Kun Liu

Summary

I am currently a research associate at UCL. From 2010 to 2013, I was a PhD researcher in ALICE team of INRIA-Nancy Grand-Est, and a student in Institut National Polytechnique de Lorraine. I earned my B.S. in mathematics and M.S. in applied mathematics from Zhejiang University. Please see my LinkedIn profile `https://www.linkedin.com/in/kwunlyou` for more information.

Specialities

3D Reconstruction, Geometry Processing, Big LiDAR/Point Data Processing, Optimization, Numerical Analysis

Experience

2013 - Present **Researcher associate**, *University College London*, United Kingdom.
I am a contributor to the project IQmulus (`http://www.iqmulus.eu/`) funded by European Commission. This project aims to create a high-volume fusion and analysis platform for large geospatial datasets. I am developing and implementing methods to process large LiDAR datasets using the state-of-the-art cluster computing engine Apache Spark.

2010 - 2013 **PhD researcher**, *INRIA-Nancy Grand-Est*, France.
I was involved in the project Physigrafix which combines acquisition techniques, geometry, and mechanics to develop simulation models that accurately reproduces realistic deformation. My work aims to develop specialized methods suitable for processing point data originating from multi-view reconstruction.

Education

2010 - 2013 **PhD candidate**, Computer Science, Institut National Polytechnique de Lorraine.

2008 - 2010 **M.S.**, Applied Mathematics, Zhejiang University.
Excellent Graduation Thesis in Zhejiang University

2004 - 2008 **B.S**, Mathematics, Zhejiang University.
Excellent Graduation Thesis in Zhejiang University
Overall GPA: 3.82/4.0 (87.22/100)
GPA of the last two years: 3.86/4.0 (89.75/100)

Skills & Expertise

Programming	C++, C, Python, Scala
Libraries	Point Cloud Library (PCL), Apache Spark, SuiteSparse
Software	LaTex, Blender, Keynote
Operating Systems	Linux, Mac OS, Windows

Languages

English	Professional working proficiency
Mandarin Chinese	Native

Honors & Awards

2005 Excellent Undergraduate of the year

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2005 Scholarship of State-level Training Base

2007 Scholarship of State-level Training Base

2009 Excellent Graduate Scholarship of the year

Publications

Classification of Big Point Cloud Data using Cloud Computing

Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci., XL-3/W3, 553-557, 2015

Authors: **Kun Liu**, Jan Boehm

Point cloud data plays a significant role in various geospatial applications as it conveys plentiful information which can be used for different types of analysis. Semantic analysis, which is an important one of them, aims to label points as different categories. In machine learning, the problem is called classification. In addition, processing point data is becoming more and more challenging due to the growing data volume. In this paper, we address point data classification in a big data context. The popular cluster computing framework Apache Spark is used through the experiments and the promising results suggests a great potential of Apache Spark for large-scale point data processing.

Sphere Packing Aided Surface Reconstruction for Multi-view Data

10th International Symposium on Visual Computing (ISVC), 2014

Authors: **Kun Liu**, Patricio A. Galindo, Rhaleb Zayer

Surface reconstruction has long been targeted at scan data. With the rise of multi-view acquisition, existing surface reconstruction techniques often turn out to be ill adapted to the highly irregular sampling and multilayered aspect of such data. In this paper, a novel surface reconstruction technique is developed to address these new challenges by means of an advancing front guided by a sphere packing methodology. The method is fairly simple and can efficiently triangulate point clouds into high quality meshes. The substantiated experimental results demonstrate the robustness and the generality of the proposed method.

A New Framework For Interactive Segmentation of Point Clouds

Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci., XL-5, 357-362, 2014

Authors: **Kun Liu**, Jan Boehm

Point cloud segmentation is a fundamental problem in point processing. Segmenting a point cloud fully automatically is very challenging due to the property of point cloud as well as different requirements of distinct users. In this paper, an interactive segmentation method for point clouds is proposed. Only two strokes need to be drawn intuitively to indicate the target object and the background respectively. The draw strokes are sparse and don't necessarily cover the whole object. Given the strokes, a weighted graph is built and the segmentation is formulated as a minimization problem. The problem is solved efficiently by using the Max Flow Min Cut algorithm. In the experiments, the mobile mapping data of a city area is utilized. The resulting segmentations demonstrate the efficiency of the method that can be potentially applied for general point clouds.

Bundle Adjustment Constrained Smoothing For Multi-View Point Cloud Data

8th International Symposium on Visual Computing (ISVC), 2012

Authors: **Kun Liu**, Rhaleb Zayer

Direct use of denoising and mesh reconstruction algorithms on point clouds originating from multi-view images is often oblivious to the reprojection error. This can be a severe limitation in applications which require accurate point tracking, e.g., metrology. In this paper, we propose a method for improving the quality of such data without forfeiting the original matches. We formulate the problem as a robust smoothness cost function constrained by a bounded reprojection error. The arising optimization problem is addressed as a sequence of unconstrained optimization problems by virtue of the barrier method. Substantiated experiments on synthetic and acquired data compare our approach to alternative techniques.

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Paint Mesh Cutting

Computer Graphic Forum (Proceedings of Eurographics 2011)

Authors: Lubin Fan, Ligang Liu, **Kun Liu**

We present a novel progressive painting-based mesh cut out tool, called Paint Mesh Cutting, for interactive mesh segmentation. Different from the previous user interfaces, the user only needs to draw a single stroke on the foreground region and then obtains the desired cutting part at an interactive rate. Moreover, the user progressively paints the region of interest using a brush and has the instant feedback on cutting results as he/she drags the mouse. This is achieved by efficient local graph-cut based optimizations based on the Gaussian mixture models (GMM) on the shape diameter function (SDF) metric of the shape. We demonstrate a number of various examples to illustrate the flexibility and applicability of our system and present a user study that supports the advantages of our user interface.

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