Experiencing Personalized Life with Global Reach

Dr. Lee Sze Wei of MMU paints an engrossing image of what life would be like in the not too distant fully digital future as well as introduce the Model Digital Home at MMU.

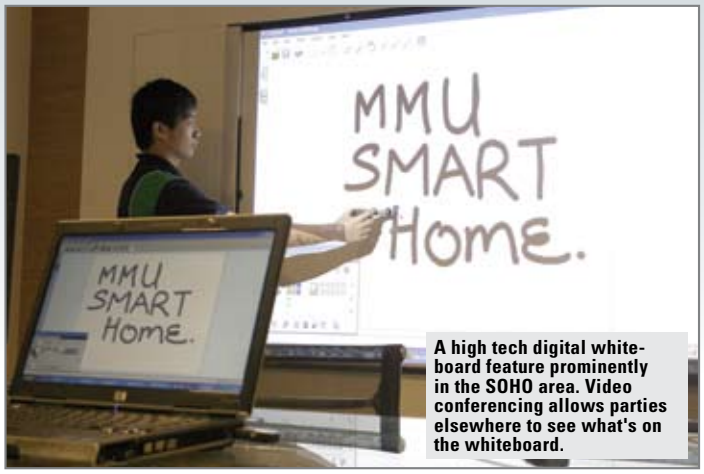
The term 'connected world' has been a favourite catchphrase of many over the last few years. There's no denying that impressive progress has been made as a result of rapid advances in communications, information and multimedia technologies and that the world is certainly very much more connected these days.

However, it still is not a fully connected world. When one sits down and examines the situation dispassionately, it becomes obvious that a fully connected world is not quite here yet.

So called convergent devices like mobile phones are still isolated stand alone devices that won't talk to any digital cameras or TVs nearby. At homes and offices, appliances are again mostly stand-alone with limited interconnectivity and coordination among the devices and appliances.

Even networks are not that connected. Within areas, regions and the global space, telecommunication systems are separated into public switched telephone networks (PSTNs), mobile phone networks, Internet access and data transfer networks, etc. All operate in separate pockets of space and are connected tenuously in somewhat inefficient ways.

Nevertheless, it is now possible to see what a fully digital and connected world would look like. Links and integration among the different spaces would bring about many new possibilities and conveniences unimagined before. Imagine what life would be like if we can use our phones to interact and control all appliances at home. Imagine if it could help us track the grocery stock in our kitchen and at the same time interact with our bodies to keep track of our health conditions? In the not too distant future, much more will become a reality.



A high tech digital white-board feature prominently in the SOHO area. Video conferencing allows parties elsewhere to see what's on the whiteboard.

The digital revolution will transform every aspect of our life; from our personal space to our home and office space. Areas, regions and the world itself would be transformed.

The possibilities of the futuristic lifestyle are endless and we are not even talking of the fantastic yet. Almost all the possibilities that will be outlined in the following paragraphs have been demonstrated to work.

The Future

One encompassing feature that will become ubiquitous will be the intense linking of living and non-living objects. Imagine being able to transmit the sense of smell and even emotions across regions. Your online friend in Britain cannot imagine what a durian smells like? No problem, just send him a whiff through your PC.

Remote sensing and monitoring will become personal too. Medical specialists would be able to monitor and diagnose health problems remotely. Imagine not having to go to a clinic when you are feeling unwell. The personal systems of the future will monitor a person's lifestyle closely and make suggestions to enhance health and enjoyment. For example, if someone is unable to sleep, the system could provide a soothing atmosphere or video to help the user fall asleep. A centralized home assistant could suggest suitable attire or food to the user.

Screen such as this one are found in many areas in the house. Touchscreen features provide ease of use.

The home will generate its own power through various methods: solar, wind and even kinetic energy through the user's movements. The power generated could be used to power up electrical devices and the extra "juice" could even be pumped back into the Grid. There could even be a system to measure the "Environment friendliness" of the community.

Lightings would never be the same again. Homes could be transformed into virtually anything. Through the use of holograms, intelligent lightings and projection systems, a home can be turned for example into a forest environment with just a click of a button. There's more good news: a robotic maid would perform all household chores.

Artificial Intelligence would become pervasive on machines and that will enable them to interact and respond to the surroundings. For example, when a phone call is incoming, the home's music Hi-Fi system will lower down its volume automatically.

Intelligence would be everywhere. Alert systems would monitor everything and help prevent tragedies by alerting people and authorities of exact locations and details of life threatening situations like fires. These systems would be able to identify moving objects by their behavior. The system could, for instance, identify whether a person is trying to break into a house, or is just walking-by.

Virtual Learning centres will be developed; these will be places where expertise is accumulated and presented in a virtual way to enhance and speed up the learning process. Like homes, schools and workplaces will change dramatically.

In short then, the possibilities are endless.

Technologies

The technologies that would make all these happen are already here; they just need to evolve a bit more.

Communication technologies, both wired and wireless, would be among the key enablers of the digital revolution. The demand for bandwidth will continue to grow to cater for the demands of highly intelligent and connected systems. Additionally, the new lifestyle will also require high and seamless mobility.

Electronic and VLSI technologies are also playing a key role. The constant advances of chip making technologies and the creation of ever smaller and yet more powerful processor chips are creating the brains of future systems. At the same time, network and data security will be strengthened far beyond what it is today. With more personal confidential data to be transferred over networks, there will be a need to have much more secure network and data security systems.

Beyond hardware and communications technologies, the main differentiator of future technologies will be in software. Thus software design methodology, technology and capability will be increased

significantly. It is worth noting that ultimately it will be humans that drive the future. The improvement of human life will cease when imagination stops. Innovation will never cease and because of that, even what we described above will be superseded by more wondrous advances in the future.

Model Digital Home in MMU

A tripartite partnership is behind the Model Digital Home at MMU.

From the outside, the building that houses the Faculty of Engineering at MMU looks just like any campus building in Malaysia. Much of the inside is no different with classrooms and lab areas everywhere.

Only one area looks conspicuously out of place, but in a nice way. About a thousand square feet of space has been remodeled into a modern looking apartment. There's a cozy living room, a bedroom, a kitchen and a spiffy looking SOHO work area and no, this has not been set up for the illicit enjoyment of lecturers and students. This apartment happens to be the Model Digital Home that has been set up to spur research and showcase what a fully connected life could be like.

One of the many goals that SKMM has been entrusted with under the MyICMS strategy is the National Digital Home initiative. To spur work in this area, SKMM appointed MMU as the host of the National Digital Home initiative sometime around September 2007. MMU is also the site of the National Centre of Excellence (COE) on Digital Home Technology.

MMU is tasked to research and develop technology and its potential uses for realizing a digital and intelligent

Government's Policy and Initiatives on Digital Home and Lifestyle

The government, mainly through the MyICMS886 national strategy, has been the main driver of the digital future. The services, infrastructures and growth areas pursued under this strategy will drive multimedia and communications growth in Malaysia.

The digital home is a specific initiative under this strategy. The MyICMS blueprint has the following goals and timeframe:

- 2006: Home Gateway / SOHO Introduced in 60000 homes
- Medium term (2008): 500,000 homes interwork with external networks
- Expected Result (2010): 1 million connected homes

The specifics of the Digital Home listed in the MyICMS blueprint are:

- Networking technologies to integrate appliances, devices and services within the home.
- Control and monitor the entire living space from within the home as well as from remote locations.
- Connectivity between terminals / appliances through Broadband over Power Line (BPL), WiFi, Bluetooth, etc.

One remote control is all that is needed to control the features in the house. Outside the home, a mobile phone serves the same function.

personal and home lifestyle. Cost effectiveness and feasibility factors were to be also considered so that the fruits of this endeavor could see wide scale implementation.

The model home was set up through a three party SKMM-University-Industry collaboration arrangement. SKMM provided the funding and support to initiate work in this area. The industry came together to provide equipment and further funding support for prototype development and model home setup. The university provided the space for model digital home and its faculty and students carry out R&D work and prototype development for the digital home.

The Model Digital Home

The first phase of the project which saw the model home being built and various intelligent systems put in place has been completed. Visitors will experience state of the art living enhancements throughout the apartment.

These enhancements will be easily controlled by its occupants. The prevalence of digital gadgets and appliances in homes has led to an increasing number of stand alone remote controls in most homes today. The Model Digital Home has just one; a smart remote control system that can interact with just about any device in the home. The home automation, security, TV remote, Astro remote, Hi-Fi remote will be replaced with a single remote control.

IP cameras are found throughout the house and their sensor technologies help the system keep track of movement of people in the house.

All control lightings and switches can be reached through this remote control. The system is smart enough for it to be reached from outside the home through a mobile phone, allowing the owner, for example, to switch on the air conditioner in the bedroom before he reaches home.

The automation system is implemented in such a way that no electrician or rewiring will be required. In fact, the aim is for an easy DIY automation system which could be self installed using off the shelf hardware.

The future occupant of a home like this would also be able to control hardware using hand gestures by wearing a glove equipped with sensors. A simple hand wave could then be used, for example, to switch off lights in the home.

Enhancements have been made in just about any area of the occupant's life in this home.

Personal Space/ Recreational Space

There is no lack of media content in this home. An Astro Max system with 80GB capacity or 60 hours video recording can do scheduled recording of shows. An IPTV system will bring additional content into the home.

The Follow-Me-Media feature would be very welcome by anybody. Any music, video or TV program that is being shown will "follow" the occupant wherever he moves. For example, music or video in the living room will follow the person when he/she moves to the kitchen and bedroom. The "follow" me will also be personalized for each occupant. It is interesting to note that the cost of such an impressive feature is already within the reach of the public.

Occupants in the home would be identified and tracked through their mobile phones. Bluetooth technology would identify where anyone is at any time. To get people fit, the home also has a Wii Fit gaming system in place that makes players actually move according to the game. It also goes without saying that there will be personalized news, music, lighting and video for each tenant.

For decoration, there are digital photo frames that can be updated with the latest sets of pictures dynamically. Even better is the possibility of personalized photo displays that show different sets of pictures for each individual occupant in the household.

Life won't be lonely too in this home as a digital pet like the currently installed Nabaztag rabbit with AI technology built in will be a welcome companion. This digital gadget can read news, play music, and also engage in instant messaging with other similar pet owners around the world. It also features speech recognition and replaces the alarm clock.

Intelligent devices like the Nintendo Wii fit provides entertainment and exercise.

Home & office space

The home office is not neglected in this undertaking. The SOHO work area will have a high definition projector and smart interactive white board. Video and tele conferencing is a given and the white board will be visible to other parties through the Internet. This would be done through high speed streaming with the 4Mbps Streamyx Internet connection.

There will be lots of screen throughout the home with every system available on each one of them. For example, one could view the CCTVs mounted throughout the home at any screen anytime.

Kitchen

The kitchen has so many features installed that it almost is the best place to hang around the in the home. There is the Digital Refrigerator with LCD screen featuring Internet access and videos. An RFID system will check the contents and tenants will be able to get nutrition facts as well as the expiry dates of the food inside the refrigerator.

The same system will automatically detect and track the items in the fridge and notify users if a certain item needs restocking etc. Items such as food, drinks could then be purchased online through an automated ordering system.

Another touchscreen on the wall allows simple Internet access. Getting recipes from the Internet will never be a problem here. A lot of touchscreens are utilized throughout the home with the aim of simplifying interaction with the system.

The intelligent system

Many technoloies have come together to make this home a reality. As mentioned there is a wired landline with 4 Mbps Streamyx (SOHO) connection. WiFi wireless technology is deployed throughout the home. Also to be found is Z-Wave wireless home automation technology.

A simple network PC server runs everything. Everything is controlled through an easy to use web enabled interface. The software is based on the open source LinuxMCE operating system. Scattered all over the home are IP based cameras, RFID tagged devices, Z-wave controllers and switches etc. A Cisco network security system protects the home network server.

A regular PC running on open source software runs the smart features.

The Future

Work on the digital home does not end with what is installed currently. A lot of research and development work is just starting and it will bring even more advanced technologies into the home. The team will continue development and software work using the open source LinuxMCE all-in-one digital home operating system. Web-based solutions will be integrated with the Internet to solve common household problems.

More work will also be done in the area of semantics: Making the digital home smarter whereby it could be aware of its surroundings and communicate with other devices in the home, as well as be a personalized assistant to the occupant.

Controls will continue to be enhanced with more virtual control devices like the Virtual Glove. The team will research into using brain waves too. This would provide a more interactive and natural way to control devices in the house or even as an entertainment tool. Another very important area that will see more work on is the increasing need to implement energy saving features.

Taking it mainstream

Most of the features seen in the model digital home could be implemented in homes even today but the cost of doing it would be prohibitive. Right now, not every worker and even every IT staff could implement the system. The need to utilize very tech savvy people will raise the implementation costs. The cutting edge devices and appliances also cost a lot presently.

But the future will be different. The cost of appliances and gadgets will drop sharply over time. The stated aim of the Malaysian Digital Home team to work towards easy to install DIY systems would bring costs down sharply too.

There is still a lot of work to do but the progress thus far is impressive. The team is also following developments in countries like Japan and Korea. However, it is also ensuring that the smart digital home it is creating for Malaysians will be custom made for the Malaysian lifestyle. .my

Dr. Lee Sze Wei is Associate Professor, Faculty of Engineering, MMU. He can be reached at swlee@mmu.edu.my