



Press Release

IIT Mandi professor fine-tunes Cognitive Radio for wireless communication

MANDI, 4thFebruary 2019: The spread of wireless communication is extensive in today's world, ranging from the humble remote control that operates various gadgets to communication over continents. Information is carried wirelessly across large distances by radiofrequency (RF) waves, a part of the electromagnetic spectrum invisible to the human eye. With the increase in the use of wireless communication, arises a severe shortage of available channels in the RF spectrum for interference-free communication. Cognitive Radio (CR) is an emerging intelligent technology that seeks to expand the use of the RF to alleviate the problem of spectral paucity. **Professor Rahul Shrestha and his research scholar Mr. Rohit Chaurasiya, at IIT Mandi, along with Mr. Mahesh Murty, from International Institute of Information Technology Hyderabad, work in this cutting-edge field of technology and have developed methods to improve hardware efficiency of CR devices. Their work has recently been published in IEEE Transactions of Circuits and Systems.**

The radiowave is the part of the electromagnetic spectrum, that lies beyond the red end of the visible rainbow, and has been used for decades now, to carry information through space over long distances. A fixed band of frequencies within the radiofrequency region has been allotted for communication, throughout the world. In India, the National Radio Regulatory Authority, a wing of the Ministry of Communications and Information Technology, is responsible for the National Frequency Allocation Plan (NFAP) by which radiofrequencies are allotted for communication purposes.

Even within the allotted band of frequencies, at any point of time, there are empty channels that are not used. With the burgeoning use of wireless telecommunication, this underutilization of portions of the licensed spectrum causes a bottleneck.

"Cognitive Radio, a term coined by Joe Mitola in 1999, allows a transmitter/receiver of information ("transceiver") to detect the unused or "white" channels to piggy-back on them and avoids the occupied channels", says Dr. Shrestha, about the basics of his field. In other words, a transceiver uses the best available wireless communication channel for communication, without interference from others.

The first step in CR is identification of the white channels. Various methods are being developed all over the world for the identification of the white channels in RF waves, for



CR applications. These methods involve a combination of sensor devices and algorithms. *"Some combinations are simple, but not very efficient"*, says Dr. Shrestha, *"for example, 'energy detection' is commonly used due to its lower hardware complexity, but is inefficient when there is negative signal-to-noise-ratio"*. The Time-Domain Cyclostationary-feature Detector (TDCD), on the other hand, performs well, but consumes significantly more hardware resources.

Dr. Shrestha and Mr. Murty have enhanced the detection capabilities of TDCD and reduced the hardware resources through a selective-sampling technique and adoption of Very-Large Scale-Integration (VLSI) architecture. *"In comparison with the state-of-the-art technique, this design alleviated memory requirement by 99% and other hardware resources by 33%"*, the authors write in their paper that has been published in IEEE Transactions of Circuits and Systems.

Cognitive radio is a good route to affordable broadband connectivity in India especially to rural areas and large-scale Wi-Fi's in public locations. Dr. Shrestha's study could hasten the introduction of CR systems in India.

###

About IIT Mandi (<http://www.iitmandi.ac.in/>)

Nestled in Sivalik Range of the Himalayas, IIT Mandi is fast emerging as a leader in science and technology education, knowledge creation and innovation, in an India marching towards a just, inclusive and sustainable society. Since the first batch of students took place in July 2009, IIT Mandi has grown to host 1,276 students including 274 PhD, 46 MS and 17 I-Ph.D. research scholars, 104 Faculty, 150 staff, and attracted funding to the tune of over Rs.70 crore for Research Projects. A growing body of alumni, nearly 850 in number, will become the champions of this institute as they assume leadership positions in industry, academia and administration.

From 1,280 students in 2018, the Institute aims to grow to 5,000 B.Tech, M.Tech/M.Sc. and M.S./Ph.D. by 2029. Currently, the campus has completed about 80,000 sq.m. of construction. Another 1,50,000 sq.m. is currently under construction. IIT Mandi has a fully residential campus with all students and 95 percent of the faculty residing within it.

Since 2010, IIT Mandi's faculty has bagged nearly 180 projects worth more than Rs. 85 Crore. IIT Mandi, in just 9 years of its existence, has been able to develop several labs and facilities on its campus here at Kamand, creating an extraordinary research ambiance. The Advanced Materials Research Centre (AMRC), created with an investment of about Rs. 50 crore, houses advanced instruments for the characterization of materials with scope for drug delivery, electrical, electronics and biological applications. Since its inception in 2013, the AMRC has contributed to more than 200 research publications.

The institute has an Interdisciplinary Academic Culture which is Design-oriented. The B.Tech. curriculum focuses on Real-World team projects from the Year One to Four A strong humanities



component as well makes the IIT Mandi curriculum even more relevant to the society at large. There are many active MoUs with TU9 in Germany since May 2011.

Launched in 2016, IIT Mandi's very own technology-business incubator Catalyst is the first Technology Business Incubator (TBI) in Himachal Pradesh. It aims to incubate technology-based startups focused on economic and/or social impacts. EWOK (Enabling Women of Kamand Valley) is another very innovative program being run by IIT Mandi which focuses on Skills training village-scale businesses by village women using Internet and pervasive mobile network and Serving local and global customers.

Media contact for IIT Mandi:**IIT Mandi Media Cell - mediacell@iitmandi.ac.in**

Akhil Vaidya –Footprint Global Communications

Cell: 9882102818 / Email ID: akhil.vaidya@footprintglobal.com

SamridhiBhal - Footprint Global Communications

Cell: 7905887524 / Email: samridhi.bhal@footprintglobal.com

Palak Sakhuja - Footprint Global Communications

Cell: 9582338333 / Email: palak.sakhuja@footprintglobal.com

Shoma Bhardwaj - Footprint Global Communications

Cell: 9899960763/ Email: shoma.bhardwaj@footprintglobal.com

Bhavani Giddu - Footprint Global Communications

Cell: 9999500262 / Email: bhavani.giddu@footprintglobal.com