Donghoon Ha

Mathematical Science Laboratory, Department of Applied Physics,
Hanyang University (ERICA), Ansan 15588, Republic of Korea
Email: mslab.h@gmail.com, Tel: +82-031-400-4136, Cell phone: +82-10-6472-3624

Research Interests

Quantum State Discrimination (**Main**)
Quantum State Tomography
Quantum Information Nonlocality
Frenkel–Kontorova Dynamics for Nanofriction

Educations

Doctor of Philosophy in Hanyang University Mar. 2012 - Feb. 2020

Major: Applied Physics
Thesis: Analysis of Optimal state discrimination for More than two quantum states
Advisor: Prof. Younghun Kwon

Bachelor of Science in Hanyang University Mar. 2005 - Aug. 2011

Multiple Majors: Applied Physics & Applied Mathematics
Dissertation(Applied Physics): Frenkel-Kontorova dynamics for Single-Chain and Double-Chain in one-dimensional motion [Advisor: Prof. Younghun Kwon]
Dissertation(Applied Mathematics): Lyapunov stability of one-dimensional dynamics with friction [Advisor: Prof. Dai-Gyoung Kim]

Publications

J. Kim, D. Ha, and Y. Kwon, Uniqueness of Minimax Strategy in View of Minimum Error Discrimination of Two Quantum States, Entropy **21**, 671 (2019).

D. Ha and Y. Kwon, A minimal set of measurements for qudit-state tomography based on unambiguous discrimination, Quantum Information Processing **17**, 232 (2018).

D. Ha and Y. Kwon, An optimal discrimination of two mixed qubit states with a fixed rate of inconclusive results, Quantum Information Processing **16**, 273 (2017).

D. Ha and Y. Kwon, Analysis of optimal unambiguous discrimination of three pure quantum states, Physical Review A **91**, 062312 (2015).

D. Ha and Y. Kwon, Discriminating N-qudit states using geometric structure, Physical Review A **90**, 022330 (2014).

D. Ha and Y. Kwon, Complete analysis for three-qubit mixed-state discrimination, Physical Review A **87**, 062302 (2013).

International Conferences

J. Shin, D. Ha, and Y. Kwon, "Optimal Discrimination of Four Qubit States when Postmeasurement information on subsystem is available, Asian Quantum Information Science 2019, Seoul, Korea (Aug 19, 2019).

J. Kim, D. Ha, and Y. Kwon, "Quantum ensembles which is error tolerant in prior probability when minimum error discrimination is performed on two quantum states", Asian Quantum Information Science 2019, Seoul, Korea (Aug 19, 2019).

D. Ha and Y. Kwon, "Nonlocality of unentangled mirror-symmetric states in two-qubit system", Quantum Information Processing 2019, Boulder, USA (Jan 14, 2019).

D. Ha, J. Kim, and Y. Kwon, "Minimum-error discrimination of Partially symmetric three pure states", Asian Quantum Information Science 2018, Nagoya, Japan (Sep 08, 2018).

D. Ha, J. Kim, and Y. Kwon, "Minimum-Error Discrimination of Partially Symmetric Quantum States", Quantum Information Processing 2018, Delft, Netherlands, (Jan 15, 2018).

M. Namkung, D. Ha, and Y. Kwon, "Construction of Sequential state discrimination for three linearly independent pure qutrits", Asian Quantum Information Science 2017, Singapore (Sep 04, 2017).

Y. Kwon, D. Ha, and J. Kim, "An Optimal Discrimination of Two Mixed Qubit States with a Fixed Rate of Inconclusive Results", Quantum Information Processing 2017, Seattle, USA (Jan 14, 2017).

J. Kim, D. Ha, and Y. Kwon, "Variation of guessing probability for three qubit states", Asian Quantum Information Science 2015, Seoul, Korea (Aug 24, 2015).

D. Ha, M. Namkung, and Y. Kwon, "Discriminating N-qudit states using geometric structure", Quantum Information Processing 2015, Sydney, Australia (Jan 12, 2015).

D. Ha, J. Shin, and Y. Kwon, "N qubit-mixed state can be analytically discriminated with minimum-error", Quantum Information Processing 2014, Barcelona, Spain (Feb 03, 2014).

Domestic Conferences

D. Ha, "Minimum-error discrmination of two-qubit states in one-way LOCC", Quantum ICT Tech Symposium 2016, Gwangju, Korea (May 26, 2016) – oral.

J. Kim, D. Ha, and Y. Kwon, "About geometric optimal conditions for minimax problem of minimum error discrimination", The Korean Physical Society: 2016 Spring Meeting, Daejeon, Korea (Apr 20, 2016).

D. Ha, "Analysis to optimal unambiguous discrimination of three pure quantum states", 2014 Quantum Universe Center Workshop on Quantum Information Science, Seoul, Korea (Jul 10, 2014).

Y. Kwon and D. Ha, "Solution for N qubit-mixed state discrmination with minimum-error", The Korean Physical Society: 2014 Spring Meeting, Daejeon, Korea (Apr 23, 2014) – oral.

Y. Kwon, J. Shin, and D. Ha, "Optimal POVM for Noisy QKD", The Korean Physical Society: 2014 Spring Meeting, Daejeon, Korea (Apr 23, 2014).

Y. Kwon, J. Kim, and D. Ha, "About Optimality Condition for N Mixed Quantum State Discrimination with Maximum Confidence", The Korean Physical Society: 2014 Spring Meeting, Daejeon, Korea (Apr 23, 2014).

D. Ha and Y. Kwon, "Complete analysis for three-qubit mixed-state discrmination", The Korean Physical Society: 2013 Fall Meeting, Changwon, Korea (Oct 30, 2013) – oral.

J. Kim, D. Ha, and Y. Kwon, "Simulation of discrimination for three qubit states", The Korean Physical Society: 2013 Fall Meeting, Changwon, Korea (Oct 30, 2013).

J. Shin, D. Ha, M. Namkung, and Y. Kwon, "Discrimination of quantum states used by QKD, in noisy environment", The Korean Physical Society: 2013 Fall Meeting, Changwon, Korea (Oct 30, 2013).

Y. Kwon and D. Ha, "Optimality conditions for minimum-error quantum state discrimination", The Korean Physical Society: 2013 Spring Meeting, Daejeon, Korea (Apr 24, 2013).

Y. Kwon, D. Ha, and J. Chang, "A study on quantum state discrimination of mixed qubit states", The Korean Physical Society: 2012 Fall Meeting, Pyeongchang, Korea (Oct 24, 2012).

Y. Kwon, D. Ha, and J. Chang, "Understanding bipartite quantum state by random states", The Korean Physical Society: 2012 Spring Meeting, Daejeon, Korea (Apr 25, 2012).

D. Ha, D. Park, and Y. Kwon, "Dynamics of underdamped Frenkel-Kontorova model in one-dimensional two layers", The Korean Physical Society: 2010 Spring Meeting, Daejeon, Korea (Apr 21, 2010).

Patents

D. Ha and Y. Kwon, "Discrimination Method for Qubit States", Korea - Patent No. 10-2016473-0000 (Aug 08, 2019).

D. Ha and Y. Kwon, "Apparatus and Method of Managing 3 Qubit-Mixed States", Korea - Patent No. 10-1918793-0000 (Nov 08, 2018).

D. Ha and Y. Kwon, " Apparatus and Method of Managing 4 Qubit-Mixed States", Korea - Patent No. 10-1629554-0000 (Jun 03, 2016).

D. Ha and Y. Kwon, "Apparatus and Method for Generating Quantum Random Number", Korea - Application No. 10-2016-0158609 (Nov 25, 2016).

Skills

Numerical simulation and optimization using MATLAB

Teaching Experience

Teaching Assistant (General Physics - Experiment and Theory)

Part-Time Lecturer (General Physics)