COMPSIG NITT

In This Issue...

- **Illustration:** Millimeter wave
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- **On-going research:** Current research works in PRCI Lab.

Dear friends! COMPSIG NITT is a monthly newsletter to share the research work done in the Pattern recognition and computational intelligence laboratory, Department of Electronics and Communication Engineering, National Institute of Technology Trichy.

Concepts, Ideas pertaining to Computational intelligence, Pattern recognition and Signal processing are also included in this newsletter.

We expect the feedback, comments and articles from you all.

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ILLUSTRATION OF MILLIMETER WAVE CHANNEL MODEL

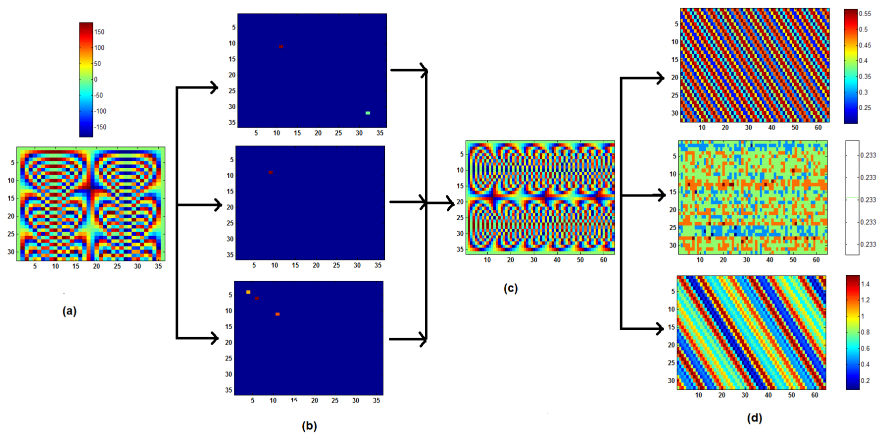

Fig: Milimeter wave channel model

Millimeter channel between the linear array transmitter (with 32 elements) antenna and the linear array receiver (with 64 elements) antenna is modeled as follows. Each path linking the transmitter and the receiver is described by the angle of departure (AOD) in the transmitter, angle of arrival(AOA) in the receiver and is scaled by the channel gain (assumed as Rayleigh distributed). Instead of estimating the actual AOD and AOA, the dictionary matrices (A_T and A_R) are constructed. The A_T is constructed for all the possible AOD (0 to 360 with 10 degree resolution) and A_R AOA (0 to 360 degree with 10 degree resolution). The AOD and AOA of the particular path is enabled using the sparse matrix H_b. Thus the millimeter channel matrix is modelled as the product of receiver dictionary matrix A_R, sparse channel matrix H_b and the transmitter dictionary matrix A_T^H i.e.

$$H = A_R H_b A_T$$

The number of columns of the matrix A_R indicates the number of antennas used in the receiver linear structure (64) and the number of rows is 36 (with 10 degree resolution of the angle of arrival). So, the size of the matrix A_R is 36×64. The $(m,n)^{th}$ element of the matrix A_R is given as $e^{(j \times \pi(m-1) sin\theta_n)}$, where $\theta_n = 2 \times \pi(n-1)/36$.

In the same fashion, the number of rows of the matrix A_T indicates the number of antennas used in the transmitter linear structure (32) and the number of columns is 36 (with 10 degree resolution of the angle of departure). So, the size of the matrix A_T is 32×36. The $(p,q)th$ element of the matrix A_R is given as $e^{(j \times \pi(p-1) sin_q)}$, where $\theta_q = 2 \times \pi(q-1)/36$.

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In the image shown, figure(a) indicates the phase of the matrix A_T. Figure(b) indicates the sparse matrix (H_b). In this figure blue colour indicates the element with zero value. The non-zero elements (indicated by dots with different colours) of the matrix H_b indicates the number of active multiple paths considered between the transmitter and the receiver linear antenna setup. Those real and the imaginary part of the non-zero elements are considered as the outcome of the Gaussian distributed random variable. The figure(c) indicates the phase of the matrix A_R. Figure(d)indicates the typical mmwave channel matrix corresponding to single path, two paths and the three paths.

Link to the M File: http://silver.nitt.edu/ esgopi/mfiles/mmwave/

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Workshop on Machine Learning, Deep Learning and Computational Intelligence for Wireless Communication (MDCWC2020)

Researchers are invited to submit their original research findings. Submitted papers are subjected to Double review process and the selected papers will be published as the book series Lecture Notes in Electrical Engineering (Confirmed). ISI Proceedings, EI-Compendex, Scopus, Meta press, Web of science and Springer link. Detailed information on paper submission, accommodation and travel will be posted on the brochure. Papers can be submitted via EasyChair through this link. Paper template is given here.
Important Dates

- Paper Submission: 31 January 2020
- Acceptance notification:1 March 2020
- Camera ready submission and registration: 15 March 2020

Link to the brochure Reference for related works

- Machine Learning Paradigms for Next-Generation Wireless Networks
- Machine Learning for Wireless Communication Channel Modeling: An Overview
- CRAWDAD dataset
- UMass Trace Repository

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Quotes

> *"The dream is not that which you see while sleeping it is something that does not let you sleep.!" — Dr. A.P.J.Abdul Kalam*

On-going Research

- Investigating Regression techniques for solving the sunflower leaf segmentation problem
- Application of machine learning techniques in next generation wireless communication
- Classification of Music composition styles using probabilistic generative model
- Engine health monitoring using Machine learning, Deep learning and Computational intelligence
- Power allocation & Capacity maximization in NOMA using computational intelligence
- Millimeter wave channel estimation using computational Intelligence

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Feedback

COMPSIG NITT invites articles and innovative ideas from readers for the Reader's Space column. We expect feedback and comments to monthly newsletter COMPSIG NITT . Readers can share their views in our facebook page, COMPSIG-NITT. Those who are interested can be a part of the facebook group.

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