GPU Programming Retreat

Report and Live Demo

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ITB Meeting
March 2017

“Code Retreat” - Aims

- Work on a problem collaboratively
- Explore new techniques
- Have fun doing it :-)

“Code Retreat” -

Beforehand

- Decide on rough topic (“GPU coding”

Wednesday

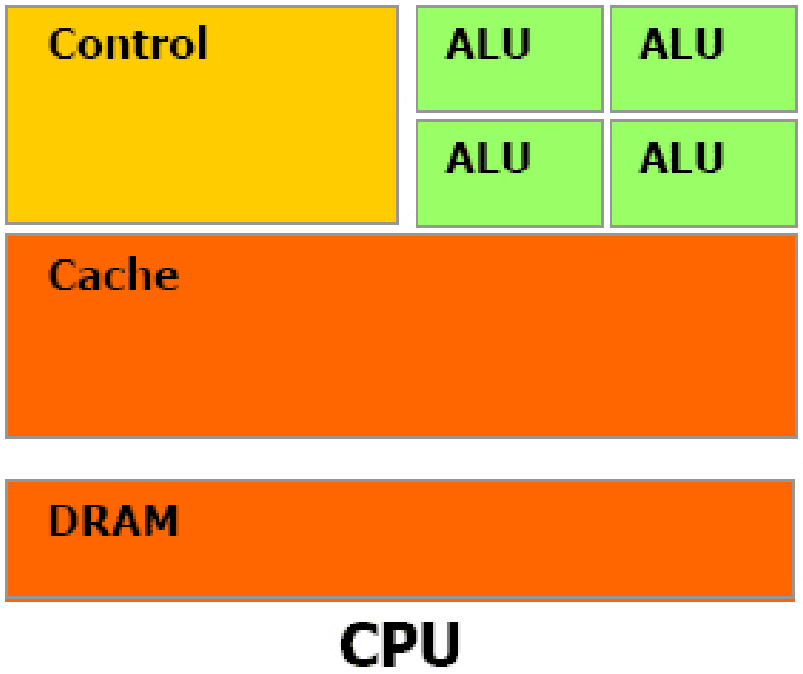
- Travel to house
- Intro presentation from David Higgins
- Discuss concrete plan

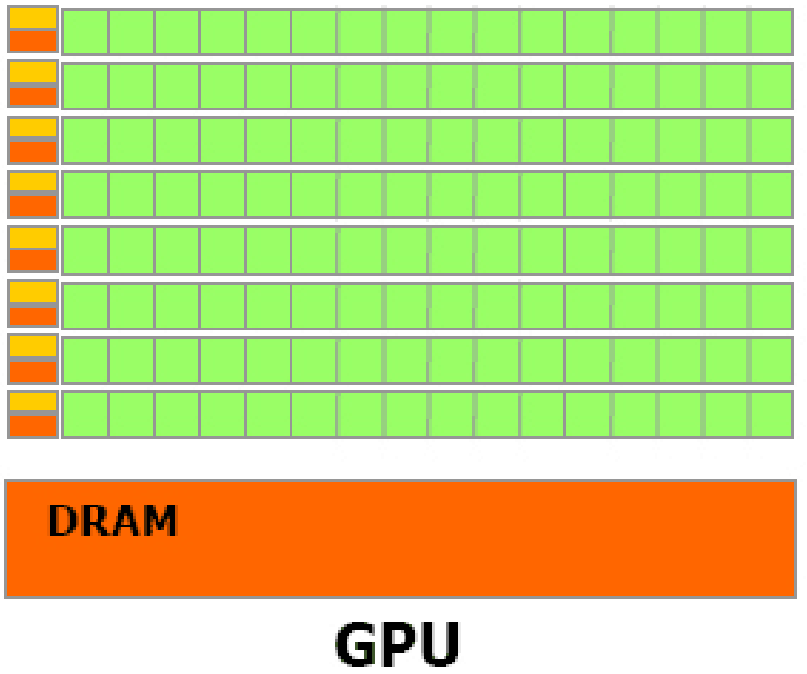
Thursday

- Code in small groups
- Help each other out as needed
- Discuss outcomes after dinner

GPU Programming

- What is it?
  - “Graphics Processing Unit”
  - Highly parallelized architecture
  - Less flexible than CPU





GPU Programming

- Some example uses:
  - Linear Algebra
  - Differential Equations
    - Parallelism in space
  - Nonlinear Fitting
    - Deep Neural Nets
- Not suitable for:
  - Different code on every core
  - Rapid memory access

Approaches

- OpenCL
  - Low-level
  - Cross-Platform
- CUDA
  - Low-level
  - Nvidia Devices only
- Tensorflow/Theano
  - High-level
  - Cross-Platform
  - Used for Neural Network Learning

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Live Demo...

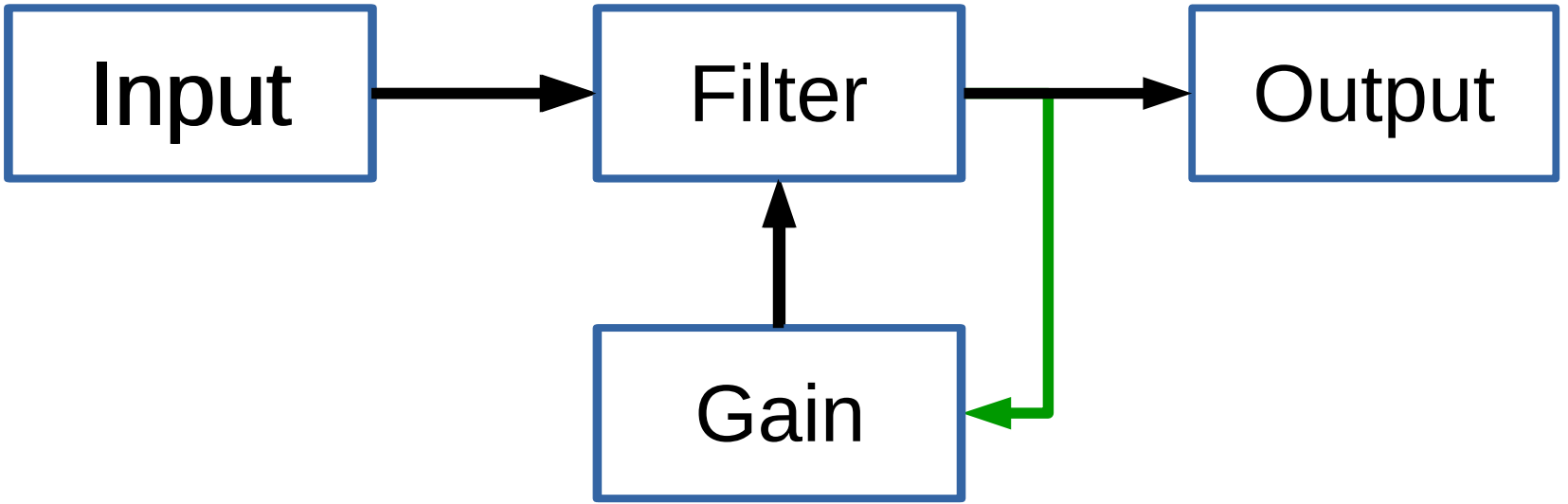
Outlook

Wiener Filter

- Linear filter that minimizes squared error between predicted and recorded system output

Feedback filter idea

- Adaptive filter gain based on output
- Non-linear fit needed



- Future: online stimulation?

Conclusion

- Code Retreat
  - Every group got working code
  - Fun was had

- GPU Programming
  - Can speed up some computations significantly
  - Easy to get started

https://github.com/daveh19/GPU_workshop