

Computer Vision Group Prof. Daniel Cremers

Technische Universität München

GPU Programming in Computer Vision

Preliminary Meeting

Thomas Möllenhoff, Robert Maier, Caner Hazirbas

What you will learn in the practical course

- Introduction to NVIDIA CUDA Framework
- Introduction to Parallel Computing on GPUs
- How to parallelise basic Computer Vision algorithms in CUDA/C++
- Practical project experience
- Team work, presentation skills

Important Dates

- Preliminary Meeting: 29. January 2015 (today)
- Registration for the matching system on TUMOnline: 30. January - 3. February 2015
 - List your preferred practical courses
- Submitting Preferred Students: 4. 9. February 2015 (by course organisers)
- Please specify if you have attended any computer vision or CUDA course before !
- Matching Results: 10. February 2015
- Only assigned students are allowed to attend !!!

Course Organisation

- 4-5 weeks Block Course (7. Sep.- 9. Oct. 2015)
- 1 week lecture and exercise session
- 3 weeks project phase
- Our computer lab will be open for students
- Computers are equipped with very recent GPUs -GTX 750, one for each student.
- Students will work in groups: ideally 8 groups, each has 3 students.
- Every group will be assigned to one advisor.





Course Structure

• First Week

- Theoretical lecture in the morning
- Hands-on programming exercises in the afternoon
- Following 3-4 weeks
 - Project phase, one project to each group
 - Your own ideas,
 - Project Proposals, any related topic to Computer Vision, Image Processing, Machine Learning
- Final presentation of the projects



Evaluation Criteria

- Successful completion of the exercises
- Gained expertise in CUDA/parallel programming
- Quality of your final project
 - Successful completion of the project
 - Projects will be evaluated by the project advisors
 - Your talk

Regular Attendance Is Required

- Attendance at classes/exercises is mandatory
- In case of absence: Medical attest



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Motivation on GPU programming



*http://static1.evermotion.org/files/tutorials_content/lechu/octane/001.png



CPU vs GPU



T. Möllenhoff, R. Maier, C. Hazirbas

1.1

Example: Shape Analysis







Example: Depth from Focus

Reconstruct a depth map from differently focused images





Example: LSD-SLAM on GPU

Porting Large-Scale Direct Monocular SLAM to GPU





https://github.com/tum-vision/lsd_slam



Example: Random Forest on GPU

Implementation of Random Forest Classifier on GPU







*https://github.com/alfonsoros88/ScaRF



Classes

TreeTrainingUtils.cuh

Contains the information referr

This class is designed to actua

Functor to obtain the probabilit

Random Forest Configuration

Decision Tree

Files Class Memb



Recent Works

- Dense Tracking and Mapping in Real-Time
 - <u>https://www.youtube.com/watch?v=Df9WhgibCQA</u>
- Kinect Fusion
 - <u>http://msrvideo.vo.msecnd.net/rmcvideos/</u> <u>152815/152815.mp4</u>



Not Assigned to the course ?

Don't Worry ! Be Happy !

- Exciting IDP Projects
- Guided Research
- Master Thesis





Enjoy the practical course!





