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Research Plan

Noisy Byzantine agreement protocol in a small quantum network

Background of the Research

What problem are we solving?

- Byzantine agreement protocol on a quantum network.
- Four-qubit network
- Imperfect hardware (measurement errors) simulated using a noise model
- How does imperfect hardware impact performance (failure probability)?

Why?

- Byzantine agreement protocol in network on **n** parties can only reach consensus in the presence of at most **t** faulty components
- Classical Implementation: **t < n/3**
- Quantum Implementation: **t < n/2**
- Quantum Implementation exists, but performance on “real” hardware has not been examined

Research Question

"How is the failure probability of the quantum Byzantine agreement protocol influenced by measurement errors?"

A

What is the failure probability of the protocol when running on perfect hardware?

B

How do measurement errors affect the outcome?

C

What is the failure probability of the protocol after introducing simulated measurement errors?

D

Is this quantum variant a feasible improvement over the classical implementation?

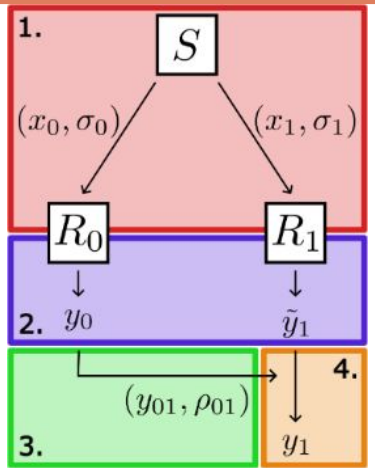
Method

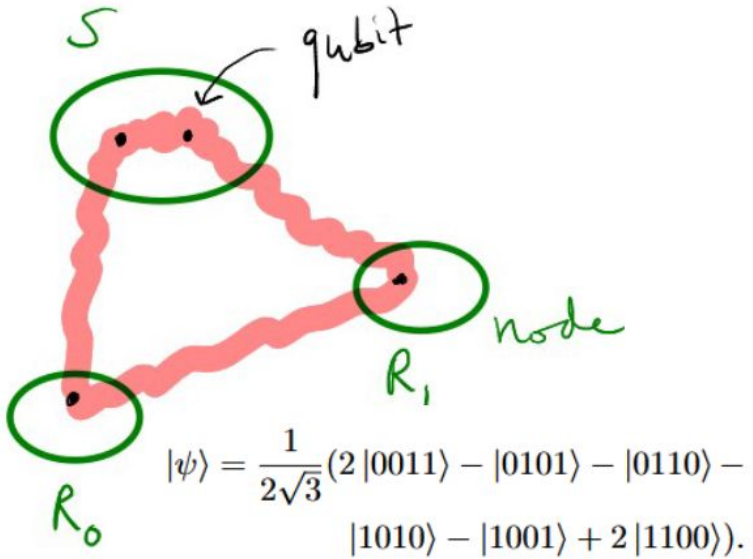
Library

- SquidASM

Collaboration

- Peer group decides on general implementation
- Each student develops the protocol on their own
- Different noise model





Week 1	Week 2	Week 3	Week 4	Week 5
Start reading related papers	Start implementing basic noiseless protocol	ACS Assignment 2: Author Feedback and Midterm poster	Rework poster	Midterm presentation
Follow SquidASM tutorial	Recreate graphs from proposal paper (lower samples)	Improve graphs (DelftBlue?)	Group meeting: Set date for final presentation	ACS Assignment 3: Improve first 300 words and add section
Meeting with supervisor - divide research questions	ACS Assignment 1: First 300 words	Group meeting: Compare code progress	Start working on adding “measurement error” noise	Group meeting: Receive midterm feedback

Week 6	Week 7	Week 8	Week 9	Week 10
Complete protocol implementation including noise model	Paper Draft v1	Implement Paper Draft v1 Feedback	Finalize paper	Finalize poster
Expand paper: Definition and implementation of model	Peer Review Draft v1	Expand data and graphs	Group meeting: Feedback on final state of paper	Final presentation
Group meeting: Assess progress, Decide if expansion of RQ is possible	Group meeting: Receive feedback on Paper Draft v1	Start working on missing paper sections	Submit final paper	
Produce initial failure probability graphs	Start working on Results section	Paper Draft v2		