Portable Electrocardiograph

The portable electrocardiograph recently developed by the general engineering laboratory of the General Electric Co. is illustrated on this page. One of these devices could be used in the ambulance for submitting a diagnosis by radio, in accordance with the apparatus depicted on the left-hand page. The entire device weighs only 26 pounds and the power unit weighs 25 pounds. The apparatus open is shown at the right.

The photo above shows the portable electrocardiograph with the panel board inverted above the vacuum tubes. In the old style cardiograph cumbersome provision against vibration had to be made. Usually vibration-proof foundations were used for the mounting of these instruments. The fragile metal quartz thread used in the former apparatus is dispensed with in this construction.

A patient having a cardiogram made is depicted in the above photo. Single metal electrodes fastened to the arms and legs of the patient are used in place of the wet sponge electrodes formerly employed. The functioning of this instrument is not affected by skin resistance. The results could be transmitted by radio to a consulting physician, telephonographically.

The power unit for the electrocardiograph is illustrated above. At the right are three typical cardiograms used for diagnosing different kinds of heart trouble taken with three different leads. They are caused by a spot of light acting on a moving thin strip.
THE VISION

Radio News Magazine 1924

The Radio Doctor – Maybe!

Finally a Reality in 2011
Нагрудный ремешок для мониторинга ЧСС

Blatand offers a worldwide unique chest strap for heart rate monitoring. The chest strap communicates via Bluetooth short distance radio with your mobile phone or other end devices, e.g., the Bluetooth access point at a gym, a home computer or the rehab staff's PDA.

It is convenient, persistent, interference-proof, tap-proof and less expensive than conventional products.
WIRELESS HEALTH MONITORING MARKET

• Ageing population
• Obesity and Diabetes epidemic
• Growing interest in “wellness”
  – In the US alone
    • More than 61.8 million with cardiovascular disease
    • More than 2 million diagnosed with atrial fibrillation (AF) have a 5-6 fold increased likelihood of stroke,
      > expected to double by 2050
  • Over 31.8 million health club members across 18,203 clubs
  – Potential market
    >US$5 Billion for wireless health monitoring products
Именно поэтому в 2002 году в нашей стране стартовала пенсионная реформа.
eHealth For Urgent Public Health Challenges

Najeeb Al-Shorbaji
Director, Knowledge Management and Sharing
WHO/HQ Geneva
Introduction

- **mHealth** is the use of mobile communication technologies as an integral part of healthcare delivery.
- **mHealth** is part of eHealth and therefore it carries all of its promises and concerns-plus. mHealth has to be part of an architecture and not another silo in the eHealth arena.
- **Mobile phone** is one of the fastest growing telecommunication infrastructure at both national and global levels. ITU predicts an estimate of 4.6 billion subscriptions globally by end of 2009. It is expected that 45% of traffic on mobile networks will be data.
- **mHealth** aims to improve healthcare delivery through eCare, eServices, eSurveillance and eLearning.
Call For Presentations - 2010 mHealth Summit

November 8-10, 2010 · WASHINGTON, DC
Walter E. Washington Convention Center

Call For Presentations Now Open!

Abstract Submission Deadline: July 1, 2010 - 11:59 PM EST

The 2010 mHealth Summit will bring together leaders enabling cutting-edge research, evidenced based practice and innovative policy solutions to advance the benefits mobile technology can bring to the health and wellbeing of developed and developing world populations.

We are seeking abstracts for Presentations from the Public and Private Sectors that highlight ground-breaking health research, information and communication technologies, systems architecture and global partnerships that leverage mobile technology to improve global health outcomes.

Additionally, we are seeking Research Technology Demonstrations. Relevant technologies include: Mobile Phones, Smart Phones, Mobile Phone Apps, Global Positioning Systems (GPS), Personal Digital Assistants (PDAs), Mobile Electronic Sensors (e.g., Accelerometers), Portable Physiological Sensors (e.g., Ambulatory Glucose Monitors), Mobile Environmental Sensors, Integrated Mobile Devices, and other Wireless Technologies.
Where Technology, Business, Research and Policy Connect.

The largest event of its kind, the 3rd annual mHealth Summit brings together leaders in government, the private sector, industry, academia, providers and not-for-profit organizations from across the mHealth ecosystem to advance collaboration in the use of wireless technology to improve health outcomes in the United States and abroad. More
Wireless Technologies for Remote Health Monitoring

• **Wireless Real-Time Cardio Monitor (2G/3G)**
  – Real-Time Information from Cardio Monitoring Systems
  – Oriented to open market: Patients, Relatives, Aged, Medical Staff
    • Estimating heart rate, blood pressure
    • Forecasting and Warning of the possible dangers and critical states
    • Transmit information in real-time to relatives and/or medical staff
    • Communication using 2G/3G cell networks, WiMAX, LTE etc.
    • Simple and user-friendly devices
Audio and Visual Reminders

Reminders on Pills

Physician’s access to Patient data on Server
Programs are developed for different mobile operating systems (Symbian, Android, Windows Mobile, W7, MAEMO, MeGo, etc.)
AliveCare

Automatically records weight, blood pressure and blood glucose via Bluetooth to online Personal Health Record (PHR) - integrates with Microsoft HealthVault and Google Health
Nonin Onyx 2 9560 Bluetooth Wireless Finger Pulse Oximeter with FREE case!!

The first wireless fingertip pulse oximeter

Oximetry Unplugged – Revolutionizing Disease Management. With the increased need for remote disease management, there is an opportunity to provide oximetry monitoring solutions to simplify the exchange of secure information.
Glucose level monitoring
Alive Technologies

Mobile Cardiac Monitoring
Bluetooth® ECG and Activity Monitor

Applications
- Cardiac Rehab
- Cardiovascular Screening
- Home Monitoring
- Disease Management
- Atrial Fibrillation Screening
- Mobile Telemedicine
- Activity Monitoring
- Falls Monitoring
- Fitness Monitoring
- Sports Training
Cardiomobile
Remote Exercise Monitoring
AliveSport
Sports Performance Monitoring

AliveTechnologies
Paris Marathon - Webcast Replay

146 bpm
8.9 kph
Elapsed Time: 02:02:10
Distance: 21,425m
8/4/2008 11:04:52
GPS Status: GPS Fix

www.alivesport.com
Alive Equine Performance Monitoring System

Al Shaqab Horse Performance Monitoring System with Options

- Bluetooth Rider Display
- 3G Smartphone with GPS in pouch on saddle cloth or saddle
- ECG electrode under saddle cloth
- ECG electrode under girth strap
- Bluetooth Heart and Cadence Monitor in pouch on saddle cloth
- High Resolution Bluetooth OFS Headset Arterios

Heart Rate:
99 bpm

Speed:
5.4 m/min
SAFE EXERCISE
AliveCor iPhone ECG
Общая схема решения

Измеритель давления
Кардиодатчик
Глюкометр

Bluetooth

Телефон пациента

Сотовые сети

Интернет

Сервер мониторинга

Стационарное рабочее место

Мед@рхив

Google health

Сервисы персональных медицинских карт

Врач
International Standards
STANDARDS FOR INTEROPERABILITY

• Bluetooth SIG Medical Device Working Group (MED WG)
  – Formed 2006
  – Currently 125 members representing 33 Companies
  – Developed Bluetooth Health Device Profile (HDP) approved in June 2008 by Bluetooth SIG and available for public download
  – New standard for Bluetooth low energy health and fitness devices

• Continua Health Alliance
  – Are companies dedicated to making personal tele-health a reality.
  – Developing design guidelines and product certification programs
  – Collaborating to address regulatory and cost issues for personal tele-health systems.
  – Have adopted Bluetooth HDP
  – ISO /IEEE 11073 standards
International standards for mobile health - Continua Alliance

Version One Device Connectivity Standards

- Thermometer
- Pulse/Oximeter
- Pulse/Blood Pressure
- Weight Scale
- Glucose Meter
- Cardiovascular and Strength Fitness Monitor
- Independent Living Activity
- Medication Adherence

Transport Independent

- 11073-10404 = Pulse Oximeter
- 11073-10406 = Pulse/Heart Rate
- 11073-10407 = Blood Pressure
- 11073-10408 = Thermometer
- 11073-10415 = Weighing Scale
- 11073-10417 = Glucose
- 11073-10441 = Cardiovascular Fitness Monitor
- 11073-10442 = Strength Fitness Equipment
- 11073-10471 = Independent Living Activity
- 11073-10472 = Medication Monitor
- 11073-20601 = Base Framework Protocol

Personal Health Device Class Specification
Medical Device Profile Specification
### Economical benefits of remote patient monitoring (RPM)

#### Heart Failure Care Comparison:
RPM vs. Standard Care and Disease Management, Per Patient Per Year

<table>
<thead>
<tr>
<th></th>
<th>Management Cost</th>
<th>Average Readmissions</th>
<th>Cost of Readmissions**</th>
<th>Gross Savings v. RPM</th>
<th>Net Savings v. RPM</th>
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</thead>
<tbody>
<tr>
<td><strong>RPM</strong></td>
<td>$2,052 Technology*</td>
<td>0.552$</td>
<td>$5,632</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$2,082 Technology &amp; DM†</td>
<td>0.552$</td>
<td>$5,632</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Disease Management</strong></td>
<td>$750‡</td>
<td>1.116**</td>
<td>$11,387</td>
<td>$5,755</td>
<td>$3,703</td>
</tr>
<tr>
<td><strong>Standard Care</strong></td>
<td>0</td>
<td>1.320‡‡</td>
<td>$13,468</td>
<td>$7,836</td>
<td>$5,034</td>
</tr>
</tbody>
</table>

New England Healthcare Institute, 2009
Remote Physiological Monitoring
Problem- too many mobile operating systems
What to do in order to decrease traffic via cellular networks?

- To compress raw data on the phone
- To analyze raw data on the phone before transmitting to the healthcare provider
- To identify person, transmitting data
Enhanced Real-Time ECG Coder for Packetized Telecardiology Applications

Álvaro Alesanco, Salvador Olmos, Member, IEEE, Robert S. H. Istepanian, Senior Member, IEEE, and José García

Abstract—A new real-time compression method for electrocardiogram (ECG) signals has been developed based on the wavelet transform approach. The method is specifically adaptable for packetized telecardiology applications. The signal is segmented into beats and a beat template is subtracted from them, producing a residual signal. Beat templates and residual signals are coded with a wavelet expansion. Compression is achieved by selecting a subset of wavelet coefficients. The number of selected coefficients depends on a threshold which has different definitions depending on the operational mode of the coder. Compression performance has been tested using a subset of ECG records from MIT-BIH Arrhythmia database. This method has been designed for real-time packetized telecardiology scenarios both in wired and wireless environments.

a heart attack in progress and preserving heart muscle function [5]. Although store-and-forward ECG transmission is also possible from the ambulance to the hospital, real-time ECG monitoring by a cardiologist in a hospital would be more convenient because it allows a reduction in the time needed for patient’s evaluation once it arrives to the hospital. These effects are specially crucial in cases where the transportation time is long [6], [7].

During the last years, the increasing popularity of Internet has made that the TCP/IP protocol stack has been implemented in the network and transport layers in almost every communication network [8]. Wireless networks which formerly were imple-
Smart Phone-Based Automatic QT Interval Measurement

ET Lim, X Chen, CT Ho, ZK Tin, M Sankaranarayanan

Institute for Infocomm Research, Singapore

Abstract

A smart phone-based automatic QT interval measurement system was developed. The system can assist pharmaceutical company in QT prolongation assessment prior to new drug approval. The ECG signal is captured by wearable sensor and processed on the smart phone. The processed results are sent using cellular network to the internet server. Cardiologist can quickly analyze the results. It shortens the time for data collection. Besides, it is convenient for the test subjects as they do not need to visit the lab frequently.

2. Methods

The embedded algorithm on smart phone first detects ORS complex using slope method [3]. Based on the
Analysis of ECG on a Smartphone

CardioView

Иванов Иван Иванов...
14:26, 28.08.08

Байбаков Иван

Статистика
Длительность: 59 сек.
Среднее: 77 уд./мин.
Мин. RR: 0.695 сек.
Макс. RR: 0.870 сек.
С.К.О.: 48 мсек.
RMSSD: 37 мсек.

25 мм/сек. 20 мм/мВ
25 mm/s, 10 mm/mV

AliveECG: Acceleration
00:00:42
0 bpm

Функции

Ритмограмма

Вар. пульсограмма
The ICT projects – GOVERNING CHARACTERISTICS

Dr. Guanyabens - Coordinator of Health IT of the Catalan Department of Health
Main Players in Russia

- Ministry of Public Health – plans to install 10,000 mobile systems in 2011 and 15,000 in 2012 (ECG and BP monitoring)
- Schools of Medicine – Moscow State University, Krasnoyarsk, Nizhny-Novgorod
- Technical Universities – Moscow, St. Petersburg, Krasnoyarsk
- Companies – Nokia, AND, Megafon, Alive Technologies, Private Medical Companies (Medsi, etc.)
CONCLUSIONS

mHealth technology
- enhancing health services and outcomes while controlling costs by helping people to better manage their own health.
- large market need
- opportunities for device manufacturers, healthcare providers and mobile carriers.
“What healthcare needs now is a daily dose of vitamin-M.”

From Healthcare IT News

Questions ?
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Skype ID: omedvedvedev