



Embedded System and Structure

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<Embedded System Architecture>

- ④ Graduate Student Course
- ④ 36hrs., 18 for lecture and 18 for hands-on
- ④ Projects development, 3~4 months
- ④ About 200 students each year
- ④ Lecture: Embedded system overview, embedded processor, embedded OS, and Application development
- ④ hand-on: based on Xscale, and Atom
- ④ Prof. Letian Jiang & Prof. Rendong Ying



**Textbook: <Embedded System Principle and Development
—Based on Atom and Meego>**

⊙ Overview

- ⊙ Embedded system history, features, hardware and software architecture, debug, and design models

⊙ Processors

- ⊙ Briefly introduce MCU, MPU, and DSP
- ⊙ Mainly focus on MPU, especially on Atom processors.

⊙ Operating System

- ⊙ Wince and Linux
- ⊙ Topics on driver development, OS customization, and etc. will covered



- ④ **Application development**
- ④ **Software Optimization**
 - ④ **Software Optimization method**
 - ④ **Optimization tools, like Vtune,**
- ④ **Low Power design of embedded system**
 - ④ **Hardware schemes, software intelligent management**
 - ④ **some methods, tips and tools**



⊗ Basic experiments

- Let the students to best know the principle of the embedded system and its structure

⊗ Project development

- Encourage the students to develop a working system based on their self-selected problem with about 3 months



3.1 Basic Experiments

- ④ **NFS file system**
- ④ **HTTP server transplanting and configuration**
- ④ **R-GDB remote debugging**
- ④ **MiniGUI and Helloworld**
- ④ **Mplayer on embedded**
- ④ **QT/embedded**
- ④ **LWIP**
- ④ **VLC**



3.1 Basic Experiments

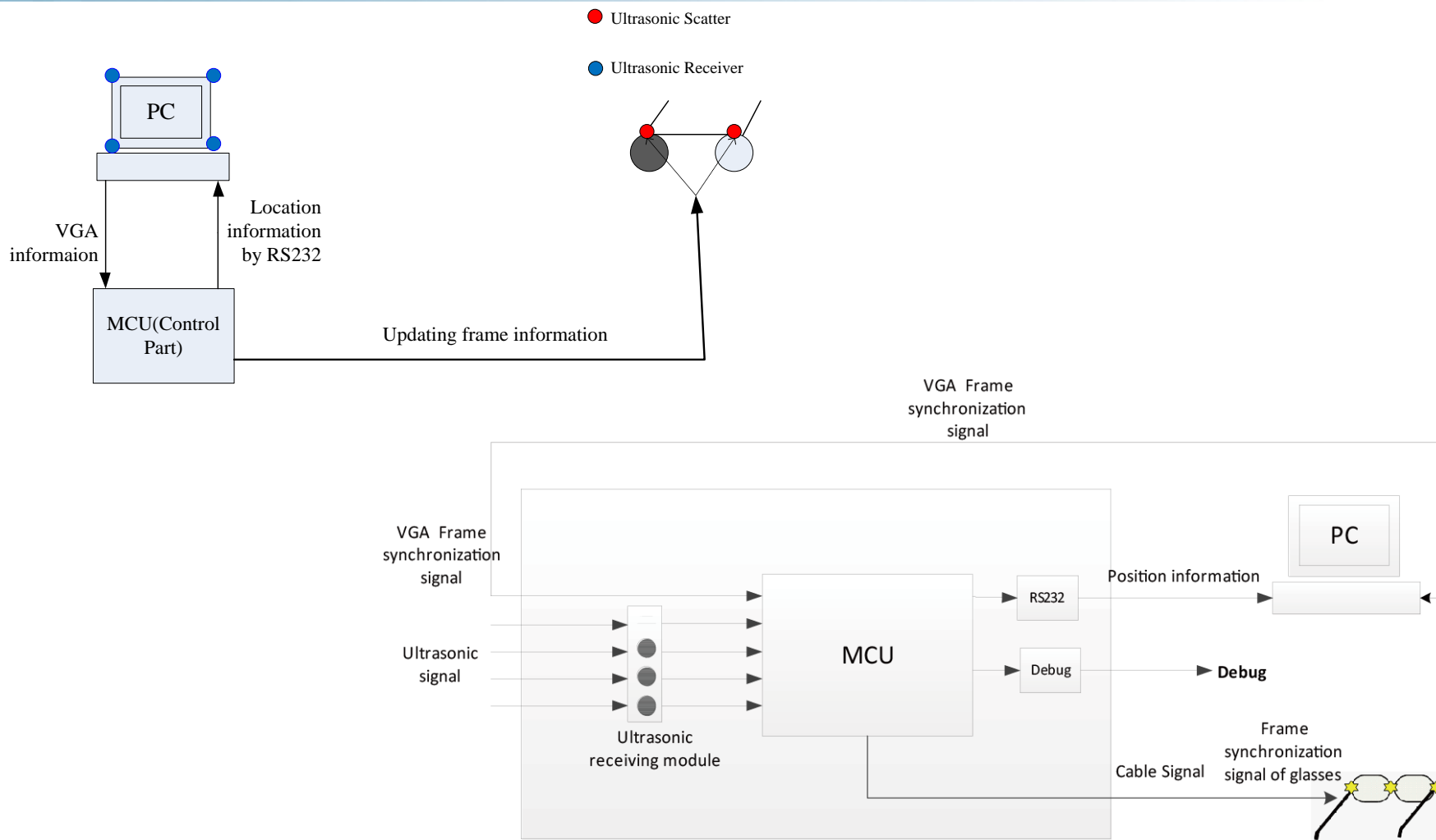
- ④ **Android**
- ④ **OpenCV**
- ④ **FAT32 filesystem**
- ④ **SSE and IPP optimization**
- ④ **USB driver**
- ④ **Multi mouse and multi keyboard on embedded system**
- ④ **QEMU**





3.2 Project development

Enhanced 3D Stereo Support with Motion Detection



3.2 Project development

Mobile 3D Rendering Video Conference System based on ATOM Platforms

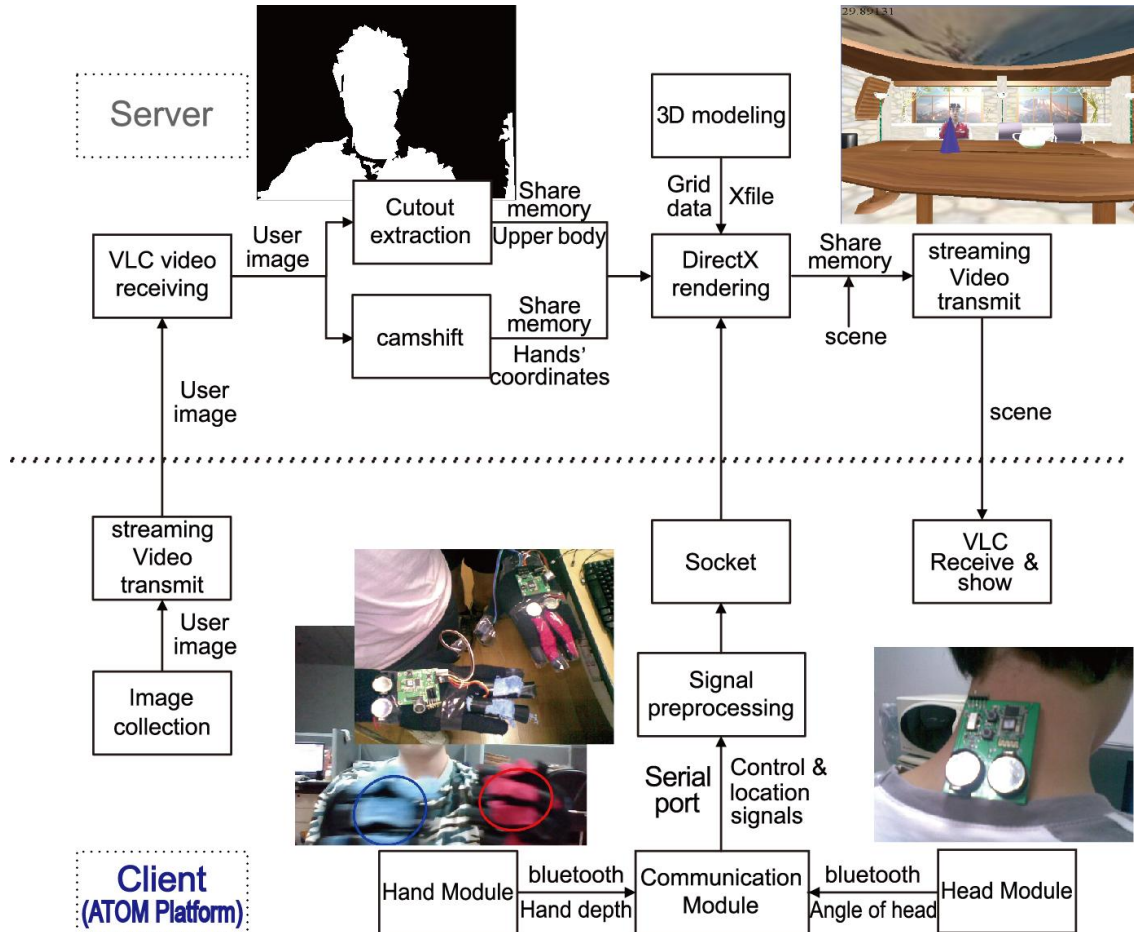


Fig. 1. System Architecture

Multi-directional panoramic image processing system

- Goal: show the environment around in a bird-eye view image.
- → Image capture
- → Bird-eye transformation
- → Image matching (SURF)
- → Image mosaic
- → Image fusion
- → Display



Audio Based Human-Computer Interaction Techniques

- This is an audio locating system that accepts knocking or sliding sound and analyses the sound to find where the sound comes from.
- Input: sound
- Data collection: microphone array, DAQ card
- Analysis: computer (using Matlab and NI DAQ driver .net version)
- Output: the location of the sound
- Application: e.g. pointing and interaction game



4. Why this course?

1) Difficulties in Embedded system course

- ④ It need a lot of related knowledge, including hardware, software, Operating system, and so on; (涵盖内容丰富，给教师课程内容的设置带来很大的困难)
- ④ The related technologies will be updated frequently; (技术发展迅速给教师课程内容的更新和实验环境的更新带来很大的挑战)
- ④ The number of the platform is limited. (学生进行实践的机会变得比较有限)



4. Why this course?

2) Characteristics of our Embedded system course

- ④ **The course will cover processors, operating systems, application, optimization, and so on. The students can learn a lot of knowledge about embedded system.**
- ④ **Will not involve detailed information, and emphasize that the students should understand the embedded system from the view of the whole system.**
- ④ **Most importantly, we will set up two kinds of hands-on, basic experiments and project development. Especially for the project development, it provides the students an great opportunity.**
- ④ **With the great support from Intel, we can update the teaching materials and experiments according to the latest platform.**

5. Resources

⊗ Textbook

- <Embedded system principle and development—based on Atom and Linux>
- Published by Publishing House of Electronics Industry

⊗ PPT & Hands-on resources

- Contact with us to get some of these materials by email: ltjiang@sjtu.edu.cn



Thanks!

