The Institution of Engineering and Technology (IET)
Wireless Symposium 2020
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"Innovation Brings Betterment"
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Prof WOO (Prof. Tim Woo, Chairman of IET HK), Dr TSANG (Dr. KF TSANG, Symposium OC Chair), distinguished guests, ladies and gentlemen, good morning, good afternoon and good evening!

It's approaching a full year since the outbreak of COVID-19.   While we have to stay away from each other for social distancing, thanks to various communication technologies and tools, both the Government and the private sectors are able to continue with essential business activities and keep the city running.

HK people can overcome the most challenging hurdles.   Our steady GDP has proven it! At the height of the pandemic, while the transport demand had drastically decreased, as seen from the MTR's patronage figures with a significant drop of over 30% as compared to 2019, our GDP in the first two quarters of 2020 was only 9% less than the same period of 2019.   The fall in GDP further narrowed down to 3.4% in the third quarter.   While COVID-19 has greatly reduced physical contacts among ourselves, agile Hong Kong people quickly become accustomed to the "New Norm" with the help of advanced communication technologies and innovative applications and products.   Hopefully it won't be long before our economy sees light at the end of the tunnel.

Last year, I had an inspiring visit to the Shanghai Yangshan Deepwater cargo terminal. The terminal deploys fully automated robotic systems to process containers inbound and outbound.   Containers are unloaded by automatic robotic crab cranes, transported by automated driverless guided vehicles in the terminal, and finally loaded to the container vehicles.   Such amazing fully automated system involves lots of intelligent communication technologies and applications.   No wonder, the development of technologies and applications are based on the expertise and collaboration of experts and professionals just like you all.

Today, we will have many experts in different fields to share with us exciting stories and challenging experiences of wireless, smart city and ABIoT developments. These enabling technologies are the building blocks of many innovative and smart applications that enhance the safety and quality of life of our people and community.

The world is fast changing with innovation and technology, which has made our dreams possible and our life better. In Japan, the Cabinet Office of Japanese Government described the present society as Society 5.0. Society 5.0 is a human-centered society, a new era of life. We have progressed from a hunting and gathering society, which we called Society 1.0, to an agricultural society that is Society 2.0. We then progressed to the Society 3.0, or the industrial society, to Society 4.0, the information society.

In Society 4.0, people access cloud service in cyberspace via the Internet to store, search, retrieve, and analyze data. In the next phase, Society 5.0, there is a high degree of convergence between cyber virtual space, and the physical real space. A huge volume of data from sensors in the physical real space is accumulated in the cyber virtual space, forming what we term as "big data". The big data in cyberspace is analyzed by artificial intelligence (AI), and the results are fed back to human in physical space for different innovative applications to improve our quality of life. Mobile wireless communication is a key enabler for Society 5.0.

Contemporary innovative and smart ideas have brought changes to our work and life. Take smart home devices as an example. In the first-generation of smart home design, most of the smart household devices relied on wired sensing and control. Sensors, thermostats, electronic roller blinds, and lighting are connected by a low-power line to a local system acting as a self-sufficient and independent node.[1] Although such wired smart home designs were fast and reliable, they were expensive to install and difficult to relocate when needed. Nowadays, the advancement of Internet of Things (IoT) technology has revolutionized smart home design. Gone are the wired interconnections for smart home devices and the localized intelligence. The smart devices are now IoT enabled and wirelessly connected. With AI enabled speech and video analytics from the cyberspace, we can simply use our voice and gesture to control the devices. It has brought us into a new era of smart living.

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[1] https://www.ceoinsightsindia.com/ceo-talks/smart-homes-past-present-future-nwid-2675.html

Moreover, electronic devices are getting more affordable in recent decades. The recent development of robotics technology and 3D printing have realized high-precision and lower cost automation in manufacturing industries. With the integration of artificial intelligence and machine learning, the robotics will be a remarkable enabling technology to improve productivity by taking over from the human beings the repetitive manufacturing process. No wonder why many enterprises have deployed robots for delivery services and disinfection works during the epidemic period.

FinTech is another area where the continuous evolution of mobile technology has brought changes to our life. Hong Kong has been using Octopus payment system based on NFC technology since 1997. Now we seldom need coins in our daily life, except possibly in a few places such as markets. With the COVID-19 outbreak, contact-less payment methods gain more popularity for hygienic payment to avoid contact with banknotes or coins. As an anti-epidemic measure, the Government is subsidizing the installation of contact-less payment systems for stalls in government markets.

The applications of new technologies are certainly amazing enough in changing our daily life and works. And when such technologies are married with innovation, the possibilities are beyond imagination. I recall that when drone was first invented, it was mainly used for leisure purpose. People used drones for photography and entertainment. However, can you imagine that drones could be used for a much more sophisticated level for show performance?

In the eve of the 2020 Chinese New Year, around 2000 drones were flown in a coordinated manner in Shanghai to welcome the new year. The drones were programmed to form a running man, displaying changes and achievements of the city in the past 40 years, and offering best wishes to the people.[2]

What else for drones? Apart from entertainment, drones have been deployed for many other purposes, such as delivery. We are used to ships, trucks or planes for materials delivery. The whole process may take 2-3 working days, which is time-consuming and energy consuming. Can this be better? In 2019, an international supply chain management company started to provide delivery services by drones. They deliver medical samples or specimens via drones in the US. The company receives US

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[2] Video: https://www.youtube.com/watch?v=v05uHuJj7Hs&feature=emb_title

government support and is allowed to operate an unlimited remote-controlled drone delivery network in the US.

When we are having a long and tiring journey, we often want to relax by listening to our preferred music.   With Bluetooth wireless technology, gone is the tedious task of unwiring the headphone wire.   By doing away the wired connection, we can even enjoy music hassle free when doing exercises.   With text-to-speech software, we can listen to incoming emails anytime, if you wish, while relaxing with music or doing exercise. With innovation, the same Bluetooth technology has been adopted for indoor positioning. Low-energy Bluetooth beacons are pre-installed, and by searching and identifying the beacons, the smart phone can locate position indoor without GPS signal.   Such indoor positioning applications can be used in a large shopping mall, e.g. to help visitors find their preferred shops, or send promotional messages to visitors when they walk by individual shops.

In Amsterdam, this positioning technology has become a part of the smart city development.   They are deploying massive number of beacons in the city; at the same time, they make use of an open platform crowdsource to consolidate beacons information from the public.   After this cooperation between government and citizen, the positioning accuracy in Amsterdam has been further enhanced.   If this extended wireless application is not innovative enough, let's see how we in Hong Kong can do more.

To combat COVID-19, the Logistics and Supply Chain MultiTech R&D Centre (LSCM), designed quarantine wristbands to enforce geofencing of inbound travelers to Hong Kong. The wristband communicates with the traveler's mobile phone with Bluetooth.   Inside the mobile phone, the installed app detects the strength of different wireless communication signals inside the home of the quarantined, including cellular networks, Bluetooth, and Wi-Fi signals, thereby forming a "signature" to establish a geofence.   If a change in signature is detected, it would imply that the person under quarantine has left the quarantined area, and this will be instantly reported to the authority.

Now let's see how the government is using alternative wireless communication technology to manage the city's infrastructure and to serve the community.   We in EMSD are building a key infrastructure network to support smart city development – that is the Government Wide IoT Network, or GWIN in short.   Deployed since early 2019, GWIN involves the use of Low Power Wide Area Network, LPWAN, technology, with a

view to establishing a cost-effective solution for close-to-real time monitoring and subsequent analysis and enhancement of asset performance, as well as enabling our E&M digitalisation.   How could GWIN benefit Hong Kong citizens?   Guess no one would disagree that Hong Kong is a scenic place, good for hiking and water sports.   While the mobile network is quite well established, it still could not cover every corner of country parks and open water areas.   This is where LoRa (Long Range) and LPWAN could play a complementary role.   With a LoRa tracker device carried by a hiker, tracker signals can be transmitted to the GWIN gateway kilometers away, relaying the hiker's position even though he is located beyond mobile network coverage.   This will allow the rescue team to locate the hiker in danger in areas outside the coverage of mobile network. Similarly, LoRa tracker connected to GWIN can be used to track a water sport athlete in the open waters.   By the same token, the trackers bundled with temperature and hazardous gas sensors can be deployed in construction sites to monitor the safety of workers entering confined space or carrying out underground works.   My colleagues will further introduce the details of GWIN in the coming session. Stay tuned.

In closing, I would like to express my sincere thanks to the IET for hosting this meaningful Symposium again amid the difficult COVID-19 pandemic.   Let me share an inspirational quote from Barbara Jordan, a famous American Educator: *"We are a party of innovation.   We do not reject our traditions, but we are willing to adapt to changing circumstances…..   We are willing to suffer the discomfort of change in order to achieve a better future."*   This is very true with the situation we are today under COVID-19. We have no travel, little gathering, and seem to be much more distanced from each other. But, in no time, we have got used to using video conferencing tools.   And now many of us are attending more international conferences and symposiums than we usually do.   So notwithstanding a slightly more distant way of attending this symposium, do make your best effort to enjoy the sharing from local and international experts in the wireless and mobile fields.

I wish the Wireless Symposium 2020 a great success and fruitful sharing of the latest development in wireless technology.   Thank you very much.

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