

Embedded Multimedia and Networking Research and Development in Lab of Multimedia Networking at NCKU

Yueh-Min (Ray) Huang
Distinguished Professor
Engineering Science Dept.
National Cheng Kung University

National Cheng Kung University



- National Cheng Kung University is a national university in Tainan City, Taiwan. Its abbreviation is NCKU. In Chinese, it is shortened to 成大 (Chéng Dà).



Outline

- Multimedia
 1. Intelligent Calling Service Based on Digital TV System
 2. Development- Android Widget TV on TI Davinci EVM
 3. TV Program on Demand on Embedded PAC EVM
 4. Widget-based Internet TV
- Network
 1. OSGi-Based Services Architecture for Cyber-Physical Home Control Systems
 2. Multi-Sensors Based 3D Reconstruction System for Elderly Falling
 3. 3D Motion-Sensing Interactive HMI for Applications in Multimedia Services

Outline

- **Multimedia**

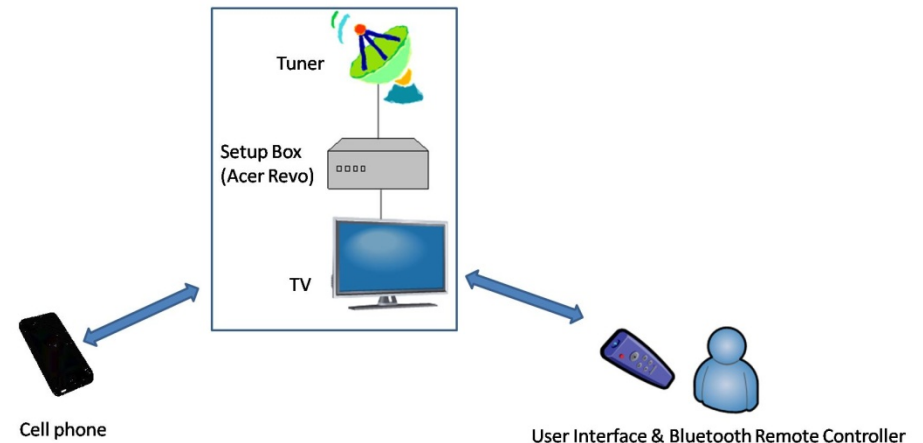
1. **Intelligent Calling Service Based on Digital TV System**
2. **Development- Android Widget TV on TI Davinci EVM**
3. **TV Program on Demand on Embedded PAC EVM**
4. **Widget-based Internet TV**

- **Network**

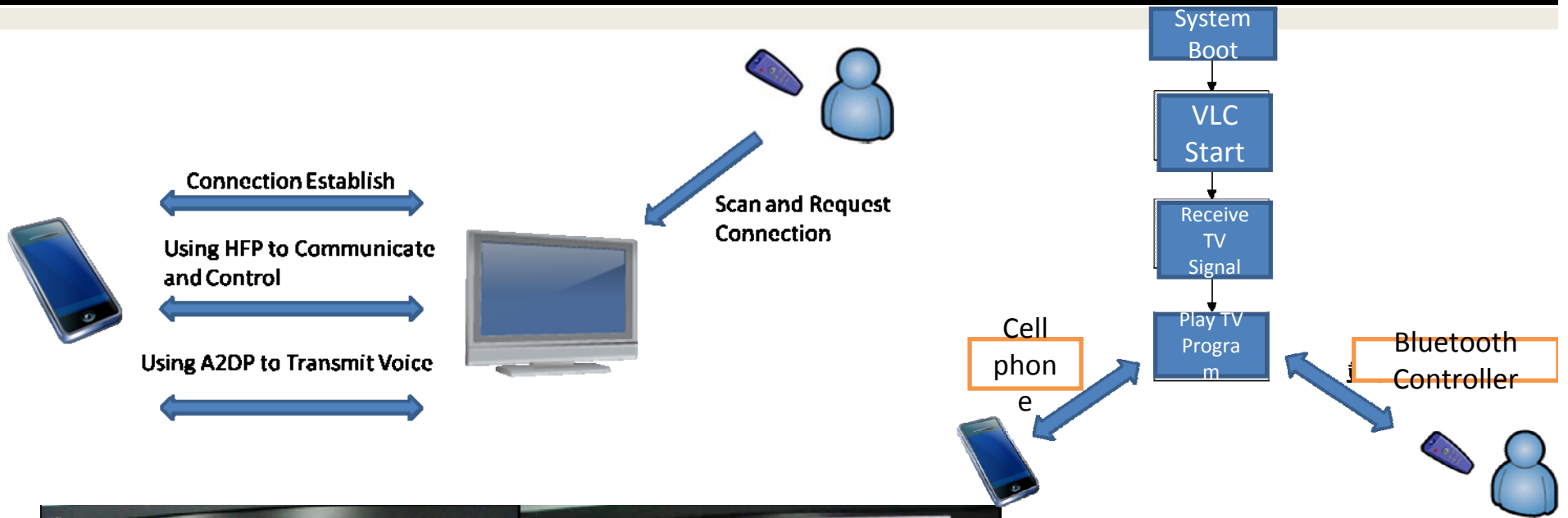
1. OSGi-Based Services Architecture for Cyber-Physical Home Control Systems
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3. 3D Motion-Sensing Interactive HMI for Applications in Multimedia Services

1. Intelligent Calling Service Based on Digital TV System

- This prototype uses the Bluetooth protocol to build a personal area network connecting TV, remote control and cell phone. Let users who watch TV could use the phone function through the remote controller.
- Three subsystems:
 1. Digital TV Program Player
 2. Bluetooth Communication Management
 3. OSD General User Interface



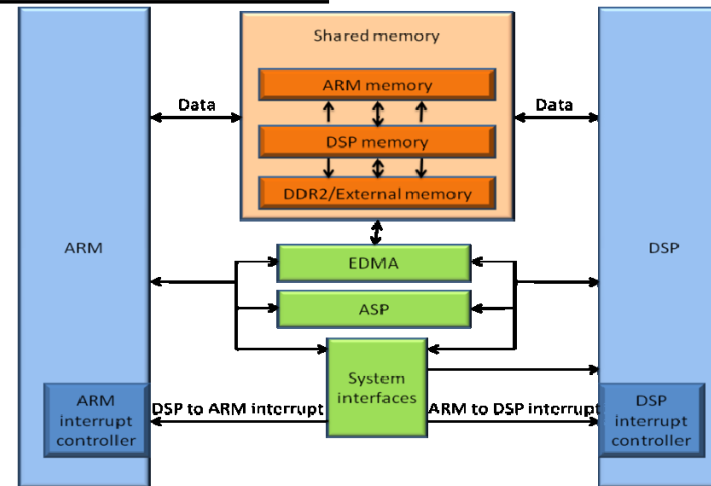
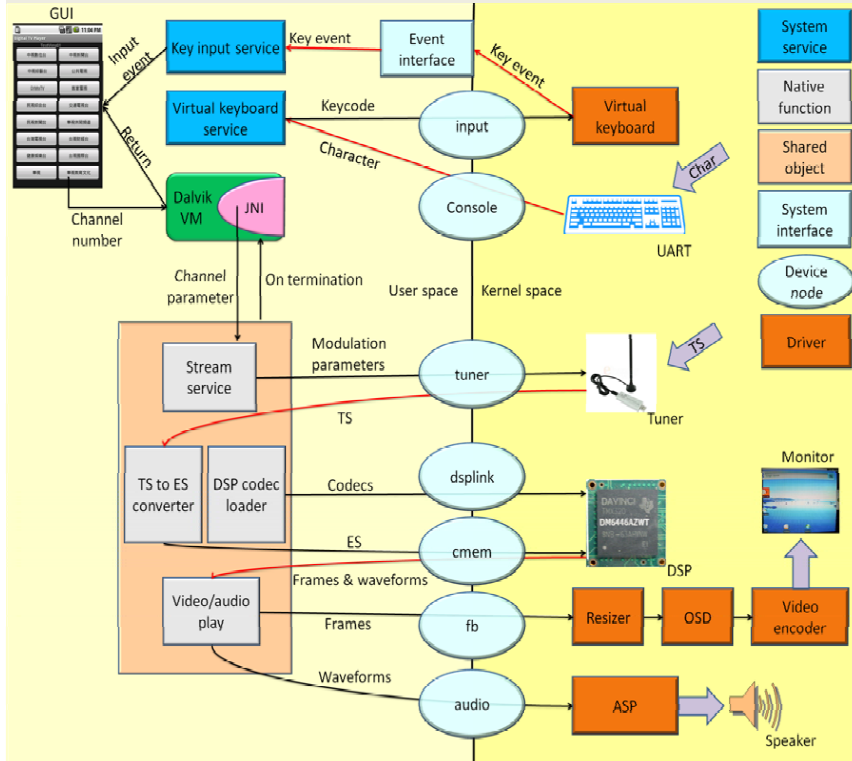
1. Intelligent Calling Service Based on Digital TV System



2. Development- Android Widget TV on TI Davinci EVM

- Based on the open source software model, mobile device providers can attempt to shorten the schedule of develop products.
- The devices of Android system are becoming more and more valuable. In spite of providing network connections and open source codes for the devices, there is still no digital TV player available on Android now.
- Combing with other functions makes users able to watch TV and enjoy other services at the same time.

2. Development- Android Widget TV on TI Davinci EVM



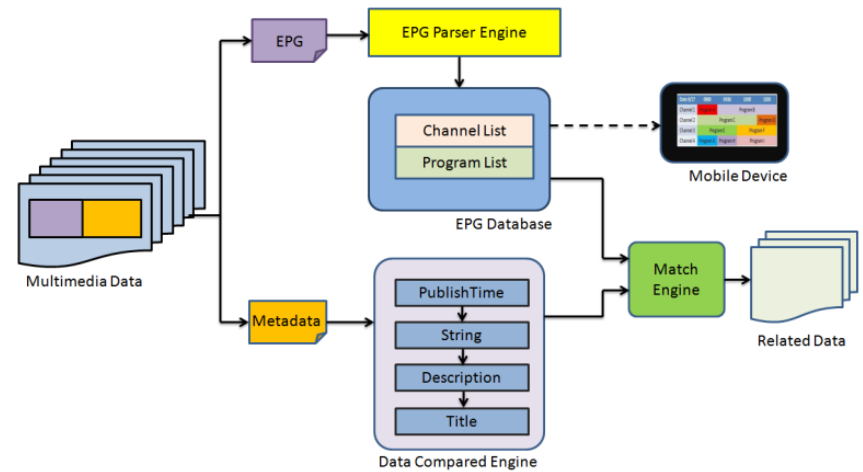
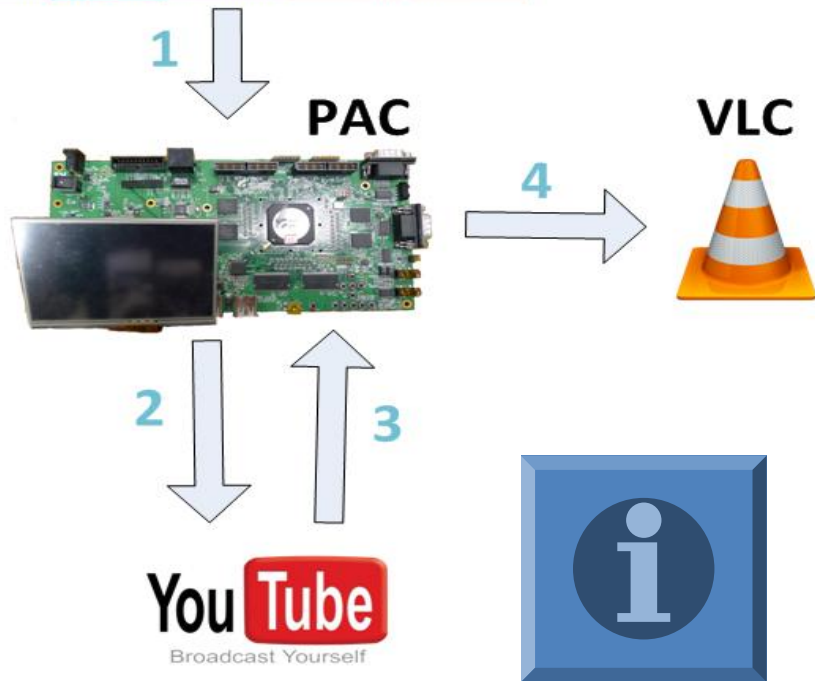
3. TV Program on Demand on Embedded PAC EVM

- Allows users browse their favorite multimedia videos in the cloud network through mobile devices.
- Avoid the trouble of repeated and complex searches of multimedia files, the system can automatically search for nearby multimedia data that users are browsing, and reconstruct dispersed video contents through a seamless video reconstruction algorithm (SVRA) for integration into video data for continuous play, thus, becoming a user-friendly mobile IPTV system

3. TV Program on Demand on Embedded PAC EVM

EPG

Date 9/17	0900	0930	1000	1030
Channel 1	Program A		Program B	
Channel 2		Program C		Program D
Channel 3	Program E		Program F	
Channel 4	Program G	Program H		Program I



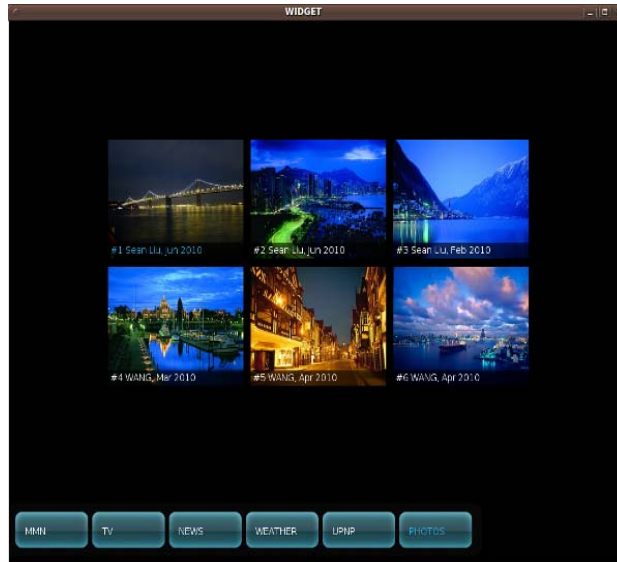
4. Widget-based Internet TV

- In 2008, Yahoo! and Intel announced the idea of Widget Channel, integrating network information to TV.
- The Widget Channel can only provide service and search on the Web but lacks of connecting home media devices.
- Therefore, Embedded Widget TV is to provide the users an easy-sharing content platform (by UPnP), in addition to providing TV function and basic Widget services,

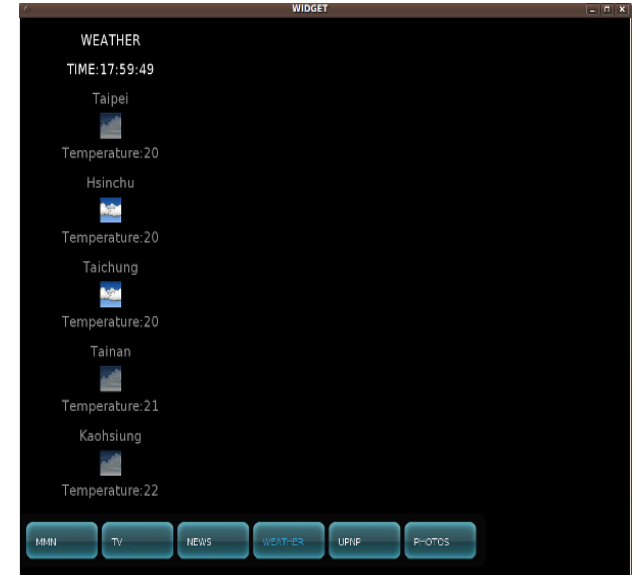
4. Widget-based Internet TV



TV Program



Media Content Sharing



Internet Information Delivery



Research- Multimedia

- Home Multimedia Sharing Communication
 - A Portable UPnP-based High Performance Content Sharing System for Supporting Multimedia Devices, The Journal of Supercomputing 2010 (SCI)
 - Design and Implement of the DLNA based Family Intercom System for Smart Home, The Computer Journal, Vol. 52, No. 8, pp 960-968, 2009 (SCI)

Research- Multimedia

- OSGi (Open Service Gateway Initiative)
 - OSGi-Based Services Architecture for Cyber-Physical Home Control Systems, Computer Communications (SCI)
 - Intelligent Context-Aware Middleware for Smart Home Appliances Based on OSGi Framework
 - DLNA-based Multimedia Sharing System for OSGi Framework with Extension to P2P Network, IEEE Systems Journal, Vol. 4, No. 2, pp 262-270, 2010 (SCI)

Research- Multimedia

- TV Issues
 - A Skin-able User Interface for Digital TV Systems, IEEE Transactions on Consumer Electronics, Vol. 53, No. 4, pp 1776-1782 ,2007 (SCI)
 - Design and Integration of the OpenCore based Mobile TV framework for DVB-H/ T Wireless Network, ACM Multimedia Systems Journal ,2010 (SCI)

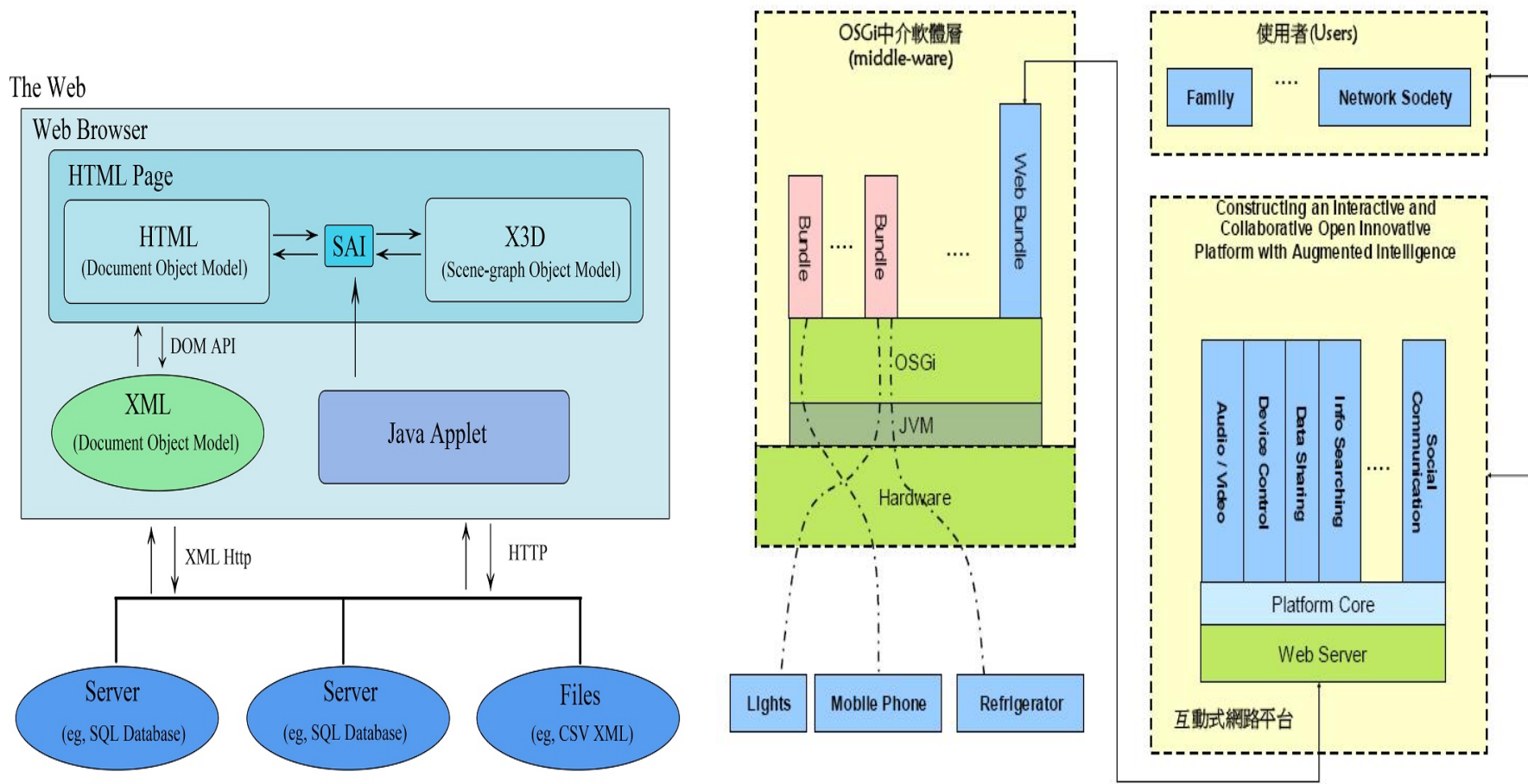
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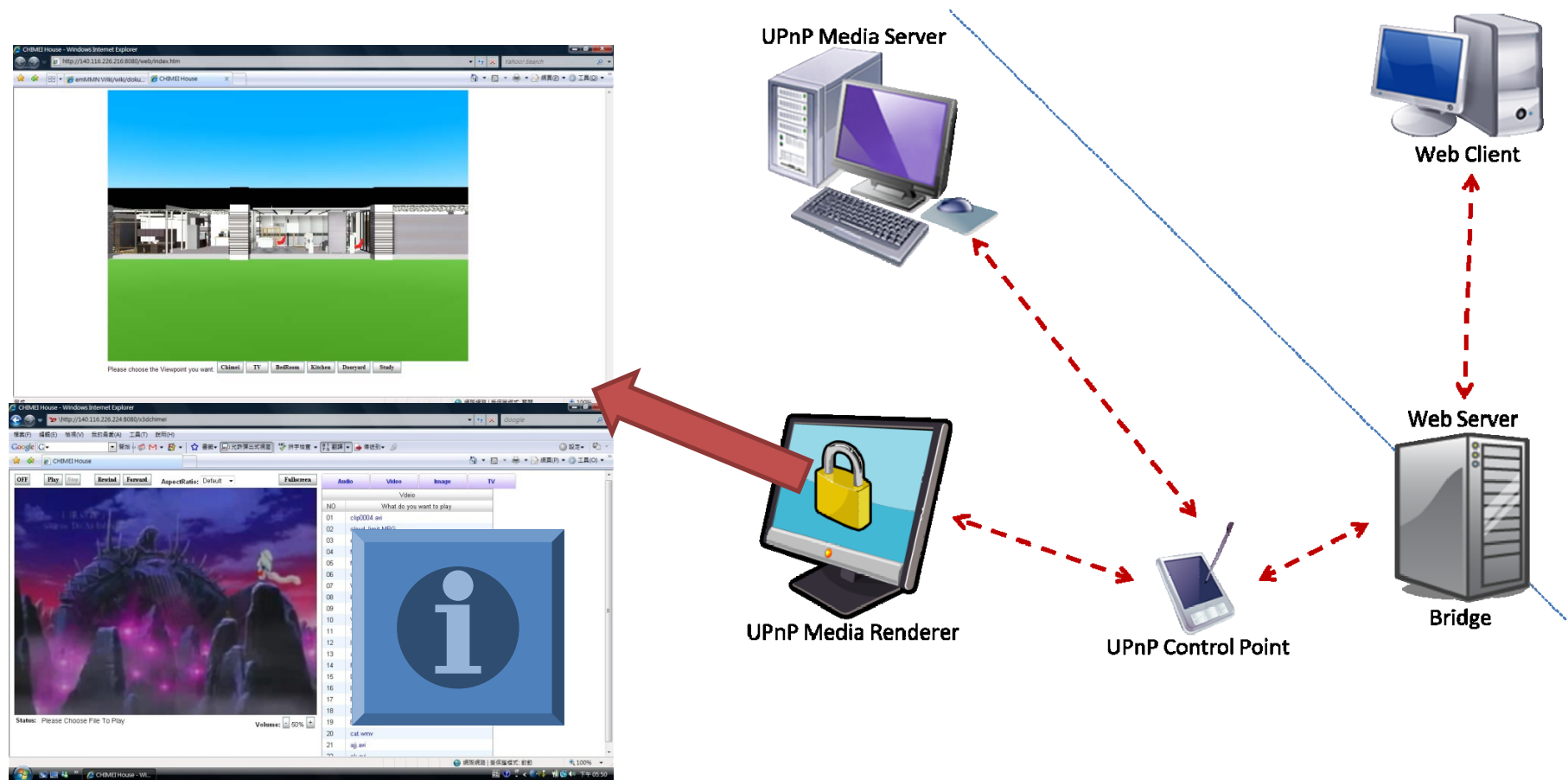
1. OSGi-Based Services Architecture for Cyber-Physical Home Control Systems

- Users can control appliances in the physical environment by intuitive operation through a virtual home on the network. When the state or location of any appliance in the physical environment changes, the virtual context can enact timely changes, accordingly.

1. OSGi-Based Services Architecture for Cyber-Physical Home Control Systems



1. OSGi-Based Services Architecture for Cyber-Physical Home Control Systems



Research- Network

- Social/Cloud Network
 - 3PRS: A Personalized and Popular Programs Recommend System of Digital TV for P2P Social Network, Multimedia Tools and Applications, Vol. 47, No. 1, pp 31-48, 2010 (SCI)
 - CPRS: A Cloud-based Program Recommendation System for Digital TV Platform, Future Generation Computer Systems 2010 (SCI)
 - A Personalized Mobile IPTV System with Seamless Video Reconstruction Algorithm in Cloud Networks, International Journal of Communication Systems 2010 (SCI)

2. Multi-Sensors Based 3D Reconstruction System for Elderly Falling

- A novel scheme to use multiple 3-axis acceleration sensors and gyroscopes to collect limb acceleration,
- Calculate the tested point position and try to utilize kinematic theory to reconstruct human body motion, called 3D adaptive human motion reconstruction (AMR).
- Take Body Precision Algorithm (BPA) to reflect human body characteristics and filter out data noise.

2. Multi-Sensors Based 3D Reconstruction System for Elderly Falling

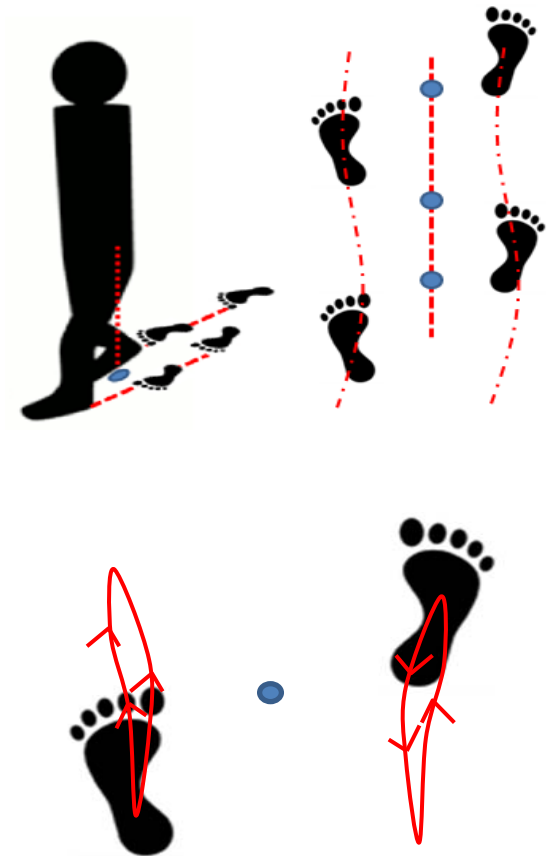
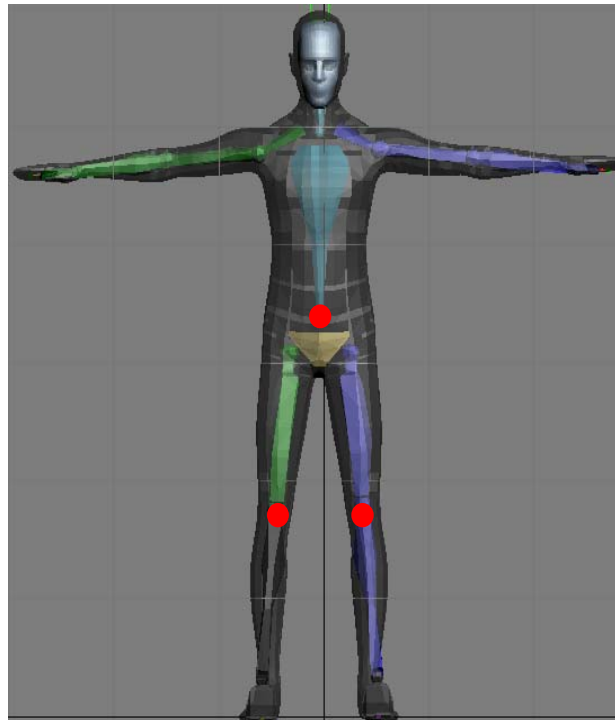


RF device

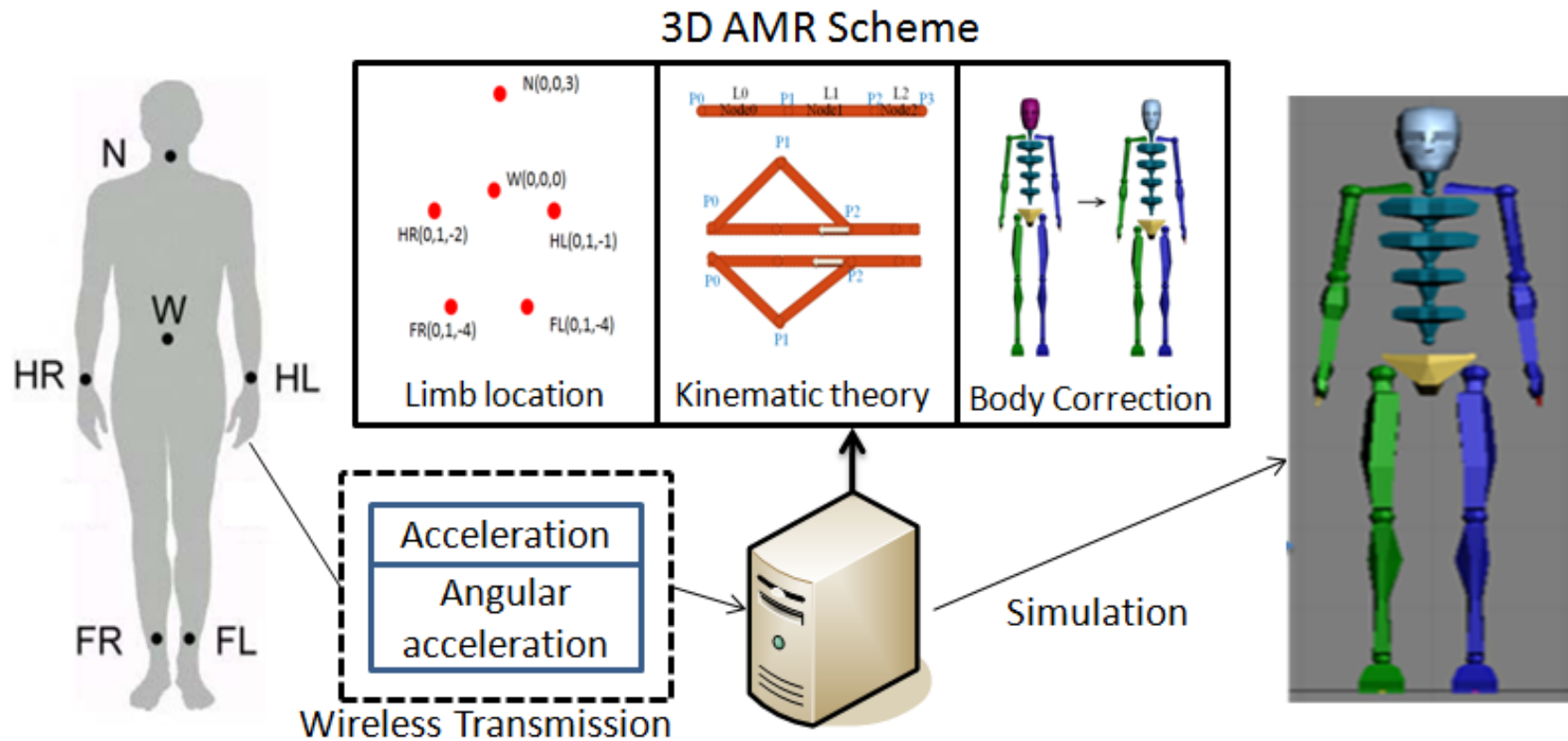
Tri-axis
Accelerometer



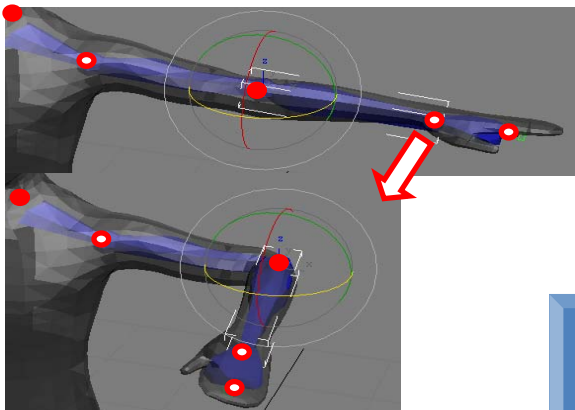
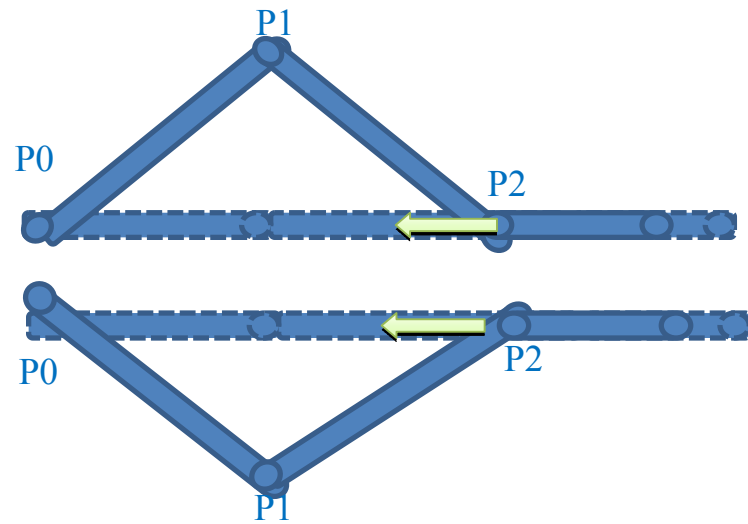
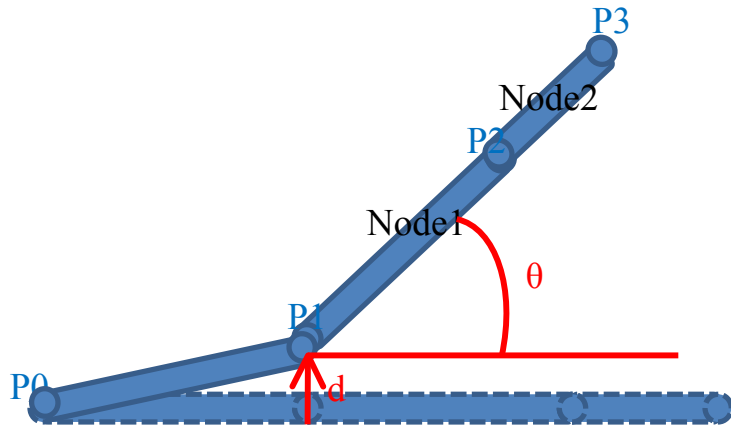
MEMS
gyroscope



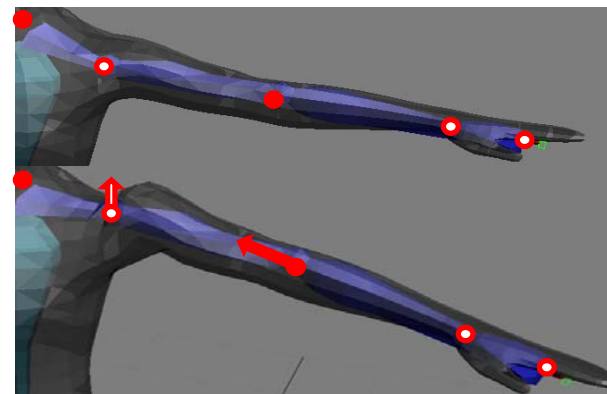
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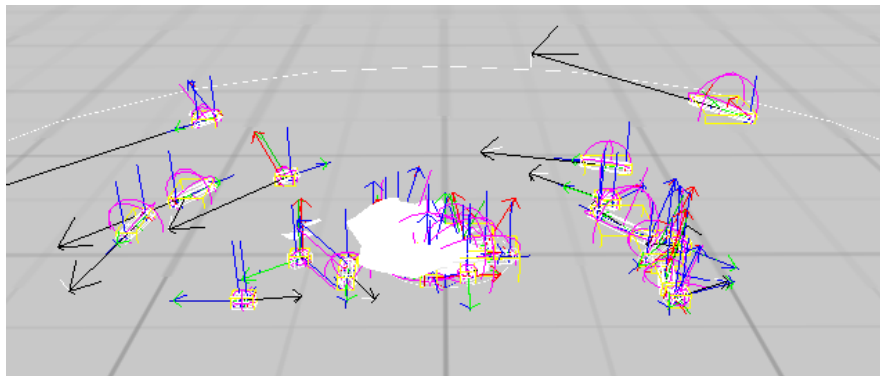
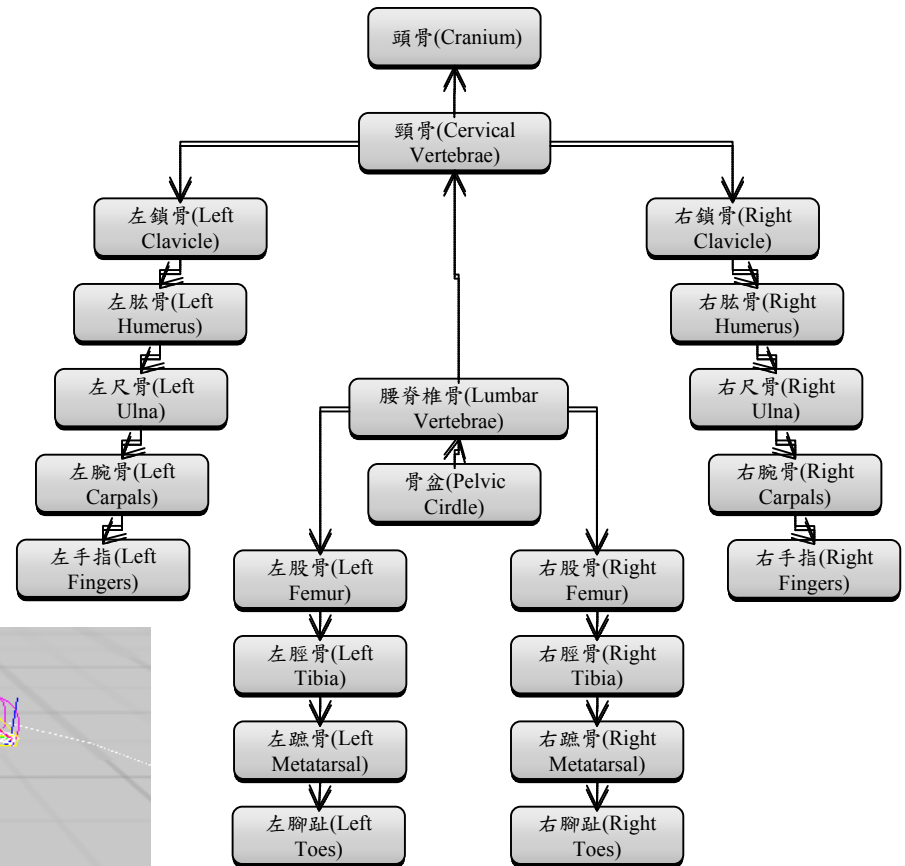
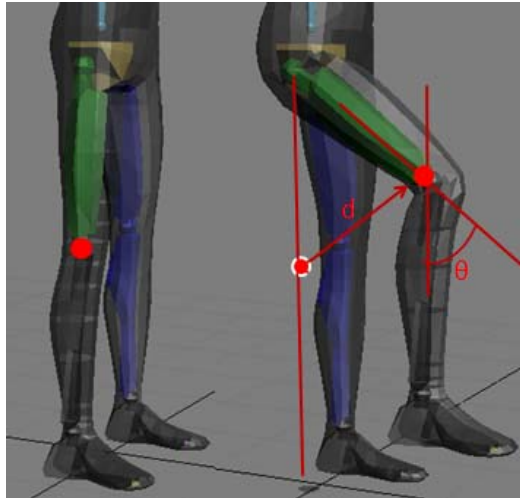
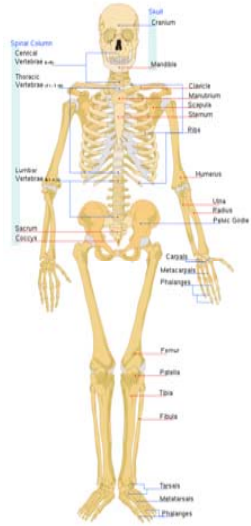


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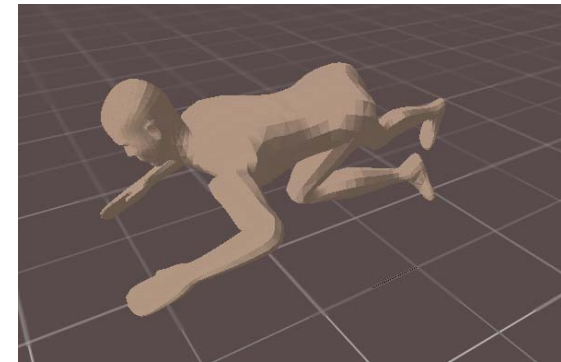
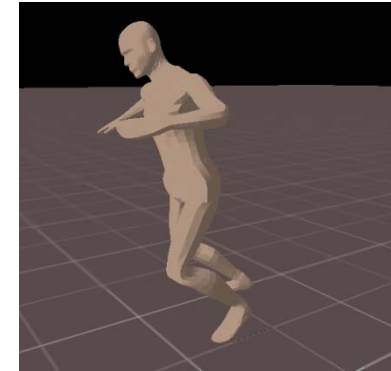
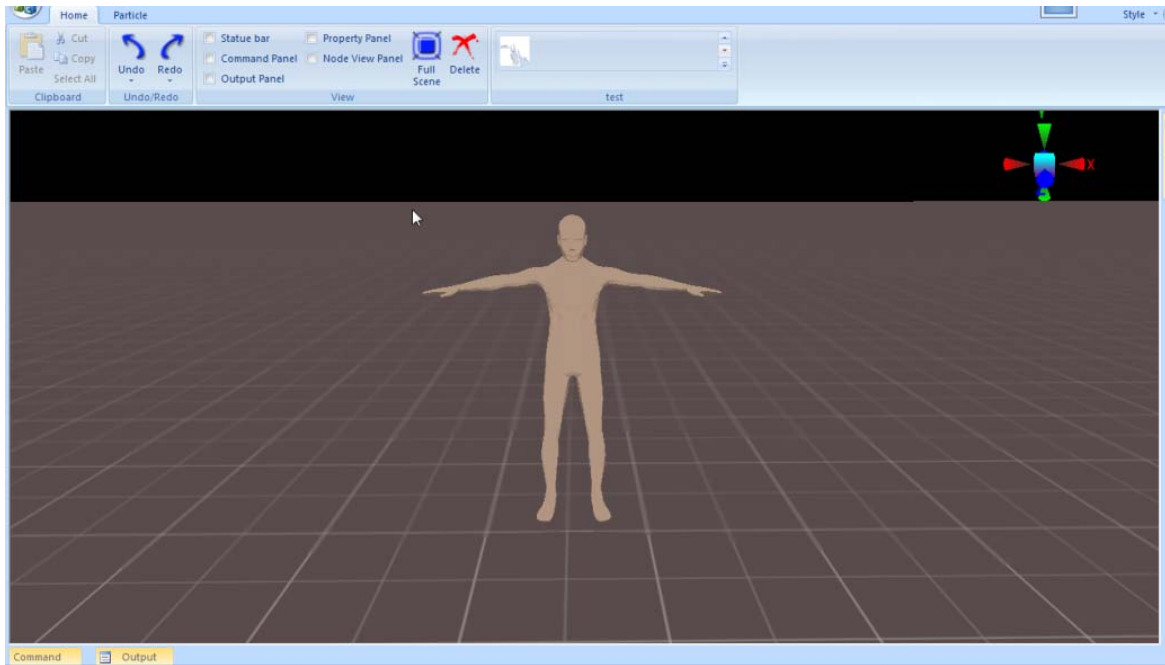


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2. Multi-Sensors Based 3D Reconstruction System for Elderly Falling



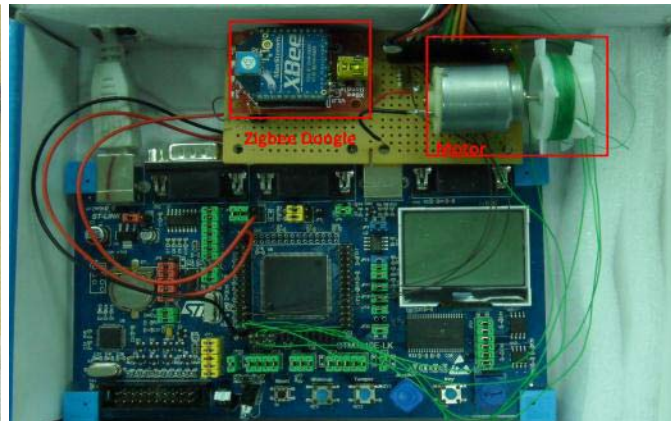
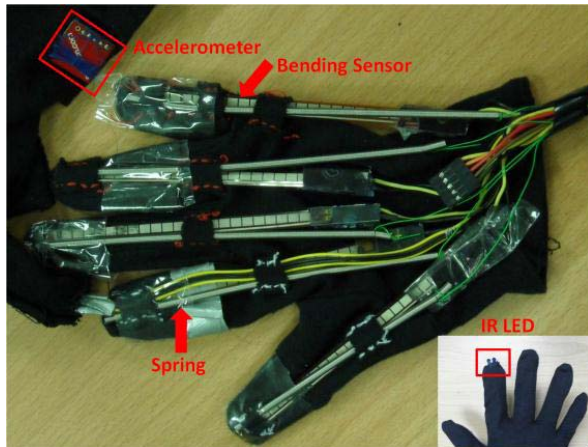
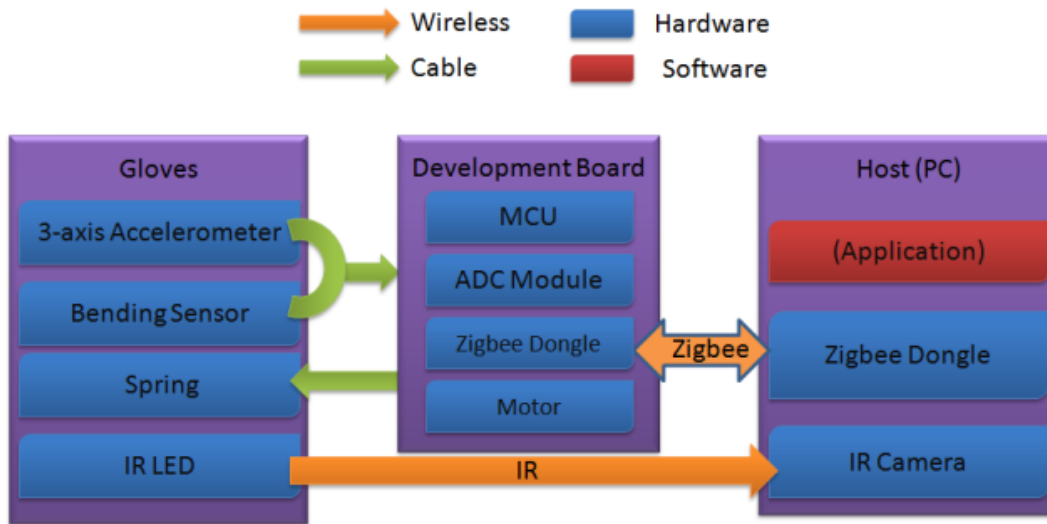
2. Multi-Sensors Based 3D Reconstruction System for Elderly Falling



3. 3D Motion-Sensing Interactive HMI for Applications in Multimedia Services

- Design a 3D motion-sensing interactive human-machine interface (HMI) system for computers and 3D multimedia service applications.
- The external design connects a bending sensor on gloves, which recognizes gestures combined with a 3-axis accelerometer, achieves 3D positioning.
- When users select objects using the glove, the touch sensation could be realistically felt by users.

3. 3D Motion-Sensing Interactive HMI for Applications in Multimedia Services



Research- Network

- Body Sensor Network
 - Detection of Cognitive Injured Body Region Using Multiple Triaxial Accelerometers for Elderly Falling, IEEE Sensor Journal , 2009 (SCI)
 - Adaptive Body Posture Analysis Using Collaborative Multi-Sensors for Elderly Falling Detection, IEEE Intelligent Systems, Vol. 24, No. 6, pp 20-30, 2010 (SCI)
 - 3D Adaptive Reconstruction of Human Motion from Body-Sensors, ICC 2010
 - Path Loss Exponent Estimation for Indoor Wireless Sensor Positioning, KSII Transactions on Internet and Information Systems, Vol. 4, No. 3, pp 243-257, 2010 (SCI)
 - Portable Automatic Conjecturing and Announcing System for Real-Time Accident Detection, International Journal on Smart Sensing and Intelligent Systems, Vol. 2, No. 2, pp 329-344, 2009
 - 3D Motion-Sensing Interactive HMI for Applications in Multimedia Services , IEEE MMTC E-Letter, pp 31-35, February 2011

Future Issues

What are we going to do ?

1. Android Stagefright (2.2) on Heterogeneous Multicore Platform
2. Sensor Based Wide-Area Monitoring and Control for Smart Grid System
3. Android-Based Health-care Mobile Service
4. Mobile Multimedia Service over Cloud Computing

Q & A