Wireless Remote Healthcare Monitoring in City Communities on Key Personnels

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Background
Our Current R&D work
Project Collaboration Suggestion
Background

Our Current R&D work

Project Collaboration Suggestion
Problems in Chinese Healthcare Industry

- Unbalanced progress and resource distribution in urban and rural areas;
- Weak in public, community and country healthcare, Morbidity in medical assurance;
- Lack of effective monitoring methods for community key personnel, such as chronic sufferers, the elderly, the children, patients in convalescence, etc.
Elderly Issue in China
In China, Year 2005
Population: 1’306’314’000
Average expected longevity: 72.3 岁

65+ 岁人口
7.69 %
19.9 %

Sources: U.S. Census Bureau, International Data Base.
“to promote novel city medical healthcare infrastructure on the basis of community healthcare services. On the purpose of community citizen’s health, to provide public healthcare services such as disease prevension and control, chronic disease management and rehabilitation. To take the responsibility of citizen’s health as ’goalkeeper’ gradually.”

“（2009-2011）Take 3 years to build matured foundamental medical healthcare service infrastructure.”
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Infrastructure of Wireless Healthcare

Home Environment
- Medical sensors around human body
- Sensor Gateway
- Alert or other medical services
- UMTS
- Internet
- Firewall
- PC
- PDA
- Smartphone

Office Environment
- Context Aware Server
- Web Service Portal
- Expert System
- Firewall

Hospital Environment
- Bluetooth
- Zigbee
- UWB

Real time monitoring via service based on context aware service and expert system

Backbone Service
The Types of Chronic in Chinese Family

- Diabetes: 13%
- Cardiopathy: 15%
- Hypertension: 32%
- None: 33%
- Other: 7%

Physiological Parameter to be monitored:

- Pulse
- Blood pressure
- Electrocardiogram
- Cardiotach
- Blood sugar
- Body temperature
- Posture

Comparison between below 30 and aged 30-50:

- Pulse: below 30 vs. aged 30-50
- Blood pressure: below 30 vs. aged 30-50
- Electrocardiogram: below 30 vs. aged 30-50
- Cardiotach: below 30 vs. aged 30-50
- Blood sugar: below 30 vs. aged 30-50
- Body temperature: below 30 vs. aged 30-50
- Posture: below 30 vs. aged 30-50
Worries about WeHealth

Worries About The Registration Using Cellphones
And The Monitoring Equipment

- Worries are inevitably on the newly emerging products
- The accuracy, convenience and possible adverse affect to human body are mainly concerned. So the system should be energy efficient, highly accurate and portable(or wearable)
Monitoring services required.

<table>
<thead>
<tr>
<th>Items</th>
<th>&lt;30 years old</th>
<th>30~50 years old</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continual Monitoring in 24 hours</td>
<td>16%</td>
<td>15%</td>
</tr>
<tr>
<td>Customization/personalized</td>
<td>56%</td>
<td>56%</td>
</tr>
<tr>
<td>Results sent to hospital</td>
<td>17%</td>
<td>35%</td>
</tr>
<tr>
<td>The relatives obtain the results</td>
<td>20%</td>
<td>41%</td>
</tr>
<tr>
<td>Get instruction from doctors</td>
<td>20%</td>
<td>37%</td>
</tr>
<tr>
<td>Emergency treatment</td>
<td>22%</td>
<td>36%</td>
</tr>
</tbody>
</table>
Our Activities on Wireless e-Health

1. **Theoretical Research:**
   - Network structure analysis;
   - PHY & MAC technology research;
   - Cross-layer design research.

2. **Hardware Development:**
   - Develop wireless sensor node and sink node;
   - Integration of the medical sensors into wireless sensor network for wireless remote healthcare monitoring.

3. **Services Promotion:**
   - Hospital healthcare workflow improvement;
   - Homecare with remote healthcare monitoring;
   - Emergency rescue based on wireless sensor network.
Journal Publications


Conference Publications

Fig. 3. Blood Monitoring Front End

Fig. 4. ECG Monitoring Front End

• Both front ends can communicate with the MACU wirelessly through Zigbee protocol
Main Projects Sponsored by MOST

Project 1:

**Public Service Infrastructure and Demo Applications of Modern Population and Healthcare**

Sponsored by: **Key Project of National Supporting Plan (2008-2010)**

Main Partners:

[Image showing the logos of various partners]
Our Tasks in the Project

• R&D on the systems of remote home procreation healthcare
  ◆ Wireless remote physiological multiparameter monitoring system
  ◆ Mobile information platform based on mobile phones

• To complete the pilot trials of the above system(s) in no less than 200 Family Planning Service Stations, with at least 10,000 users till the end of 2010.
Main Projects Sponsored by MOST

Project 2:

**Key Technologies and Systems of Wireless Remote Medical Emergent Rescue in Disaster**

Sponsored by: **National 863 Project (2009-2010)**

Main Partners:

- The General Hospital of the People's Liberation Army (PLAGH) (also Hospital 301)
• Research on the remote medical field rescue mode and remote healthcare information standardization;
• Research on the key technologies (such as wireless sensor networking and positioning, etc) in Wireless remote healthcare monitoring;
• Develop the portable wireless remote health monitoring system and build the first-aid database for the injured people;
• Construct of the trial network and carry out pilot trials till the end of 2010.

◆ In city communities
◆ In remote island
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Collaboration Suggestion for China-UK Bridge Project:

- Wireless Remote Healthcare Monitoring in City Communities on Key Personnels

--- Key Technologies and Service Demonstration
Technical Routine

- Requirement Investigation
- Research on KEY Technologies
- Software and Hardware Development
- Trial Networks and Service Demonstration

For key personnels
- Service mode
- Management requirement
- Monitoring characteristics

Technologies
- Medical signal collection
- Wireless transmission
- Networking
- Energy guaranteeing
- Positioning

- Multiparameter physical gather and transmission device
- Chip Design of key modules
- Database and Healthcare management system

- Build pilot trail networks with certain coverage and certain number of users
- Service demonstration in 10-20 native communities
One Possible Case

GPRS/3G Wireless networks

Base Station

Wireless Gateway

Computer

Internet

Wired Gateway

Zigbee Wireless Sensor Network

Blood Press Monitoring Terminal

Hypertension Management
(
高血压知晓率、控制率)

生活方式指导、就诊通知、随访通知

Community Hospital
• Chronic disease statistics and management
• Disease prevention and control
• Children healthcare and management

Ministry of Healthcare (MOH) of China
Thanks!