



National Institute of Technology Agartala

(An Institute of National Importance by MHRD, Govt. of India)

Agartala, Tripura-799046

GIAN: Global Initiative of Academic Network



An Initiative of



Ministry of Human Resource Development
Government of India

Introduction to Speech Coding WITH Internet of Things (IOT) Applications

Overview and Introduction of course:

Speech Coding refers to the digital representation of the information-bearing analog speech signal, with emphasis on removing the inherent redundancies. Efficient coding of speech waveforms is essential in a myriad of transmission and storage applications such as traditional telephony, wireless communications (e.g., mobile phones), internet telephony, voice-over-internet protocol (VoIP), and voice mail. Many of these speech applications are currently going through an impressive growth phase.

With new Internet of Things (IoT) concept becoming popular and strong ecosystem created by the network infrastructure companies, chip vendor and sensor manufacturer. It is estimated that 50 + Billion connected devices by 2020 wherein Speech Coding will play very important role in the whole IoT development system and architecture ecosystem.

The course outlines how speech coding can be utilized in an IoT application and save highly demanding available network bandwidth (IPV6, 6LowPAN and ZigBee) The IoT based Voice codec system need lot many computing power when delivering input analog signal (Sinusoidal in nature) to the desired IoT output cloud infrastructure. Several IoT platform vendors are providing MCU based board support with internet connectivity such as Wi-Fi , Bluetooth and GPRS protocols. As such these are all low processing power with high connectivity. Adding speech coding processing unit such as DSP to the system forms a complete IoT systems delivering high efficient and low bandwidth.

By having pre and post processing elements, Students will learn how to design and develop an IoT System for speech applications from scratch. Attendees will learn how to build systems from concept to the final product.

Students will also learn Internet Protocol (IP) applicability for Smart Objects and the main challenges that IoT systems demands. Also the IEEE 802.15.4 recommendation, and the Constrained Application Protocol (CoAP) features, interaction model, packet format, messages and request/response sub layers.

Dates	21st November 2016 to 25th November 2016
Place & Venue	Department of Electronics and Communication Engineering, National Institute of Technology Agartala, Tripura, India.
Modules to Cover	<p>A: Introduction, Examples, Network requirement for Speech Coding, Demonstration of various IoT hardware platform such as Intel (Edison), ARM (mbed) and ARC(IoT platform) (21st Nov)</p> <p>B: Differential coding, Internet Network, Speech coding methodologies and its usage (22nd Nov)</p> <p>C: LPC Coding, CELP Coding, Application to speech coding(23rd Nov)</p> <p>D:Examples of Speech Coding such as ITU G.711, ITU G.723, ITU G.729A, Sensor Technology, Constrained Application Protocol (CoAP), Practical Implementation of Speech Coding(24th Nov)</p> <p>E:Signal Processing in VoIP Systems, Overview of Bluetooth technologies, Build IoT systems (25th Nov)</p>
Who can Participate?	<ul style="list-style-type: none"> • UG, PG (B.Tech./ B.Sc /M.Sc./M.Tech./Ph.D.) students and research scholars of all areas of engineering and applied sciences. • Researchers from R&D laboratories working in the field of VLSI Design, Architecture, Communication (but not limited). • Faculty from reputed academic and other technical institutions.
Registration Fees of Participants	<p>The participation fees for taking the course is as follows:</p> <ul style="list-style-type: none"> ✓ Participants from abroad : US \$300 ✓ Non-students (i.e. academic, industry participants etc.): Rs. 2000/-. ✓ Students: Rs. 500/- <ul style="list-style-type: none"> • The above fee include all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges, 24 hr free internet facility. The participants will be provided with accommodation on payment basis. The individual course participants will have to borne the charges for their food, transport separately. • Registration will be accepted as first come first serve basis and limited to 50. • Confirmation of participation will be intimated over Email. • Due date of Registration: 16th November 2016
Benefits	<ul style="list-style-type: none"> • Participants can earn extra credit and exposure by attending GIAN expert lectures from Professor of Santa Clara University, CA. • Opportunity to learn characteristics, principles and implementation of Speech Coding and application of IoT(Internet of Things). • Opportunity for participant to formulate research problem with the expert. • Opportunity to establish research links with the faculty from CA University. • Opportunity to solve hands on problems in Speech Coding with IoT.

Foreign Faculty



Tokunbo Ogunfunmi is the Director of the Signal Processing Research Lab (SPRL) in the School of Engineering and Professor in the Department of Electrical Engineering at Santa Clara University, Santa Clara, CA.

His current research interests include adaptive/nonlinear signal processing, digital signal processing, multimedia (speech, video) VLSI/DSP/FPGA implementations and artificial neural networks. He has published 2 books and over 130 refereed journal and conference papers in these and related areas.

Dr. Ogunfunmi has been a consultant to industry and government, and a visiting professor at The University of Texas and Stanford University. His industrial experience includes consulting for companies such as Broadcom, AMD, CASE Technology, CLARIS Corp., Clairvoyant, NEC, AT&T Bell Labs. and NIKON Precision Research & Development. He is also a registered professional engineer.

He is currently an IEEE Distinguished Lecturer for the Circuits and Systems Society. He is a Senior Associate Editor for the IEEE Signal Processing Letters and an Associate Editor for the journal Circuits, Systems and Signal Processing. He is a Senior Member of the Institution of Electrical and Electronic Engineers (IEEE), a Member of Sigma Xi (the Scientific Research Society), and Member of the American Association for the Advancement of Science (AAAS). From 2007-2009, he was the Chair of the IEEE Signal Processing Society (SPS) Santa Clara Valley Chapter. He is also a member of the IEEE Signal Processing Society Technical Committee on Design and Implementation of Signal Processing Systems (DISPS), the IEEE Circuits and Systems Society Technical Committee on DSP and the IEEE Circuits and Systems Society Technical Committee on Circuits and Systems for Communications (CASCOM).

Education

- Ph.D., Stanford University, 1990
- M.S., Stanford University, 1984
- B.S., University of Ife, Nigeria, 1980

Research Interests

- Digital, Adaptive and nonlinear signal processing.
- Multimedia (Video/Audio/Speech) signal processing.
- DSP/FPGA/VLSI Design

Foreign Faculty

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Host Faculty

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Host Faculty



Mr. Mitra Barun Sarkar is Assistant Professor in Department of Electronics and Communication Engineering, NIT Agartala, Tripura. He received B.E. degree in Electronics and Communication Engineering, M.Tech degree in Microwave Engineering and pursuing Ph.D. degree in the field of Optoelectronics Devices. His research interest include RF & Microwave Engg., Nanoelectronics, Wireless Communication, signal processing, VLSI Semiconductor and Optoelectronics Device.



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Tentative Programme Schedule

Date	Forenoon	Afternoon
	9:30-12:00 Noon	2:00-4:00 PM
21/09/2016 Monday	Inauguration and Lectures on Speech Coding and IoT Application	Tutorial on Demonstration of IoT Hardware Platform
22/09/2016 Tuesday	Lectures on Differential Coding and Internet Network	Tutorial on Assembling and Installation of IoT hardware
23/09/2016 Wednesday	Lectures on LPC and Wireless Technology	Tutorial on DSP Programming and Interfacing with IoT platform
24/09/2016 Thursday	Lectures on Sensor Technology and COAP	Tutorial on practical implementation of Speech Coder
25/09/2016 Friday	Lectures on VoIP system and Bluetooth Technology	Tutorial on Build IoT system, evaluation and grading