

# YANG SONG

## ***PERSONAL INFORMATION***

Ph.D. student

Department of Electrical and Computer Engineering

University of Arizona

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## ***PROFESSIONAL INTERESTS***

- Coarse grained reconfigurable architecture and its applications.
- Video processing and communication. FPGA- and DSP-based video processing.

## ***EDUCATION***

- Jan. 2008 - Present, Ph.D. student, Department of ECE, University of Arizona  
Advisor: Professor Ali Akoglu
- Sept. 2005 - July 2007, M.S., School of Automation, Nanjing University of Science and Technology (NUST)  
Thesis: Optimization of H.264 Encoder and its Implementation on DM642  
Major Advisor: Professor Yaobin Mao
- Sept. 2001 - July 2005, B.S., School of Automation, NUST  
Thesis: Implementation of H.263 Decoder on TI 642 DSP  
Major Advisor: Professor Yaobin Mao

## ***RESEARCH EXPERIENCE***

- *Jan. 2008 - Present, Department of ECE, University of Arizona*
  - Improve an application-specific hybrid coarse grained reconfigurable architecture with an intelligent network on chip (NoC) mechanism, supporting both variable block size and multiple motion vector search algorithms (full, diamond, hexagon, big hexagon and spiral) requirement of H.264 video codec.
  - Apply initial motion vector prediction and early termination techniques to enhance the throughput 80% compared to the initial architecture. Reduce the gate count by 7x compared to its ASIC counterpart which only supports full search method. Operates at a frequency comparable to ASIC based implementation while sustaining 60fps (HDTV) which is not achievable with bit serial and bit parallel architectures. Outperform bit serial and bit parallel

approaches in terms of technology independent gate count, throughput and performance per gate.

- *Sept. 2005 - July 2007, School of Automation, NUST*  
Conduct M.S. research focusing on optimization of H.264/AVC encoder and its implementation on TMS320DM642.
  - Developed a video capture and compression platform. Captured and encoded the video into H.264 bitstream at 15fps (CIF format).
  - Analyzed the architecture and complexity of H.264 encoder and developed low-complexity inter and intra prediction algorithms.
  - Optimized algorithms focused on sample interpolation, DCT and motion estimation on DSP using linear assembly language.
  - Evaluated the performances of different encoders, including H.264 encoder (baseline and main profiles), H.263 encoder, H.261 encoder, MPEG-4 encoder, MPEG-2 encoder and AVS encoder.
  
- *Sept. 2006 - Oct. 2006 Shuofan Intelligent Technology Co., Ltd. Nanjing China*
  - Participated in the development of a video surveillance system based on H.264 encoder using TMS320DM642. Implemented different functionalities for surveillance.
  - Optimized algorithms to enhance video captured from surveillance camera using linear assembly language.
  
- *Dec. 2004 - June 2005, School of Automation, NUST*
  - Implemented the real-time H.263 decoder on TMS320DM642. Decoded QCIF format H.263 bitstream at 25fps.
  - Analyzed and evaluated the performances of different decoders, including H.263, H.261 and MPEG-2.
  
- *Feb. 2004 - May 2004, School of Automation, NUST*
  - Participated in the research of gray image encryption based on spatiotemporal chaos.
  - Implemented algorithms on the gray image encryption with C and Matlab using Couple Map Lattice (CML)

### **TEACHING EXPERIENCE**

- *Jan. 2008 - May 2008 Department of ECE University of Arizona*  
Undergraduate teaching assistant.

- Fundamentals of Computer Architecture (ECE369), Junior, Spring 2008.
- *March 2006 - May 2006 School of Automation NUST*  
Guided and supervised undergraduate students in implementing video codec via internet using UDP protocol.
- *Feb. 2006 - March 2006 School of Automation NUST*  
Taught and supervised undergraduate students in implementing complex algorithms and advanced programming with Visual C++ based on open-source code T264.

### ***SKILLS***

- Detailed knowledge of signal processing, H.264/AVC and MPEG-4 coding standards.
- Strong programming skills in C&C++, Matlab and Simulink, Verilog, assembly languages.
- Strong experience on FPGA and DSP-based hardware programming and implementation.
- Familiar with Linux programming and TCP/IP protocol.
- Strong team work spirits and responsibility. Very quick ability to learn and handle new technologies and tools.
- Creative in thinking. Ability to find the problems quickly and conduct productive research.

### ***HONORS AND AWARDS***

- 2006 Excellent Graduate Student in NUST
- 2005 Acceptance to the graduate school with entrance examinations waived
- 2005 Excellent thesis of bachelor degree
- 2004 Third prize in the 14th Creative Cup Academic Contest in NUST
- 2003 Second Prize in National English Contest
- 2002 Third prize in Provincial Mathematics Contest
- 2001-2005 Won NUST first-class scholarship four times