Song Cao

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Current Position

3rd Year PhD Student (Research Assistant), Department of Computer Science, Cornell University

Previous Education

B.E. Computer Software, Tsinghua University, Beijing, China, 2008.

GPA: 92.1/100

Ranking: 2/52

Thesis: Multiple Motion Trajectory-Based Video Retrieval

Research

Interests

Computer Vision

Machine Learning

Publications

(In submission) Song Cao, Noah Snavely: Iterative discriminative learning for large-scale image matching. CVPR 2012.

Yijun Yang, Song Cao, Junhai Yong, Hui Zhang, Jean-Claude Paul, Jiaguang Sun: Approximate computation of curves on B-spline surfaces. Computer-Aided Design, Volume 40, Issue 2, February 2008, Pages 223-234.

Teaching

CS 6670: Computer Vision (PhD-level course), Teaching Assistant, 2011 Spring, Cornell University.

Honors & Awards

Excellent Graduate, Tsinghua University, China, 2008

Tsinghua Academic Excellence Scholarship, 1st Prize(Mitsubishi UFJ Scholarship), 2007

Tsinghua Comprehensive Excellence Scholarship, 2nd Prize (IBM Scholarship), 2007

Tsinghua Comprehensive Excellence Scholarship, 1st Prize (Toyota Scholarship), 2006

Tsinghua Comprehensive Excellence Scholarship, 1st Prize (POSCO Scholarship), 2005

1st Prize of National Physics Competition for College Students, 2005

2nd Prize of Chinese High School Physics Olympiad, 2003

Project Experience

Iterative Discriminative Learning for Large-Scale Image Matching

Many computer vision applications require computing feature correspondences among a large, unstructured collection of images, generally a computationally expensive process. Approximate methods, such as bag-of-words models or global features, are often used to predict similar pairs of images to match, but can be very noisy. In this paper, we propose a new image matching procedure, based on a bag-of-words representation, that uses discriminative learning techniques—applied to training data gathered automatically during the matching process—to gradually discover a better similarity measure for predicting whether two images overlap. By using such a learned similarity measure, our algorithm can select image pairs that are more likely to match for performing further matching and geometric consistency checks, improving overall efficiency in the matching process. Our approach processes a set of images in an iterative manner, alternately performing image matching and learning an improved similarity measure. Our experiments show that our learned similarity measure can consistently improve match prediction over the standard tf-idf weighted similarity measure with around 1000 training examples, and can improve the overall efficiency of the image matching process by more than a factor of two.

Multiple Motion Trajectory-Based Video Retrieval (Undergraduate Thesis)

A video retrieval system is built which extracts motion vectors from MPEG-1 video bit-stream and connects them to form motion trajectories. Then an improved reduction algorithm is proposed and utilized to obtain the most representative trajectories, which are then stored in database. When processing the query, the system uses a coarse-to-fine comparison strategy to reduce time cost. 2 types of query input are processed: Query by Example (QBE) and Query by Sketch (QBS). At last, all the algorithms are implemented and tested, and the result indicates the proposed reduction algorithm indeed excels the existing one and the systemï£is performance is satisfactory.

Real-time Aircraft Scheduling and Path Planning

The efficient scheduling of airport runways is an important part of surface operations planning, with the goal of increasing the throughput of airports. The challenge mainly lies in optimizing different objective functions, while satisfying a variety of real world constraints. We implemented an aircraft scheduling and path planning simulation system utilizing several state-of-the-art algorithms to generate optimized aircraft schedule and path with conflict detection and resolution in real airport situations.

Approximate Computation of Curves on B-spline Surfaces

Curves on surfaces play an important role in Computer Aided Geometric Design. Due to the considerably high degree of exact curves on surfaces, approximation algorithms are preferred in CAD systems. We present an algorithm to approximate the exact curve with a reasonably low degree curve which also lies completely on the B-spline surface. The Hausdorff distance between the approximate curve and the exact curve is controlled under the user-specified distance tolerance.

Leadership Experience

President, Cornell Chinese Tennis Club, July 2010 to June 2011.

Class Leader, September 2007 to July 2008.

President, Tennis Association of Tsinghua University, September 2006 to September 2007.

Captain, Tsinghua Tennis Team, October 2006 to October 2007.

Volunteer Activities

"Information Service" Volunteer, China Open 2007, Sep. 2007

"Campus Guide" Volunteer, Tsinghua University, Oct 2006

Member, Volunteer Association of THSS (School of Software, Tsinghua University), Oct. 2006 to Jul. 2008

Member, Communication and Study Department of THSS Student Union, Oct. 2004 to Jun. 2006

Other Extracurricular Activities

3rd place, Men's Single of Ma Yuehan Tennis Cup, Tsinghua University, Apr. 2008

Half-marathoner in the ANA Beijing International Marathon, Oct. 2005

1st Prize, Teenager Painting and Calligraphy Exhibition, Hubei Province, China, Feb. 1998

2nd Prize, Golden Globe Awards of National Teenager Painting and Calligraphy Contest, China, Jan 1998

"Excellence" in Level 5 in Professional Accordion Proficiency Test, Member of Musician Association of Hubei Province, China, Oct. 1993

Interests & Hobbies

Unix, Python

Tennis, Swimming

Accordion Playing, Traditional Chinese Painting

Last updated: January 13, 2012