the patient and less expensive for the government.
  - Help and teach families how to assist patients in the time between professionals visits.
Motivation and Scenario

• Before Borboleta, homecare assistance was registered using paper forms, bringing disadvantages:
  − To fill lots of paper sheets take too much time from the homecare professional team.
  − To search for an information on paper forms demand a long time.
  − Time between the visit and the filling of the forms can lead to information loss, because it depends on human memory.
  − Difficult to raise statistics to aide the homecare assistance management.
System Design

• Modules Division:
  – Mobile Module (PDAs and Smartphones)
  – Desktop Module

• Features: Mobile Module
  – Patient data
  – Patient caregiver data
  – Patient socioeconomic data
  – Schedule visits
  – Visits registration
  – Access to the visit history of a patient
  – Disease catalog (IDC-10)
  – PHC medicaments catalog
System Design

• Features: Desktop Module
  – New patient registration
  – Import supporting medical information
  – Import/export patient data
• The import and export processes are done using XML and stored by a Web server on a shared folder
Implementation

• Mobile Module (PDA and Smartphones)
  – Focus on HCI trying to maximize the usability and getting information as clear as possible.
    • Usage of *dropdown lists* and *radio button components*.
    • Optimization of the data information on different screens according to the user needs is a way to keep the information clear.

• Difficulties with the Mobile module implementation
  – Resource Limitation: Memory, Java ME Library
  – Difference between Java ME simulator and real PDA environment
Implementation

- Desktop Module and Synchronization
  - Synchronization done over HTTP using XML and also file sharing
    - 😊 Deploy the system as soon as possible
    - 😊 Easy to implement
    - 😞 Lack of security
    - 😞 Too much user interaction during the process
Development

- **eXtreme Programing Methodology**
  - Unit Tests
  - Short Releases
  - Strong and frequent relationship with the users
    - nurses, physicians, PHC director

- **Java and Java ME**
  - Portability
  - In spite of the limitations, Java ME has a useful range of features
    - Easy way to use the HTTP protocol
    - XML parsing and building
Preliminary Results

- Before deploying Borboleta, the time between the visit and the form filling was about 3 days, and sometimes could reach up to a week.
- With Borboleta, the form is filled on site during the visit, taking much less time.

- We measured the time spent filling the paper forms and disposed on the table bellow.
- Reduction of time spent filling the forms to about 5 minutes.

<table>
<thead>
<tr>
<th>Visit Type</th>
<th>Time Spent</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Patient</td>
<td>30-40min</td>
</tr>
<tr>
<td>Treatments</td>
<td>15-20min</td>
</tr>
<tr>
<td>Occasional assistance and Dressing</td>
<td>10-15min</td>
</tr>
</tbody>
</table>

Time spent filling the paper forms
Preliminary Results

- Immediate access to the patient visits history, without the need for \textit{a priori} preparation to gather the information.
- The PDA gives more mobility during a visit than the paper forms.
- Filling the visit data on the site
  - Before the Borboleta system, the paper forms data were typed into the old Healthcenter system.
- Creates the opportunity for integration with other systems
  - for example, for data mining.
Ongoing and Future Work

**Ongoing:**
- Keep developing the Mobile module (PDA and smartphones) to better fit the needs of the healthcare professionals
- Develop a Web system to replace the Desktop Module
- Simplify the synchronization process
- Raise the security level
- Integration with international standards (e.g., HL7, OpenEHR).

**For the future:**
- Extension of Borboleta to support other kinds of health services.
- Data mining
- Artificial Intelligence
References

http://borboleta.incubadora.fapesp.br

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