SPACE DIVERSITY MODEL FOR FIELD MONITORING SYSTEMS DEPLOYED IN AGRICULTURE

Wijerange Sumudu Lakmal Ruwan Kumara

(088377)

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Department of Electronics & Telecommunication Engineering

University of Moratuwa
Sri Lanka

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DECLARATION

"I declare that this is my own work and this thesis does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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ABSTRACT

With the rapid technical development, advance technical concepts are applied to enhance the efficient of agriculture sector. One of the key technical concepts is field monitoring networks. Today wired & wireless networks are mainly deployed on agriculture fields. Different kind of information such as temperature, relative humidity, wind speed, wind direction, soil moisture, CO_2 concentration, illumination, leaf wetness, PH indication of soil, light intensity and rainfall volume has been collected and sent to analyzing central office over this network.

There is huge barrier to increase reliability of this network due to lack of power on these fields. To improve reliability of network, it needs some time complex operations, high end error control coding mechanisms. It will lead uncertainty on node, since node is running with low power. Improve the field monitoring network reliability without exceeding exciting power consumption of sensor nodes. Space diversity model based on multiple data collection points instead of single data collection point has been introduced to proposed network model.

The new algorithms have been introduced under the thesis on data link layer, network layer and application layer. Rest of the things, which are not defined under this thesis, is followed IEEE 802.15.4 specifications.

Different data combining techniques such as selective gain combining, equal gain combining & maximal ratio combining have been analyzed over different fading mechanisms such as Rayleigh, Rician & Gaussian on top MathLab 7.0 environment under different routing strategies on field monitoring network. For each simulation, BER vs. Eb/No has been taken as output and completed the comparison.

Finally it is proofed that, the performance on Eb/No & reliability of field monitoring network can be increased with using this space diversity model based on two data collection points with maximal ratio combining on data collection server. Further, this model can be increased up to **n** number of data collection points depending on requirements.

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W. Sumudu L. R. Kumara
M. Sc in Telecommunication
Department of Electronic & Telecommunication Engineering
University of Moratuwa
Sri Lanka

TABLE OF CONTENTS

LIST OF FIGURES

ABBREVIATIONS

PA	Precision Agriculture
OSI	Open Systems Interconnection
WSN	Wireless Sensor Network
WLAN	Wireless Local Area Networks
CSMA/CA	Carrier Sense Multiple Access with Collision Avoidance
MAC	Media Access Control
FEC	Forward Error Correction
ARQ	Automatic Repeat Request
PEAS	Probing Environment and Adaptive Sleeping
MTE	Minimum Transmission Energy
LEACH	Low-Energy Adaptive Clustering Hierarchy
STCP	Sensor Transmission Control Protocol
PORT	Price-Oriented Reliable Transport Protocol
PSFQ	Pump Slow Fetch Quick
BER	Bit Error Rate
SNR	Signal to Noise Ration
PAN	Personal Area Network
AES	Advanced Encryption Standard
GPS	Global Positioning System
GIS	Geographic Information System
SoC	System-On-Chip
MCU	Main Control Unit
BPSK	Binary Phase Shift Keying
QPSK	Quadrature Phase Shift Keying
TDMA	Time Division Multiple Access
LLR	Log Likelihood Ratio
MLR	Maximum Likelihood Ratio
EGCR	Equal Gain Combining Ratio
AWGN	Adaptive White Gaussian Noise