Mixed Precision Block QR

Week 1 (1/3/22 – 1/10/22)

Kickoff with Amazon

First meeting with Tong Qin of Amazon Lab 126.

Goal: Come up with a mixed-precision block QR decomposition and run it on NividiaGPU.

Stretch Goal: Integrate the CUDA QR into open-source package and test it on real-world structure from motion problems.

Key Milestones

- Working QR using numpy or matlab 01/23
- Working QR using Eigen running on GPU 03/23
- Mixed precision QR using CUDA 04/23
- Performance evaluation 05/23

Team Skills

- Basic knowledge about numerical linear algebra
- CUDA programming
- C++
- Python/MATLAB

Action Items

- Fix Job roles (must include descriptions of roles for UW)

Name	Administrative Role	Technical Role
Jaidon Lybbert	Point of Contact	CUDA C++ Developer
Fulin Li	Finances	Python Developer
Shashank Shivashankar		CUDA C++ Lead Developer
Alice		Python Lead Developer
Yiming Du	Documentation / Submitter	C++ / Python Developer
Mike Pao		Python Developer

- ~~Team manager sets up GitHub repo~~
  - https://github.com/jaidonlybbert/MixedPrecisionBlockQR
- Read the mixed-precision QR paper with the following questions in mind – What is IEEE fp16? – What is QR and how it helps solving least square problems? – How to obtain QR decomposition?
- ~~Set up the CUDA environment.~~
  - Workstation claimed in ECE 159 – not set up yet
  - Shashank & Jaidon set up for CUDA development on Windows + VS IDE
- Clone the mixed-precision QR code to local. Install dependencies and run the test by following the GitHub page.
- Implement a QR code with Python/MATLAB with Householder transformation

Kickoff with UW

Deliverables:

- Sign NDA (Jan 15th)
- ~~Introductions~~
- ~~Team meetup~~
- Team Charter (No due date)
- Project Sketch (Jan 15th)
    - Rough outline: Background, objective, deliverables, milestones, timeline / sequence of tasks, learning goals, industry mentor comments
- Project Plan (Feb 5th)
    - Plan for scope and time dimensions: background, objective, list of well-defined milestones, work breakdown structure, Gantt chart, Requirements, written concept description and sketch, budget, mentor comments
- Design Report (Mar 15th)
- Standards and Ethics (No due date)
- Self Evaluation (end of Spring)
- Final Report (end of Spring)
- Final Poster (middle of Spring)
- Biweekly written reports and meetings with TA
    - Mondays, starting 3rd week of January on Zoom

Meeting Notes:

Winter quarter focuses on project scoping, requirements, and initial prototyping.

Spring focuses on prototyping, testing, and documentation

Roles must be defined (job descriptions)

Must work to a schedule

Give two weeks at end of spring for documentation

1. Please assign one team member to be the Point of Contact (PoC) for all purchasing needs.

2. Please assign one member who communicates on behalf of the team and submits assignments/reports and presentations etc.

3. Please assign one member as the project manager who is responsible for keep track of team's progress and deliverables.

Expected contribution 15-16 hrs/week each student