Mobile 2.0 – mHealth Project's
ISMICT 2010 Conference Participation Report
"Intelligent mobile computing for better medical services"

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Executive Summary

The talks were on remote monitoring and servicing of health driving towards accountable patient care, reducing government subsidized costs, remote servicing to minimizing patient admissions, and enabling convenience for the present day dynamic society. With the increase of better health care and growth in economies, the world has to cater to the increasing aging population. Chronic cases are also gaining statistical significance. It is hypothesized that such problems can be overcome with introduction of Biomedical and Bioinformatics systems.

LIRNEasia's mHealth project titled "Evaluating a Real-Time Biosurveillance Program (RTBP)" is a system with mobile phone applications, regarded as human sensors digitizing clinical records for remote detection of disease outbreaks for early intervention and prevention. Early actions can save lives and reduce economic loses; especially in a countries like India and Sri Lanka where health care is fully subsidized by the Government.

I presented the RTBP research findings to date in Session B2 on Bio-Informatics, Chaired by Dr. Ray-Jade Chen, Deputy Superintendent, CMUH, Taiwan[2]. The Canadian Broadcasting Corporation aired, 2 minute, TV news story – The National Lifelines: mobiles for disease surveillance was also shown at this event.

Financial assistance to attend the conference was made possible through the LIRNEasia's Mobile 2.0 at BOP[3] Project which is funded by the International Development Research Center of Canada.

Background

This report shares notes from the 4th International Symposium on Medical Informatics and Communication Technology (ISMICT) 2010, which took place in the Grand Hyatt Hotel, Taipei, Taiwan, Mar 22 – 25, 2010. Symposium focus was on "Intelligent mobile computing for better medical services"

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1 Nuwan's profile – http://www.lirneasia.net/prifiles/nuwan-waidyanatha
2 Program of ISMICT - https://www.ismict2010.org/program.htm
3 Mobile 2.0@BOP - http://lirneasia.net/projects/2008-2010/mobile20bop/

Summary of the Talks

"Mobile computing is the only solution for health reforms" was one of the opening statements along with the emphasis that medical information will reside in the cloud. However, physicians disagree with this because they don't want patients to make diagnostics on their own, which may lead to complications and even possible litigation actions against the medical content providers.

On the other hand telemedicine seems to evade complication posed by the self-diagnostic problem. "A legacy telemedicine solution was the use of Facsimile to send a Radio Cardiology Diagram to a specialist physician for remote diagnosis". But now experts are working on low power implanted and wearable sensors and actuators. These *remote monitoring and maintenance* health technologies communicate through the information through Body Area Network[4] (BAN) that is in the Ultra Wide Band (UWB) range/ These frequencies are used for controlling the low power implanted or wearable devices.

These lower powered devices usually act as both as sensors and actuators that would provide real-time information on vital statistics such as blood sugar levels to a physician far away from the patient to remotely administer the injection of insulin through an implanted regulator.

A proven technology is the wireless electrocardiogram such as the u-Huatuo project aiming to aid heart patients "get back on their feet"; for example if they enjoyed running they could and the u-Huatuo would signal the person running if there are any threatening complications or even alert the ambulatory services if critical, Prof. Chen, Ray-Jade (China Medical University Hospital)

BAN is an IEEE working body[5]. They have realized issues such as electromagnetic radio interference between devices; where each device can optimally accommodate 256 channels. Given the constraints of "real-time remote maintenance" capabilities, BAN low power devices work in the "1Kbps to 1.5Mbps with less than 100mW[6]" of power; in comparison to Zigbee, Bluetooth, WirelessUSB, and $802.119_{a/b/g}$ technologies that take un more than 100mWs.

Communication with VSAT has been ruled out for cyber control because of its latency of 800mSec. Policies are to be established for reserving the 3 – 5MHz frequency range for BAN technologies. However, there is debate as to whether this frequency band should be made available to industrial solutions such monitoring and stimulating athletes.

BAN Requirements	
Distance	3 m
Piconet density	~10 nets in $(6m)^3$
Devices per network	~256
Net network throughput	10Mbps max.
Power consumption	~ 1mW / Mbps (@ 1 m)
Network setup time	< 1sec (after initial setup, per device)
Emergency Mode	20m range

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4   BAN white paper - http://www.cse.wustl.edu/~jain/cse574-08/ftp/ban/index.html
5   IEEE WPAN Task Group 6 - http://www.ieee802.org/15/pub/TG6.html
6   Image of BAN power requirements - http://www.cse.wustl.edu/~jain/cse574-08/ftp/ban/fig1.png

Technically how these systems work is by combining the BAN with already available cellular technologies such as GPRS, Edge, 3G Internet transports[7]. For example, a patient who recently received a bypass operation can be discharged early with remote sensing heart monitor. The heart monitor is embedded in to his or her t-shirt or brassier or worn as a necklace that is unrevealing. This embedded monitor would use the BAN frequencies to communicate vital signs to that patient's mobile phone or wrist watch, which in tern would transmit that real-time data over long distances through the cellular networks to a processor that monitors the vital signs and the location of the patient at a health facility. If the monitor detects any threatening anomalies in the vital signs, would immediately alert the respective physicians and even the ambulance service, if required.

Telemedicine only works in geographically large countries where there are no physicians (doctors) of a certain skill within a reach to provide the service. While telemedicine may work well in India it has proven to fail in Taiwan as there's an abundance of hospitals and clinics, which patients prefer visiting. This may also be because healthcare in Taiwan is nationally financed by the government. Then we ask the question why has China, a large country with lack of specialized medical resources in the remote areas, have not adopted Telemedicine? The man power required for such deploying such as system requires $$.

Public Health Records (PHR) are maintained by the person themselves, either in the cloud with Google Health and Microsoft Vault or on one's personal mobile phone memory, or a combination of both with self synchronization; similar to Google desktop synchronizing with Google Internet on line version. Another embedded concept of the gamut of EMR is the Community Health Records potentially used by Sarvodaya Suwadana Centers[8] (Clement Mc Donald)

On Standards

SNOMED CT[9] – Systematized Nomenclature of Medicine Clinical Terms – used for finding codes, may be a starting point for developing the disease, syndrome, and aetiology ontology that supports the diagnosis component for a real-time biosurveillance program. Other potential initiatives such as LOINC[10],used in USA and other countries, for reporting measurements and observations of patients clinical information. Somehow these standards are eventually tied in to the HL7 structures, National Library of Medicine (NLM), in USA, advocates opportunities for research in epidemiological and health improvement research.

Follow up work

Collaborate with Prof. Lou, Der-Ming, Institute of Biomedical Informatics, National Yang-Ming University and Prof. Chou, Yuntsai, Social Informatics, Yuan Ze University through the 21st Centenary Foundation on developing the diagnosis ontology.

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7 Image of BAN with Cellular networks - http://www.cse.wustl.edu/~jain/cse574-08/ftp/ban/fig2.png
8 Suwadana Centers - http://tinyurl.com/18r
9 SNOMED CT on wikipedia - http://en.wikipedia.org/wiki/SNOMED_CT
10 LOIC overview - http://loinc.org/faq/getting-started/getting-started/#what-is-loinc