Application Layer Coding for Delay and Feedback-Constrainted Scenarios

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of

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by

Vatsalya Chaubey

Under the guidance of

Dr Siddhartha S Borkotoky

SCHOOL OF ELECTRICAL SCIENCES

INDIAN INSTITUTE OF TECHNOLOGY BHUBANESWAR

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CERTIFICATE

This is to certify that the thesis entitled **Application Layer Coding for Delay and Feedback-Constrainted Scenarios**, submitted by **Vatsalya Chaubey (17EC01044)** to Indian Institute of Technology Bhubaneswar, is a record of bonafide research work under my supervision and the report is submitted for end semester evaluation of the B.Tech project.

Date :

Dr Siddhartha S Borkotoky
Assistant Professor
School of Electrical Sciences
Indian Institute of Technology Bhubaneswar
Bhubaneswar, India

DECLARATION

I certify that

a. the work contained in the thesis is original and has been done by myself under the general supervision of my supervisor.

b. the work has not been submitted to any other institute for any degree or diploma.

c. I have followed the guidelines provided by the institute in writing the thesis.

d. I have conformed to the norms and guidelines given in the ethical code of conduct of the institute.

e. whenever I have used materials (data, theoretical analysis, and text) from other sources, I have given due credit to them by citing them in the text of the thesis and giving their details in the references.

f. whenever I have quoted written materials from other sources, I have put them under quotation marks and given due credit to the sources by citing them and giving required details in the references.

Vatsalya Chaubey

Acknowledgments

Abstract

Application layer in a communication network is an abstraction layer that provides a set of shared protocols and interfaces between various hosts for information transfer. It is the topmost layer in various communication models like TCP/IP and OSI and masks the underlying mechanisms and allow for communication between various applications in different hosts. Application layer codes ensure that the communication between hosts is reliable with minimum number of data packets lost in transmission. In this work we present a application layer coding scheme which utilizes intermittent feedback and can be used for delay and energy constraint applications. Such a scheme could be widely used for control operations in wireless sensor networks where a number of sensors transmit data to a common gateway for analysis and decision making purposes.

Contents

List of Figures

List of Tables

List of Abbreviations

5G	Fifth generation
ABER	Average bit error rate
ADSL	Asymmetric digital subscriber line
AF	Amplify-and-forward
ASER	Average symbol error rate
AWGN	Additive white Gaussian noise
BER	Bit error rate
BFSK	Binary frequency shift keying
BPSK	Binary phase shift keying

List of Symbols

$|\cdot|$ Absolute value

$\binom{k}{l}$ Binomial coefficient

$B(\cdot,\cdot)$ Beta function

$\Phi_2^{(n)}(\cdot)$ Confluent form of the generalized Lauricella series

$_1F_1(\cdot,\cdot;\cdot)$ Confluent hypergeometric function

$F_X(\cdot)$ Cumulative distribution function of random variable X

$\mathbb{E}[\cdot]$ Expectation operator

$\exp(\cdot)$ Exponential

Chapter 1

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Figure 1.1: Figure Caption

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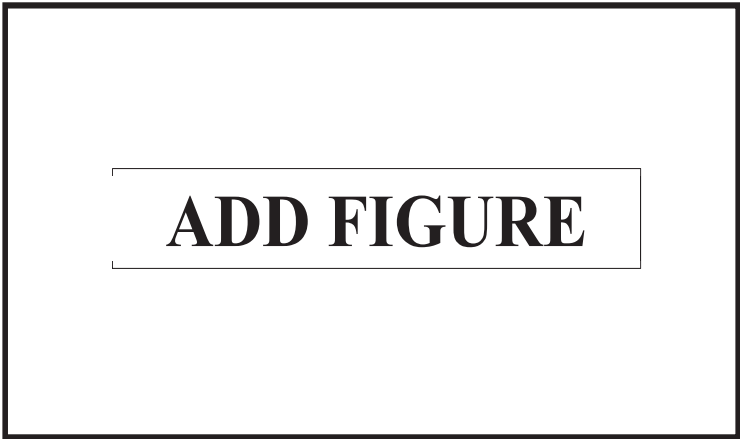
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1.4   Problem Formulation

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Appendix A

Title of Appendix

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$$y = \alpha\, x + n \tag{A.1}$$

Publications

Journal Publications

1.

2.

3.

Conference Publication

1.

2.

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