

# 计算机科学与技术博士后流动站

## COMPUTER SCIENCE AND TECHNOLOGY POSTDOCTORAL FELLOWS PROGRAMME

计算机科学与技术博士后流动站设立于 1994 年 6 月，计算机学院的计算机应用技术是国家重点学科，为西部地区最早的重点学科；计算机科学与技术博士后流动站设有计算机系统结构、计算机应用技术、计算机软件与理论 3 个二级学科。该站拥有语音与图像信息处理陕西省重点实验室，嵌入式系统技术陕西省重点实验室，嵌入式系统集成教育部工程研究中心等，2009 年计算机科学与技术博士后流动站被评为省级优秀博士后科研流动站。

Northwestern Polytechnical University (NPU) set up its Computer Science and Technology (CST) Postdoctoral Fellows Programme (CST-PFP for short) in June 1994. The NPU discipline of Applied Computer Technology, as one of national importance, was the first to be introduced to western China academia. CST-PFP consists of 3 sub-disciplines, i.e. Computer System Architecture, Applied Computer Technology, and Computer Software and Theoretical Computer Science, which are supported by multiple laboratories, e.g. Shaanxi Provincial Key Voice and Image Processing Technology Strategic Laboratory, Shaanxi Embedded System Technology Strategic Laboratory, and Ministry of Education (MOE) Embedded System Technology Engineering Center. CST-PFP captured the honor as an excellent provincial postdoctoral research programme in 2009.

### 一、研究方向及科研成果：

#### I. Research Orientation and Scientific Achievements

##### (一)、嵌入式微处理器与 SoC 设计

##### 1.1. Embedded Microprocessor and SoC Design

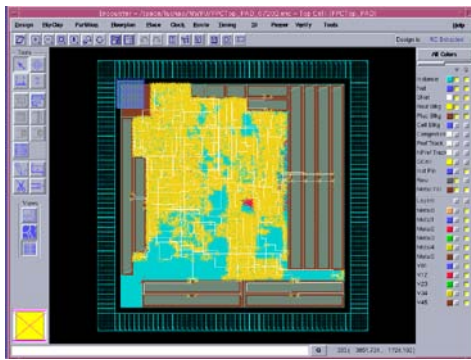
该研究方向在先进体系结构研究方面取得重要进展，突破深亚微米工艺先进嵌入式微处理器设计技术瓶颈，掌握了高压混合信号 SoC 设计技术，建成了国内一流的嵌入式微处理器与混合信号 SoC 设计、测试、集成环境，已建成“嵌入式系统集成技术教育部工程中心”。

CST-PFP has made significant achievements in advanced computer architecture studies. These include deep submicron-level embedded microprocessor design, high voltage mixed-signal SoC design, and top-notch solutions to the design, test and integration of embedded microprocessors and mixed-signal SoCs. CST-PFP prides itself on the MOE Embedded System Technology Engineering Center.

“十一五”期间获得 5 项自然科学基金重点项目和面上项目，在先进计算结

构、可重构控制机制、可变指令集 DSP、微系统仿真模型、多核流处理结构、自适应多核计算结构等方面取得创新成果。在《计算机学报》等学术期刊和高水平国际会议上发表论文 70 余篇。在高等教育出版社、国防工业出版社等出版专著教材 3 部。“九五”、“十五”、“十一五”一直承担总装备部预研项目和国防科工委国防基础研究课题,开展面向航空应用为特色的高性能嵌入式微处理器和专用微系统集成技术研究,自主研发的微处理器可用于多种型号飞行器,并兼容国际先进战斗机采用的高性能微处理器。自主研发的高性能嵌入式微处理器“龙腾 R1”获得教育部科技进步一等奖。混合信号液晶驱动芯片“龙腾 T1”获陕西省科技进步一等奖。

In the 11<sup>th</sup> Five-year Plan period, CST-PFP captured grants from National Natural Science Foundation of China (NNSFC) for 5 significant programmes and generic programmes. Innovative achievements were made in advanced computer architecture, reconfigurable control system, variable-length instruction sets & DSP, microsystem modeling and simulation, multi-core stream processor architecture, self-adaptive multi-core computing architecture, etc. 70+ treatises were made public on academic journals or at high-level international conventions. 3 coursebooks were published through Higher Education Press and National Defense Industry Press. In implementing fundamental programmes of the Commission on Science, Technology, and Industry for National Defense (CSTIND) as well as preliminary programmes of the General Armament Department in the 9<sup>th</sup>, 10<sup>th</sup> and 11<sup>th</sup> Five-year Plan periods, CST-PFP conducted R&D on aeronautic engineering-specific high performance embedded microprocessors and specialized microsystem integration. CST-PFP proprietary microprocessors, which have found applications in a variety of aircraft models, are compatible with high performance microprocessors equipped for international advanced fighter fleets. Longteng R1, a type of proprietary high performance embedded microprocessor, has won a MOE 1<sup>st</sup> prize in scientific progress, while Longteng T1, a type of mixed signal microcontroller with LCD drivers, has won a Shaanxi 1<sup>st</sup> prize in science progress.



## (二)、嵌入式计算与分布计算

### 1.2. Embedded Computing and Distributed Computing

该学科方向通过十一五重点学科建设项目的实施,建设了具有特色的研究与实验平台,形成了结构合理的创新团队,承担自然科学基金、国家 863、国防基础与预研等课题,开展国际学术交流与科研合作,在网络化嵌入式计算模型、基于模型的嵌入式软件设计与验证、普适情景感知计算,传感器网络及应用,分布计算资源虚拟化,自适应分布服务,面向武器装备和工业控制的网络化嵌入式应用系统集成技术研究方面取得显著进展;网络化嵌入式软件平台获得陕西省科技进步一等奖,分布实时计算系统获得 3 项国防科工委科技进步奖。在 IEEE transaction 以及国际学术会议上发表 100 余篇学术论文。以该学科方向为主体,批准建立了“陕西省嵌入式系统技术重点实验室”,与美国、日本、欧洲、新加坡等相关研究机构开展国际学术交流与合作,研究水平处于国内前列。

As an 11<sup>th</sup> Five-year Key Discipline Programme, the embedded computing and distributed computing programme succeeded in erecting a specialized research & experiment platform, forming a reasonably structured innovation team, and taking up many research programmes, e.g. NNSFC-funded key programmes, 863 Program, preliminary research on defense basics, and international academic exchange & technological cooperation. Significant progress were also made in embedded computing networking, model-based embedded software design & validation, context awareness in context-awareness in ubiquitous computing, sensor networks & application, distributed computing resource virtualization, self-adaptive distribution service, and arms-and industrial controls-oriented embedded system integration. The networked embedded software platform won a Shaanxi 1<sup>st</sup> prize in science progress, while the real-time distributed computing system won 3 science progress prizes from the Commission on Science, Technology and Industry for National Defense (CSTIND). CST-PFP published 100+ papers through the IEEE Transactions on

Education (TOE) or at international academic workshops. Besides, CST-PFP has been approved to build the Shaanxi Embedded System Technology Strategic Laboratory, which is an institute in cooperation with its international counterparts from the U.S., Japan, Europe and Singapore. The laboratory ranks among the top-notch labs in China.



感知节点 Sensor node    网关 Gateway    簇头节点 Cluster head    嵌入式感知网络 Embedded sensor network    嵌入式移动通信网络 Embedded mobile communications network    实时信息处理与服务平台 Real-time data processing and service platform    信息处理与网络服务器 Data processing and network server    交换机/路由器 Switch/router    高性能服务器 High-performance server    刀片服务器 & 磁盘阵列 Blade server & disk array    仿真与测试环境 Emulation & test environment    仿真机 Emulator    上位机 Upper computer

### (三)、海量数据的存储、管理与分析

#### 1.3. Storage, Management and Analysis of Mass Data

从 1980 年代初开始从事数据存储与管理等领域的研究工作。曾获国家科技进步二等奖一项；省部级科技进步一等奖一项；省部级科技进步二等奖三项等。发表学术论文 200 余篇。

Beginning from the early 1980s CST-PFP engaged itself in data storage and management. It won a national 2<sup>nd</sup> prize in science progress, a provincial/ministerial 1<sup>st</sup> prize in science progress, and 3 provincial 2<sup>nd</sup> prize in science progress. So far CST-PFP has published 200+ academic papers.

在数据管理技术领域，是国内最早开展工程数据库技术研究的单位之一，研制了多种具有自主知识产权的数据库管理系统并获得了应用。在海量信息存储领域，十余年来一直与世界 500 强企业之一日本 NEC 公司合作研发了多种存储管理相关的大型软件产品。

In data management technology CST-PFP is one of the earliest Chinese institutes

to conduct technological research on engineering databases. It has successfully developed multiple copyright-protected data management systems independently. In mass data storage it has devoted more than a decade to developing a variety of major storage & management software products hand in hand with NEC, which is a Fortune 500 company.

目前，在存储领域承担了国防预研、国家 863 重大项目以及与 NEC 的合作项目等，主要研究方向有：海量存储系统的评测技术、存储管理软件的研究与开发、容灾系统的研究与开发等；在数据管理领域承担了国家自然科学基金委的重大国际合作项目、面上项目、国家 863 项目等，主要研究方向有：RFID 数据管理技术、XML 数据管理技术、数据流挖掘、多生物信息挖掘等数据挖掘术等。本学科方向与国外大学与研究机构建立了实质性的合作关系，如与澳大利亚昆士兰大学在 RFID 数据管理方面，与新加坡国立大学在人才培养方面的合作，与日本 NEC 公司在开发大型数据存储软件方面的合作等。

In data storage CST-PFP is responsible for defense technology preliminary programmes, significant 863 programmes and NEC programmes. In this field the research orientation covers primarily data storage system assessment, data management software R&D, and disaster-tolerance R&D. In data management CST-PFP takes up the responsibility for NNSFC significant international cooperation programmes, general programmes and 863 programmes. In this field the research orientation covers primarily RFID data management, XML data management, data stream mining, bioinformatics mining and similar data mining technologies. In undergraduate programmes CST-PFP has introduced substantial cooperation with foreign universities and academies, e.g. RFID data management with University of Queensland, talent development with National University of Singapore, and VLDB storage software development with NEC.



#### (四)、数字图象处理与虚拟试验

#### 1.4. Digital Image Processing (DIP) and Virtual Experiment

该学科方向通过十一五重点学科建设项目的实施,建设了具有特色的多媒体信息处理研究与实验平台,形成了结构合理的创新团队,同时开展了广泛和深度的国际学术交流与科研合作,成立了国际校际间联合实验室 2 个,提升了该学科方向建设的陕西省语音与图像处理重点实验室的研究能力。目前实验室面积 1000 多平方米,建设有多源多视觉采集和处理系统、专用语音处理采集环境、三维扫描仪和显示器、图像处理并行环境和多种多源图像视频数据库等软硬件研究平台,近年先后承担了国家自然科学基金、国家 863 计划、国防 863 计划、国防预研和国防基础研究等多项国家级课题。在遥感和 SAR 图像处理、军事目标识别、多元图像协同处理、海量图像快速并行处理、听视觉融合信息处理、分布式虚拟现实与测试、泛逻辑和机器智能等方面取得了研究进展,图像快速并行处理和分布式协同综合虚拟试验与测试技术均获国防科技进步奖,研究水平处于国内同行前列。在 IEEE transaction 国际学术会议和国内重要期刊上发表 100 余篇学术论文,2009 年成功举办 2 个国际会议:第五届国际图象图形学术会议、第九届亚洲计算机视觉学术会议,2009 年获陕西省科学技术二等奖一项。

As an 11<sup>th</sup> Five-year Significant Discipline Programme, the discipline has a unique multimedia information processing R&D platform, a reasonably-structured innovation team, and extensive and in-depth international academic exchange & cooperation programmes. There are 2 international laboratories which improves the academic capacity of Shaanxi Voice and Image Processing Technology Strategic Laboratory by linking up school resources. Totalling 1000+ m<sup>2</sup> GFA, the laboratories are equipped with a lot of software and hardware research platforms, e.g. multi-source multi-destination visual data collection & processing, voice data collection & processing environment, 3D scanners & displays, parallel image processing environment, and multiple video and image information database (VIID). In recent years the laboratories have taken up multiple programmes of national importance, e.g. NNSFC programmes, 863 programmes, 863 defense programmes, defense technology preliminary programmes and fundamental defense programmes. CST-PFP has also made achievements in remote sensing & SAR image processing, military target identification, multi-image co-processing, mass image fast parallel processing, distributed virtual reality experiment, and generic logic & machine intelligence. Ranking among the top-notch Chinese high-tech institutes, CST-PFP captured defense technology prizes in image fast parallel processing as well as distributed coordinated virtual experiment & test. CST-PFP has published 100+ papers at international

scholastic workshops and major Chinese journals, convened 2 international workshops in 2009 (i.e. the 5<sup>th</sup> International Conference on Images and Graphics, and the 9<sup>th</sup> Asian Conference on Computer Vision). In 2009, CST-PFP won a 2<sup>nd</sup> prize in science & technology in Shaanxi.



立体视觉实验环境

Stereo-vision experiment laboratory



多视觉采集实验环境

Multi-visual acquisition experiment laboratory

## 二、学术队伍及带头人

### II. Academic Team and Lead Researchers

本站拥有一支学术思想活跃、年龄结构合理、综合素质优良的实力雄厚的学术队伍。现有站内有院士 1 人，博导 23 人，教授 29 人，副教授 29 人，在站博士后 2 人。

CST-PFP is supported by an enthusiastic and powerful academic team of reasonable age structure and fine overall qualities. It comprises 1 CAS/CAE academician, 23 doctoral advisers, 29 professors, 29 associated professors and 2 resident postdoctoral fellows.

博士后是高层次人才培养的“高端”人才，计算机科学与技术博士后流动站建站以来，先后进出站博士后 14 人，接收外校的博士后约占 50%，招收 4 名博士后留校任教，国家资助博士后基金约占 50% 以上。

Postdoctoral fellowship represents the high-end orientation of an upper-level training programme. Since the introduction of CST-PFP, the programme has enrolled or graduated 14 postdoctoral fellows. 50%+ of the enrolled are non-NPU students. CST-PFP has retained 4 postdoctoral fellows on NPU staff. 50%+ of the grants are from national postdoctoral fellowship funds.

## 三、招收计划

### III. Enrollment Programme

每年招收博士后 5 名，对应的学科方向分别是：

Every year 5 postdoctoral fellows are enrolled for the following disciplines:

( 1 ) 网络化嵌入式系统设计与验证 1 名；

3.1. 1 for network embedded system design and validation;

( 2 ) 海量数据的存储、管理与分析 2 名；

3.2. 2 for mass data storage, management and analysis; and

( 3 ) 数字图象处理与虚拟试验 2 名；

3.3. 3 for digital image processing and virtual experiments.