NYU COURANT

Department of Computer Science

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Master's Independent Study Authorization Form

Student Information	
Name: (Last, First) Ashok Kumar, Arahant	**University ID #** N1 3 1 3 5 7 1 2
Independent Study Information	
Term & Year Term: Fall Year: 2020	**Number of Credits:** 3

Brief Description of Independent Study: **Quantum Networks - Quantum Packet design**

Quantum Communication requires transmission of Qubits over a quantum channel/ medium. However, in a holistic Quantum Networks paradigm, mere transmission of Qubits will probably be insufficient. As Qubits hold core quantum information, it cannot be used to transmit other relevant classical information.

In classical networks, any data that is transmitted has a packet associated with it. Similarly, the nature, content and structure of a packet in Q-Networks will be crucial. Irrespective of the type of Entanglement, the type of Qubits, there still needs to be some form of information "attached" to the Qubit when they're transmitted.

Therefore, this "quantum packet" needs to have a classical component. And I believe this will be an important problem to solve. As far as I know, there hasn't been a definitive progress in designing packets for Quantum Networks. I feel this is a very concrete, well defined, and feasible research direction.

My approach will be similar to the datagram structure that is currently in use in classical networks today. I suspect much of the information will remain the same, as there is a classical component to the transmitted Qubit. Every node will be hybrid in nature - classical computer and Quantum computer.

In particular, my focus will be on determining the relevant content from the existing classical packets which can be used as is in a Quantum packet. Next, I will focus on adding classical information about the transmitted Qubit. All of this is classical in nature. Then, I will try to develop a quantum packet that is quantum in nature (if possible).

GitHub link: https://github.com/arahant/Quantum-Networks

SIGNATURES

Student Name: Arahant Ashok Kumar	Signature: Arahant	Date: 8-20-2020
Professor Name: Anirudh Sivaraman	Signature: Anirudh S.K., Aug 20, 2020	Date:
DGS Name:	Signature:	Date:

IMPORTANT GUIDELINES FOR INDEPENDENT STUDY

- Students must arrange to work on independent study projects under the direction of a full-time Department of Computer Science faculty member.
- Students should submit this form, after it is completed and signed off on by the professor, to their advisor, either Betty Tsang in CIWW 326 or James Paguyo in CIWW 324.