INTENSIVE COURSE

Medical Healthcare Systems and Services based on Advanced ICT (Information and Communication Technologies)

Date: Thursday 21 August – Friday 22 August, 2014, at 8:30-11:30

Venue: TBA

Lecturer: Ryuji Kohno, Finnish Distinguished Professor (FiDiPro), CWC, University of Oulu; Professor, Division of Physics, Electrical and Computer Engineering, Graduate School of Engineering, and Director, Center of Medical Information and Communication Technology, Yokohama National University, Japan; CEO, University of Oulu Research Institute Japan – CWC-Nippon Oy (Co.), Japan

Description:

Healthcare and medicine must be very attractive fields for industry who is seeking a new huge market size of business while regional gap, high expense and sugary failure in medical health care becomes a serious social problem. Mobile communication business is facing a problem of too much competition and needs a new market. Population ageing may crap social healthcare service due to exceeding expense for high cost and long treatment etc.

For these problems, advanced medical healthcare using sophisticated information and communication technology (ICT), so-called medical ICT can promote a new big business and improve medical healthcare services among hospitals, homes and peoples in country sides by networking. Ultimately advanced ICT will realize “Ubiquitous Medicine,” so that medical healthcare can be served for anyone anytime and anywhere.

This course of lectures will provide demand and trend of Ubiquitous Medicine, and introduce some advanced medical healthcare systems such as body area network (BAN), medical implant communication system (MICS) etc. The lecture will introduce technical requirements to carry out ubiquitous medicine based on such an advanced ICT that can satisfy the requirement to solve various problems. Standardization and regulation to make medical ICT social service and business successful are introduced, in particular, international standard of wireless BAN IEEE802.15.6 can make a global market while various states of art in ICT have been developed and applied for.

Another important issue must be regulation for medical device because it takes a long time and cost much for regulatory compliance test for human life safety. The lecture also introduce “Regulatory Science,” which is important to analyse risk and benefit of new invented medical devices, to make a regulation acceptable for anyone and to educate experts for regulatory compliance testing.

Furthermore, it will also discuss on subjects of research and develop for ubiquitous medicine and medical ICT to make better social service and attractive business and key projects for interaction at industry and academia.
Structure:
The course will consist of two parts.
Part I will include several hours of lectures spread over three mornings.
Part II will consist of presentations by registered students discussing possible research themes of learnt requirement, technologies, and applications using advanced wireless technologies for advanced medical healthcare. Each student will make a presentation on research themes and scenario with resumes. These discussion and resumes are evaluated instead of exams.

Keywords:
Ubiquitous Medicine, EMC, Array Sensor, Space-Time Signal Processing, Software Reconfiguration, Cognitive Systems, Ultra Wideband, Sensor Networks, Medical ICT, Body Area Network (BAN), Medical Implant System (MICS), Regulatory Science, Compliance Test, IEEE802, MIC, PMDA, FCC, FDA

Number of lecture hours:
4 x 4 x 45 minutes

Timetable
The course will take place on 21-22 August 2014.
Part I: Thursday 21.8.2014 9:00-12:00, Friday 22.8.2014 8:15-9:45
Part II: Friday 22.8.2014 13:00-14:30

Course Plan:
1. Overview of Advanced Medical Healthcare Based on ICT
2. Background and Demand
3. Global Trend and Projects on Medical ICT
   3.1 Ubiquitous Medicine Based on Advanced ICT
   3.2 Related Projects
4. Required Wireless Technologies
   4.1 Basic Communication Theory and Advanced ICT
   4.2 Adaptive Array Antenna and Sensor
   4.3 Space-Time Signal Processing and Communication Theory
   4.4 Software Defined (Reconfigurable) Radio and Network
   4.5 Cognitive Radio and Network
   4.6 Spread Spectrum and Ultra Wideband (UWB) Communications and Ranging
5. Advanced Medical Healthcare Systems
   5.1 Body Area Network (BAN): Wearable and Implant BANs
   5.2 Medical Implant Communication System (MICS)
   5.3 Others
6. Research and Develop Subjects
   6.1 Channel Measurement and Modeling
   6.2 Technologies in PHY and MAC Layers
   6.3 Interference Mitigation for Coexistence
   6.4 Security for Medical Healthcare Systems
7. Regulatory Science and Business Model
   7.1 International Standard (IEEE802.15)
   7.2 Regulations for Radio and Medicine (FCC, FDA, MIC)
   7.3 Clinical Testing for Medical Regulation and Type Approval for Radio Regulation
   7.4 Regulatory Science for Medical Devices and Services
   7.5 Business Model for Medicine, Cars, Energy, Disaster etc
8. Concluding Remark
Biography:

Ryuji Kohno received the Ph.D. degree from the University of Tokyo in 1984. Since 1998 he has been a Professor of the Division of Physics, Electrical and Computer Engineering, and the Director of Center on Medical Information and Communication Technology, in Yokohama National University in Japan. In his currier he was a director of Advanced Telecommunications Laboratory of SONY CSL during 1998-2002, a director of UWB Technology institute of National Institute of Information and Communications Technology (NICT) during 2002-2006, and that of Medical ICT institute of NICT during 2006-2012. Since 2012 he is CEO of University of Oulu Research Institute Japan – CWC-Nippon Co.

In his academic activities, he was elected as a member of the Board of Governors of IEEE Information Theory (IT) Society in 2000, 2003 and 2006. He has played a role of an editor of the IEEE Transactions on IT, Communications, and Intelligent Transport Systems (ITS). He is fellows of IEEE and IEICE, and was vice-president of Engineering Sciences Society of IEICE, the Chairmen of the IEICE Technical Committee on Spread Spectrum Technology, ITS, and Software Defined Radio(SDR), Medical ICT, and Reliable Robust Controlling Communications. Prof. Kohno has contributed for organizing many international conferences, such as an chair-in honor of International Conferences of SDR(SDR02 & SDR03), a general co-chair of IEEE International Symposium on IT (ISIT03), UWBST&IWUWB04, IWUWBST05, International Symposia Medial ICT (ISMICT2006, 2007, 2010, 2012 & 2014), Joint International Symposia on Information Theory and Its Applications (ISITA2010) and on Spread Spectrum Technology and Applications (ISSSTA2010). He was awarded IEICE Greatest Contribution Award and NTT DoCoMo Mobile Science Award in 1999 and 2002, respectively.

Since 2007, he became a Finnish Distinguished Professor (FiDiPro). He was an principal leader of MEXT Global COE (Centre of Excellence) program on “Innovative Integration between Medicine and Engineering Based on ICT,” during 2008-2013 and JSPS-TEKES joint program on Life Science during 2013-2015 to promote joint research and education between Finland and Japan. Since 2014, he is a director of Medical Device Regulatory Science Center in YNU.

Materials used:

- Actual course material: YES
- Additional in-depth material: NO
- Support material: YES