COMPSIG NITT

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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Team members

1. Dr. E.S.Gopi, Co-ordinator.
2. G. Jaya Brindha, Ph.D. Scholar.
3. Neema. M, Ph.D. Scholar.
4. Rajasekharreddy Poreddy, Ph.D Scholar.
5. Vineetha Yogesh, M.Tech, Communication systems.
6. Shaik Mahammad, M.Tech, Communication systems.
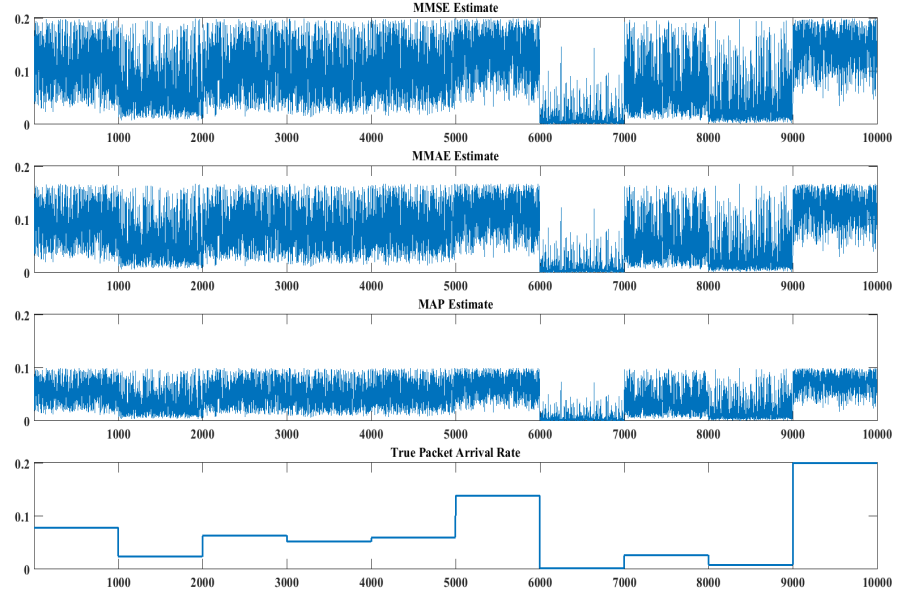
Packet Arrival Rate Estimation

Fig. a

The data transmission is carried out in the form of discrete packets. There is a need for the receiver to estimate the rate at which the packets are arriving. The estimation of the rate at which data is transmitted can be done by using the MMSE(Minimum Mean Square Error), MMAE(Minimum Mean Absolute Error) and MAP(Maximum Aposteriori Probability). Observing the time delay between the successive incoming packets, the packet arrival rate is estimated. For illustration, it is assumed that the inter-packet arrival delay y is the outcome of the random variable Y (exponentially distributed with mean $\frac{1}{\theta}$). The mean packet rate, θ is taken as the outcome of random variable Θ which is also assumed to be exponentially distributed with some arbitrarily fixed mean $\frac{1}{\alpha}$. It is also assumed that the outcome of the random variable Θ is changing once in every 1000 packets. The packet arrival rate is estimated for every outcome of the random variable Y using MMSE, MMAE and MAP estimation techniques. Here the MMSE, MMAE and MAP estimates of Θ are given by

$$\Theta_{MMSE}(y) = \frac{2}{\alpha + y}, \quad \Theta_{MMAE}(y) = \frac{1.68}{\alpha + y}, \quad \Theta_{MAP}(y) = \frac{1}{\alpha + y}$$

In fig. a, the first three subplots illustrates the MMSE, MMAE and MAP estimates of the instantaneous packet arrival rate and the fourth subplot shows the true packet arrival rate changing once in every 1000 packets. If the packet arrival rate estimates are averaged for every 1000 packets, then the change of packet arrival rate is proportional to actual packet arrival rate which can be seen in Fig. b. The first three subplots of Fig. b shows the average of the packet arrival rate estimates (MMSE, MMAE and MAP) for every 1000 packets and fourth subplot shows the true packet arrival rate changing once in every 1000 packets.

Link to the m-file: packet arrival rate estimation

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Average of MMSE Estimate for every 1000 packets

Average of MMAE Estimate for every 1000 packets

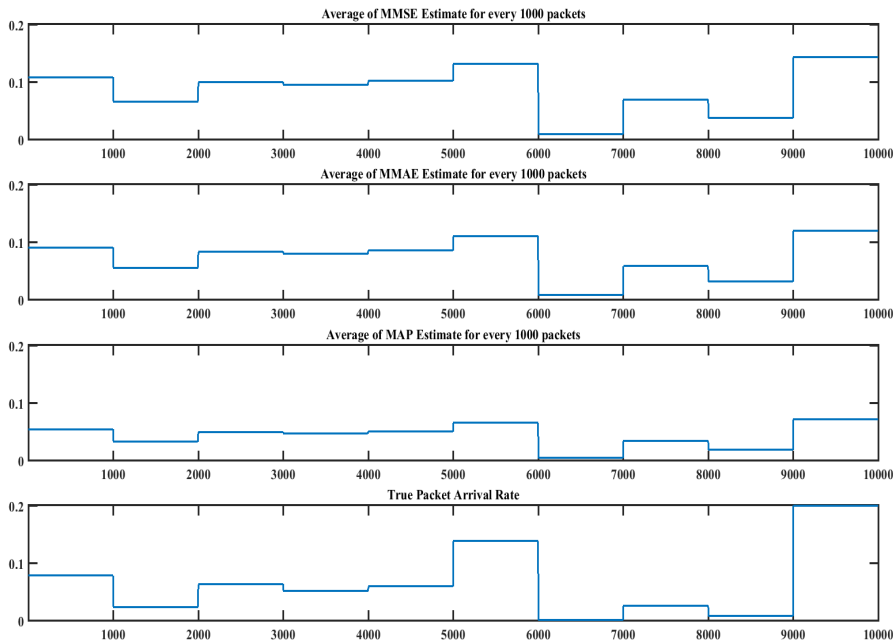Average of MAP Estimate for every 1000 packets

True Packet Arrival Rate

Fig. b

Off Type Identification of Sunflower Plants

Due to the recent advancements in the field of biotechnology that occurred in the past decades, a lot of research have been done for the development of hybrid varieties of different crops and plants. Due to this, the number of varieties of a single crop/plant has increased tremendously. Hence a lot of focus is now being given on identifying whether the plants are of the same type or not. This is known as "Off type identification".

Our PRCI lab is currently working on Off type identification of Sunflower Plants. As a part of it, varietal identification of sunflower seeds has been attempted. In Seed Testing Laboratory (STL), test for Other Distinguishable Variety (ODV) is carried out for the seed sample received from the seed producer after harvesting. This is done to obtain foundation/certified tag from the seed certification department before marketing the product. This is currently done manually by observing the morphological characteristics of the seeds through the naked eye. This is a time consuming process for the STL and there is a chance for human error in identifying ODV.

In this connection a machine vision technique is developed to automate the process of identifying seed variety from the seed images. The proposed technique authored by G. JayaBrindha and Dr. E. S. Gopi is accepted for publication in "**IEEE Transactions on Emerging Topics in Computational Intelligence**" in the upcoming issue.

For further details contact: Mrs. G. JayaBrindha, Ph.D Scholar.
Mail Id: gjbrinda@gmail.com

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Quotes

> *"A big shot is a little shot who keeps on shooting, so keep trying."* —
> Dr. A.P.J.Abdul Kalam

On-going Research

- Constructing a Sunflower plant database and perform off-type identification using morphological features.
- Application of machine learning techniques in next generation wireless communication.
- Classification of Music composition styles using probabilistic generative model
- Computational intelligence for transmit power control policy of Energy Harvesting Sensors
- Estimation of Primary User Parameters in Cognitive Radio 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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Contact Information:
Pattern Recognition and Computational Intelligence Laboratory,
Department of Electronics and Communication Engineering,
National Institute of Technology Trichy - 620015
E-mail:esgopi@nitt.edu