

ANNEX A – Master Thesis Proposal

1. Student Information

Date and Signature

Family Name: Huang

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2. Master Thesis Information (use as many pages as needed)

Title: 'Hidden Markov Modelling of Digital Wireless Channels'

Description:

A time-discrete digital channel comprises the complete communication chain, which includes the transmitter, the physical transmission channel, and the receiver in the complex baseband. Due to various impairments in the telecommunication process, errors are always encountered in the digital wireless channels, and those errors are not independent but occur in bursts or clusters.

In order to study those telecommunication processes, channel models are introduced. For digital channels, those models are called error models, which aim at describing the statistical properties of the underlying burst error sequences. The error models have wide applications to design and performance evaluation of error-control schemes, as well as high-layer wireless communication protocols. One key issue of error models is to reduce the time of computations when simulating a wireless communication system: by using generated error sequences to replace the previous model. This is absolutely crucial to industry since the product cycle can significantly be reduced and a leading market can be secured.

For this purpose, fast error generation mechanisms (generative models) are necessary to be developed for generating numerous long error sequences which can be stored in the computer for future simulations of the system and higher layer protocols. This project

is devoted to the development of hidden Markov generative models for digital wireless channels.

Aims:

To propose a new hidden Markov generative model having better performance than the existing models in terms of simplicity and accurate burst error statistics.

Tasks:

- 1 To study the previous researches on the HMM in wireless modelling, conclude the methods and features of their works
- 2 To propose a new generative error model based on the previous literature review works
- 3 To execute Matlab simulation on the new model, and to compare this new model with an existing model
- 4 To analyse and evaluate the performance of this new model, and suggest further improvements on this model
- 5 To finish the MSc thesis writing and thesis defending.

Planning:

(Please see the attached Gantt chart)

3. Supervisor Information

Name: Dr. Cheng-Xiang Wang

Department: School of Engineering & Physical Sciences

Institution: Heriot-Watt University

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Date and Signature

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Gantt chart of MSc VIBOT thesis—Ruoheng (Harley) HUANG

Tasks/weeks	18-24 Jan	25-31 Jan	1-7 Feb	8-14 Feb	15-21 Feb	22-28 Feb	1-7 Mar	8-14 Mar	15-21 Mar	22-28 Mar	29 Mar- 4 Apr	5-11 Apr	12-1 8 Apr	19-25 Apr	26 Apr-2 May	3-9 May	10-1 6 May	17-23 May	24-30 May	1 Jun	5 Jun	16 Jun
Learning Introduction knowledge	X	X																				
Learning Hidden markov process			X																			
Learning Hidden markov process in error models (theory studies)				X	X	X	X	X														
Conclude the previous study, and suggest a new generative error model based on previous studies								X	X	X												
MATLAB simulating and analysis on new model compare with existing model										X	X	X	X									
Improvement and conclusions													X	X								
Thesis writing													X	X	X	X	X					
Improvement of thesis																	X	X	X			
Submission of thesis																				X		
Submission of paper and poster																					X	
VIVA																						X
Meetings and feed backs with Dr Wang		O		O		O		O		O		O		O		O		O		O	O	O