sdMay23-24 Quantum Computing

Aug 2022 - May 2023
Mid / Late April Report

Team: Quantum Computing

Goal: Create a kilo-qubit scale (KQB) **design** for a quantum computer

Team Members (all present):

- Nicholas Greenwood
- Jacob Frieden
- Emile Albert Kum Chi
- Colin Gorgen
- Arvid Gusatfson
- Sam Degnan

Advisors (all present):

- Gavin Nop (PhD student)
- Dr. Jonathan Smith
- Dr. Durga Paudyal

Agenda:

- Software Side Updates
  - Jacob
  - Arvid
  - Sam
- Hardware Side Updates
  - Nick
  - Emilie
  - Colin
- Any additional updates

Summary

- Weekly meeting summary, **including accomplishments, pending issues, and individual contributions**
  - Software Team
    - Worked on the scheduler to make it more efficient and accurate. Worked on bugs and reunderstanding what needs to be done
    - Serializer works contrary to most scheduling problems
    - Prelim tests for single and multi qubit problem done but still working on movement of ions
    - Arvid shared a serializer demo at the end of the meeting, This presentation was about 10 minutes long and went through an exhaustive list of quantum gates and multiple ions
  - Hardware Team

- - Nick spoke briefly on the final deliverables that he'd been working on: the PPT and poster.
    - The PPT has been fully laid out and most slides that have been used previously will work with either no or minor modifications.
    - The poster will take almost directly from the PPT and will just be comprised of the most important elements of the presentation
    - Emile shared that the cooling happens in the vacuum
    - He also shared that you can build circuity on / beneath the ion trap that may be able to help with the cooling and / or addressal of ions. This is not something we'd heard or thought of before
    - Johnatan pointed out that some of these lasers could be directly above and below the traps while some of the cooling could be in the traditional sideband design that we've been working on for a month
    - Colin talked about his paper. He wrote a rough draft of an abstract on the Iowa State Openleaf. We discussed specific verbiage in the abstract and exact terminology
  - Other updates
    - We delved into discussion about a different team - the Quantum Clusters team. This is a different ECPE Senior Design team that started this Spring. We have been working with Quantum Nodes (smaller scale) and they have been working on the Quantum Clusters (larger scale). We need to meet with them and organize our terminology and centralize our goals.

Name	Contributions	Weekly Hours	Total Hours
Nick	Worked extensively on final deliverables, created design for ancillary larsers	8	96
Emile	Looked more into the organization of the ancillary hardware and the ways that we can address ions	5	90
Colin	First draft of abstract done on Iowa State OpenLeaf	4	87
Sam	Worked at software team meeting on Monday (serializer redesign)	6	90
Jacob	Worked at software team meeting on Monday (serializer redesign)	6	91
Arvid	Worked at software team meeting on Monday (serializer	6	92

	redesign)		

- Please note: We have not been keeping track of weekly or cumulative hours before Early/Mid March. It seems very micro-manag-y and is not how we like to work. The only reason we have this table in here is to appease course requirements. All numbers are estimates.

- List of any decisions made
  - NA, no decisions made
- Next steps for the project / Plans for the coming week(s)
  - Nick will be gone from the meeting next week due to a club trip. Organization continues to be his primary duty and more work will be done on all deliverables, primarily the poster
  - Software team will continue to work on their serializer design and working on getting the ion movement working
  - Emile will continue to look into ways of addressal and ancillary hardware organization
  - Colin will work on primarily the introduction of our paper
  - The entire team will be meeting with the Quantum Cluster team in the next two weeks to coordinate our ontologies and centralize our goals