

Study and Design of Home Intelligent System Based on Embedded Internet

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ABSTRACT

- *AT91SAM9260* as the host controller.
- Home Intelligent System which has several merits such as credible, flexible, easy maintenance, low cost and so on.
- Java language to develop Embedded Web Server, provide a friendly interface for users.



Outline

- Introduction
- Principle and scheme of Home Intelligent System
- Hardware implementation of Home Intelligent System
- Software design of Home Intelligent System
- Realization of Embedded Web Server
- Test and application of system
- Conclusion
- References




Introduction

- 1.1 Background
 - It has brought tremendous changes to the structure of automation system with the rapid development of each fields.
 - It makes people to set a higher request to security, comfort and efficiency of domestic environment.



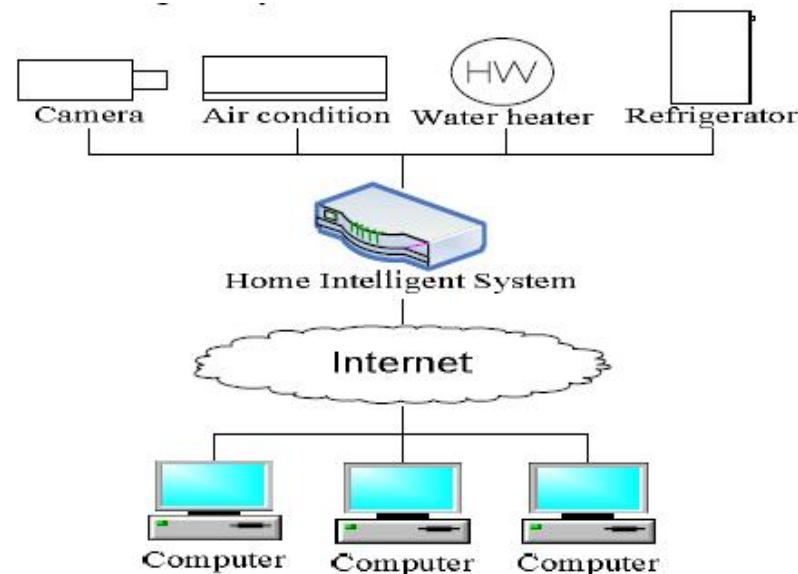
□ 1.2 Relevant researches

- The Asia's International Exhibition for household appliances and consumer electronics has been held in Singapore on May 1998.
- Samsung has put forward Smart Home System in China and in Korea from 2003.
- Bill Gates created E-Home technical system for Microsoft in Munich, Germany on January 2005.
- Haier Corporation put forward U-HOME system on July 2006.

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- Home Intelligent System with many merits such as good generality, security and stability, low cost and so on.
 - Users can browse the home page of this System in different regions through Internet Explorer.
 - control the household appliances
 - inquire about the operational status of household appliances
 - monitor the security situation at home in real-time

Principle and scheme of Home Intelligent System

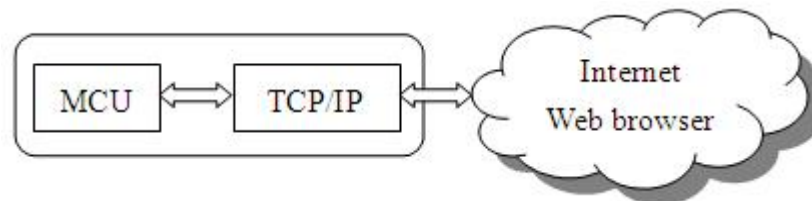
- 2.1 Working principle of system
 - The Home Intelligent System used *AT91SAM9260* as the host controller, and realized the interconnection with Internet through Embedded Internet technology.



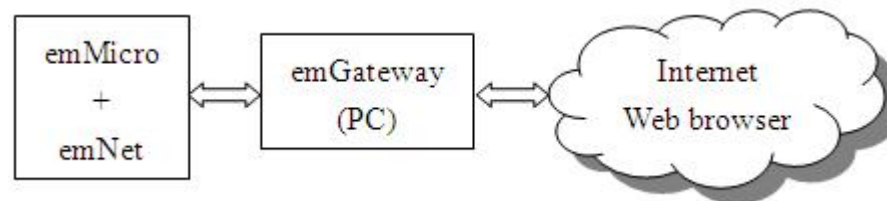
□ 2.2 Design scheme of system

■ Three schemes to realize Embedded Internet

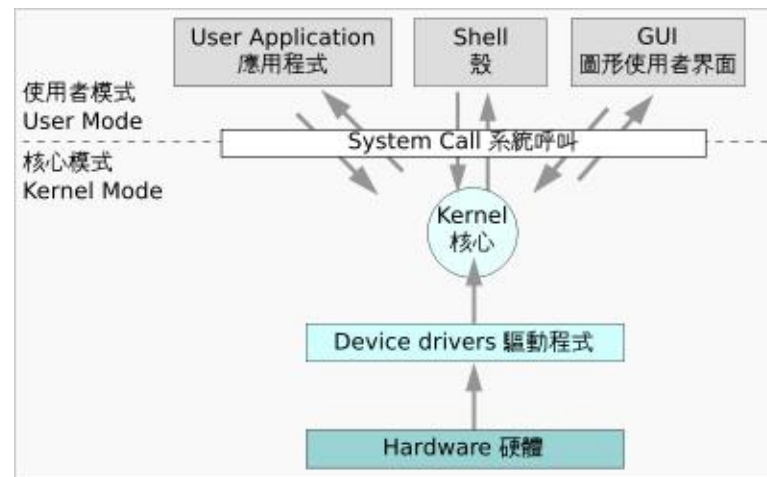
1. Using a special chip of TCP/IP protocol as the core of application system.



2. Using the EMIT (Embedded Micro Internetworking Technology) of emWare company.



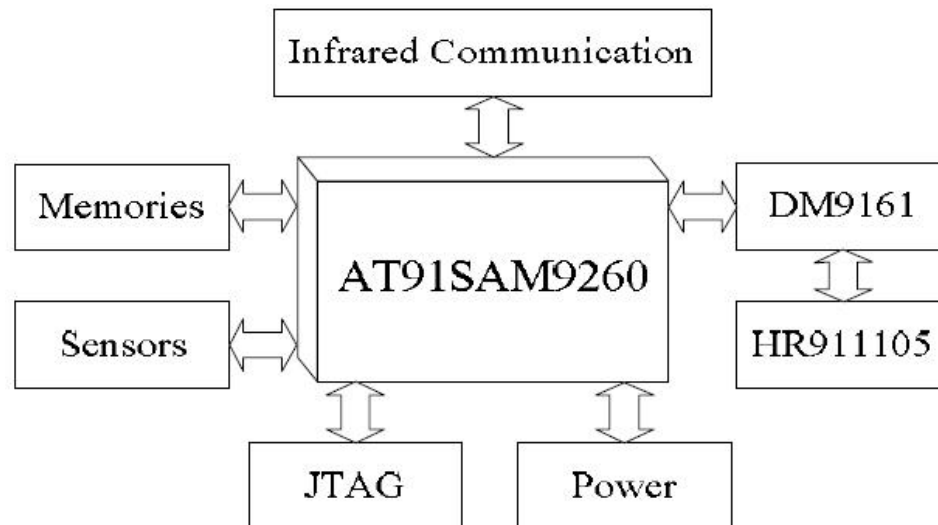
3. To use Embedded Operating System.



- Considered the developing cost of this system, and the resources of *AT91SAM9260* is sufficient.
- To use the third scheme to realize Embedded Internet.

Hardware implementation of Home Intelligent System

- *AT91SAM9260* as the main controller(32 bit micro-controller with *ARM9EJ-S* kernel).
 - abundant system resources
 - support Java language
 - 10/100M Base T Ethernet MAC

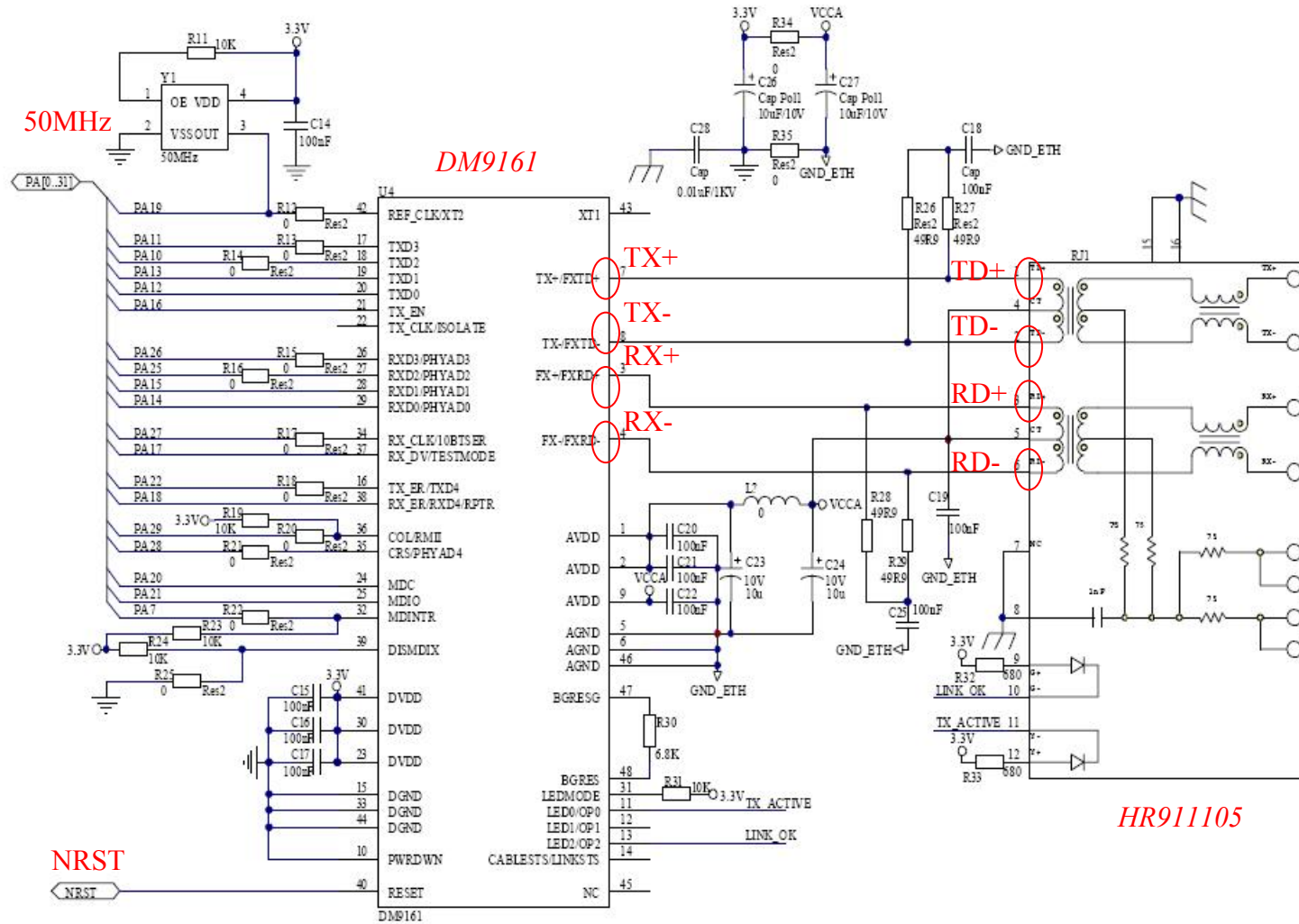


□ 3.1 Design of Interface circuit

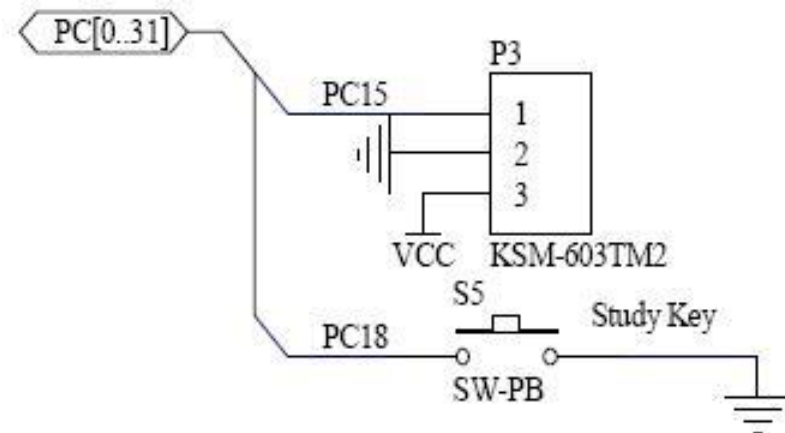
➤ Internet interface is composed of MAC controller and physical interface.

□ physical interface :

<i>DM9161</i>	<ul style="list-style-type: none">→ low power loss and high performance→ Ethernet transmission of 10/100M→ coding, decoding, input data and output data
<i>HR911105</i>	<ul style="list-style-type: none">→ Network insulate transformer <i>HR911105</i> has integrated the <i>RJ45</i> joint.

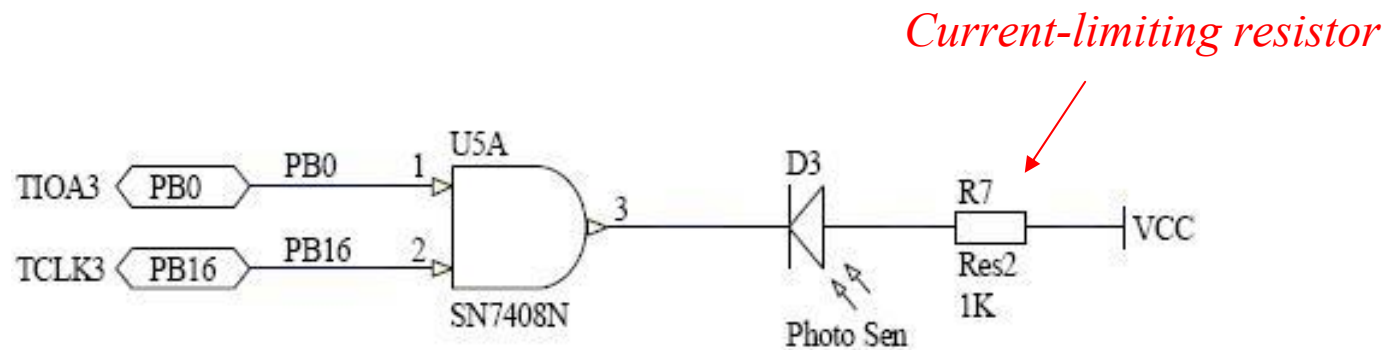



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- 3.2 Design of Infrared communication circuit
 - Infrared receiving circuit
 - the first pin is connected with PC15 of 9260
 - demodulate the 38 KHz infrared pulse signal
 - use a study key to control *KSM-603TM2* to work



■ infrared emission circuit

- output the carrier signal from PB16
- operation with the binary pulse signal (from PB0)
- infrared remote-control signal can be emitted through the infrared light emitting diode

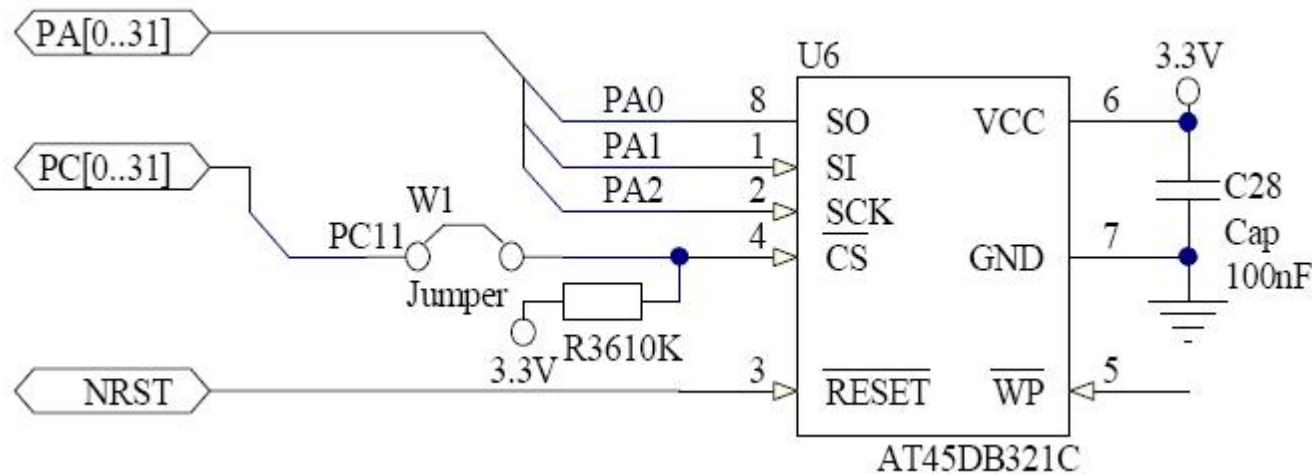




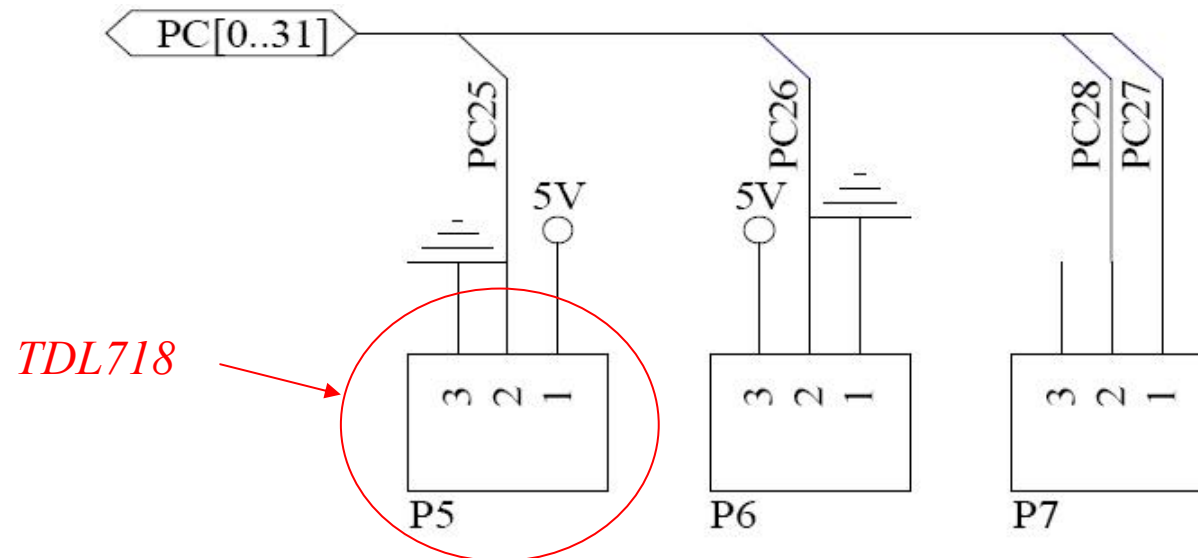
□ 3.3 Design of memory circuit

- 32 Mega serial interface programmable memory *AT45DB321C* as the memory of system.
- Flash memory with single power source supply.
- It can communicate with the host controller via SPI bus.
- The highest serial clock rate of *AT45DB321C* can reach 22 Mega.

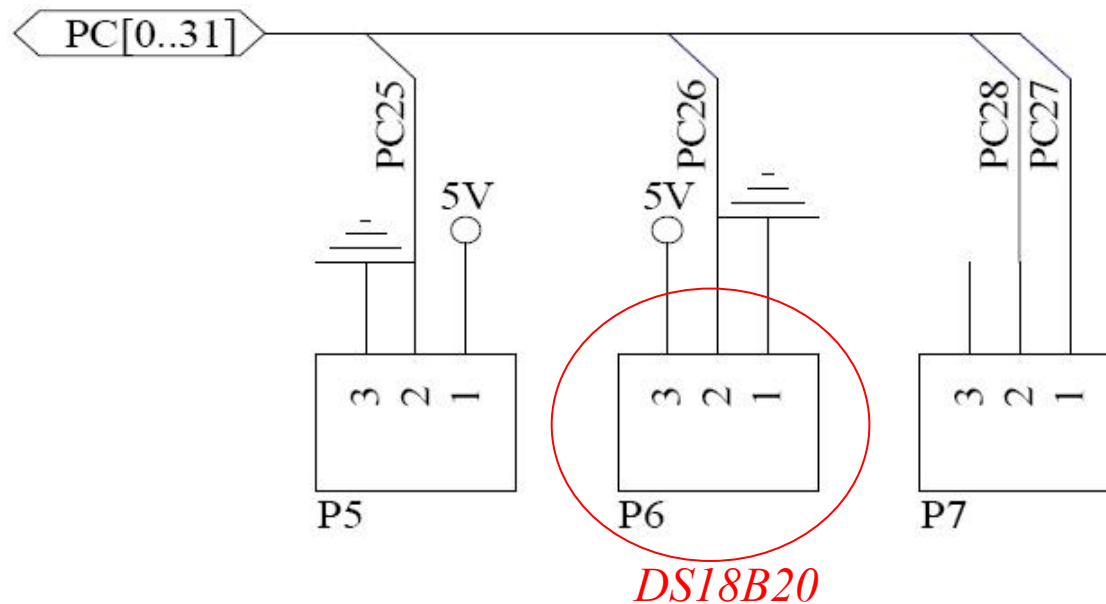
- SO is a serial-output pin (PA0)
- SI is a serial-input pin (PA1)
- SCK is a serial clock pin (PA2)
- /CS is used for the selection of chip (PC11)



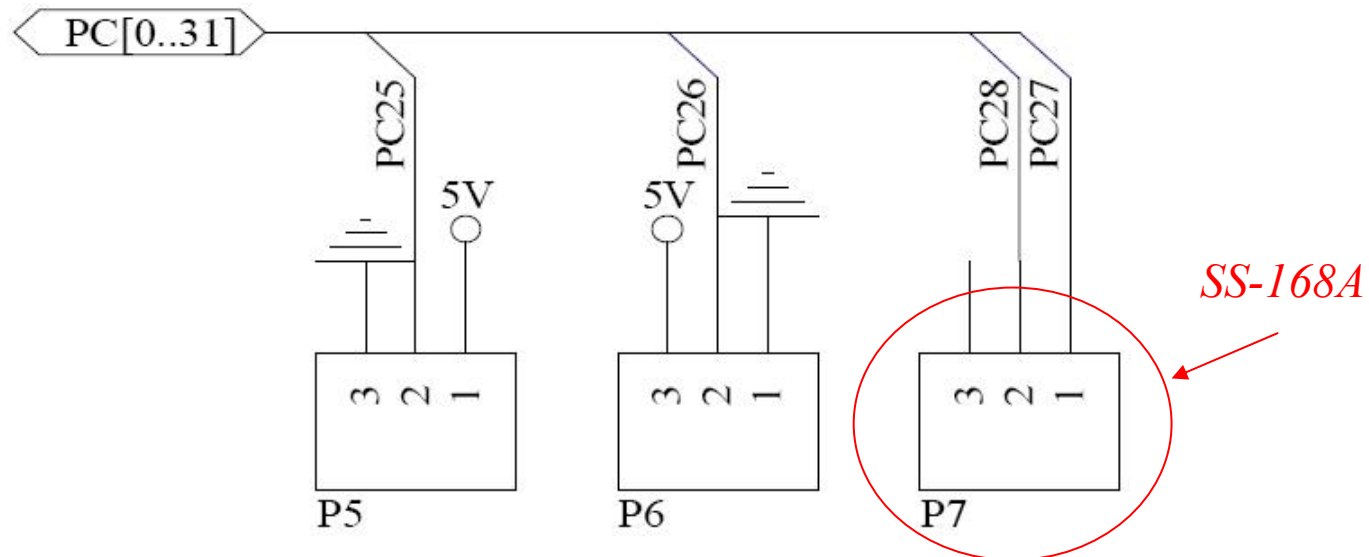
- Human body induction module
- *TDL718* which is a human body induction module based on Infrared Technology.



- Temperature Sensor
 - *DS18B20* as the temperature sensor.
 - Send temperature (turn it into digital signal) to the PC26 pin of 9260 through DQ pin.



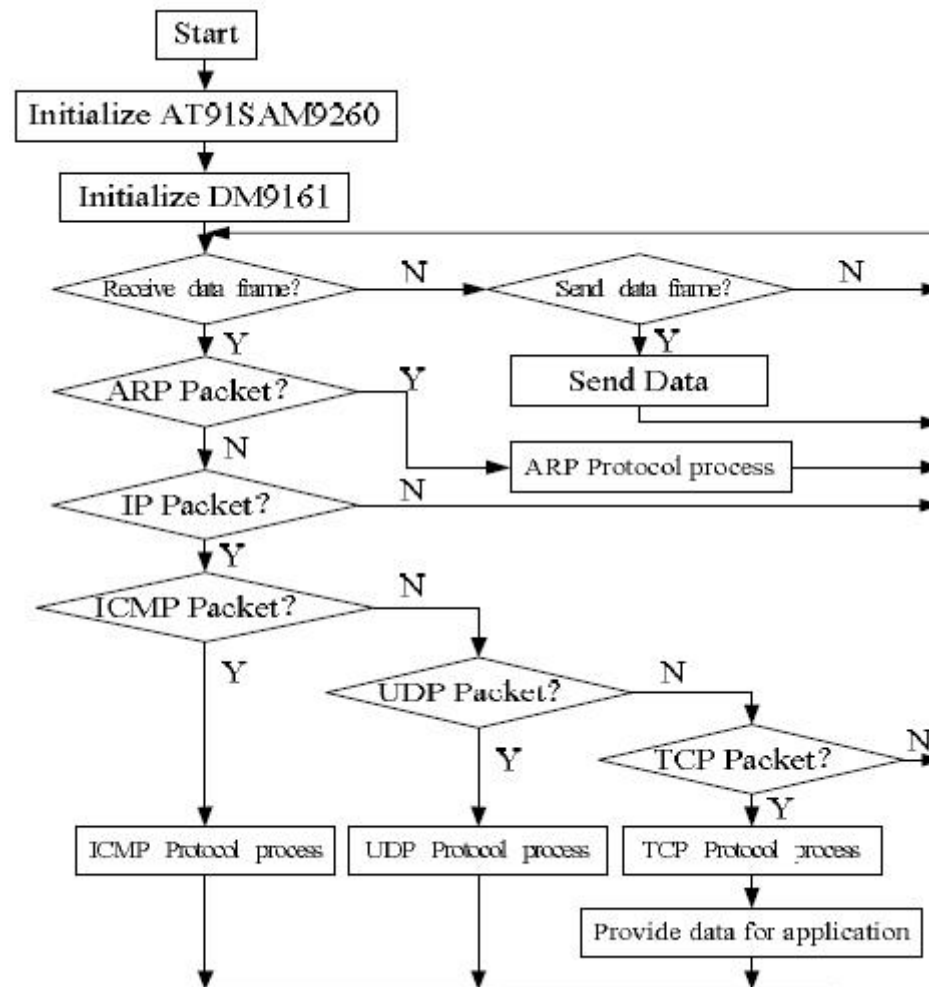
- Smoke sensor
- *SS-168A* as the smoke sensor in this system.
- Outputs signals to the host controller from the two dry contacts.





Software design of Home Intelligent System

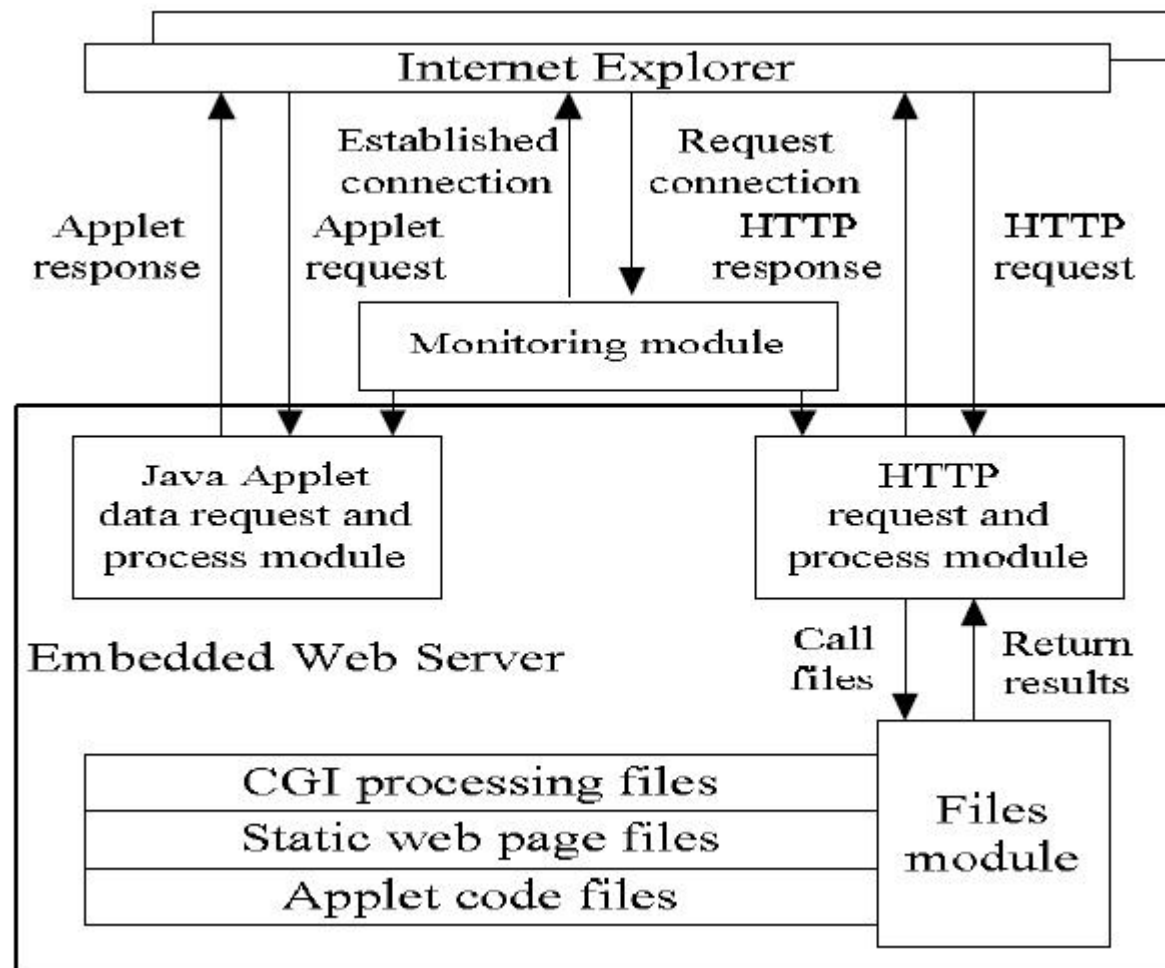
- In the whole software system, there are two key parts:
 1. the initialization of system hardware
 2. gather data and control bottom hardware, then realize TCP/IP protocol stack
- The processing speed of this system is slowly, and the capacity of memory is small.
- Chose ARP, IP, ICMP, UDP and TCP protocol to constitute Embedded TCP/IP protocol stack.





Realization of Embedded Web Server

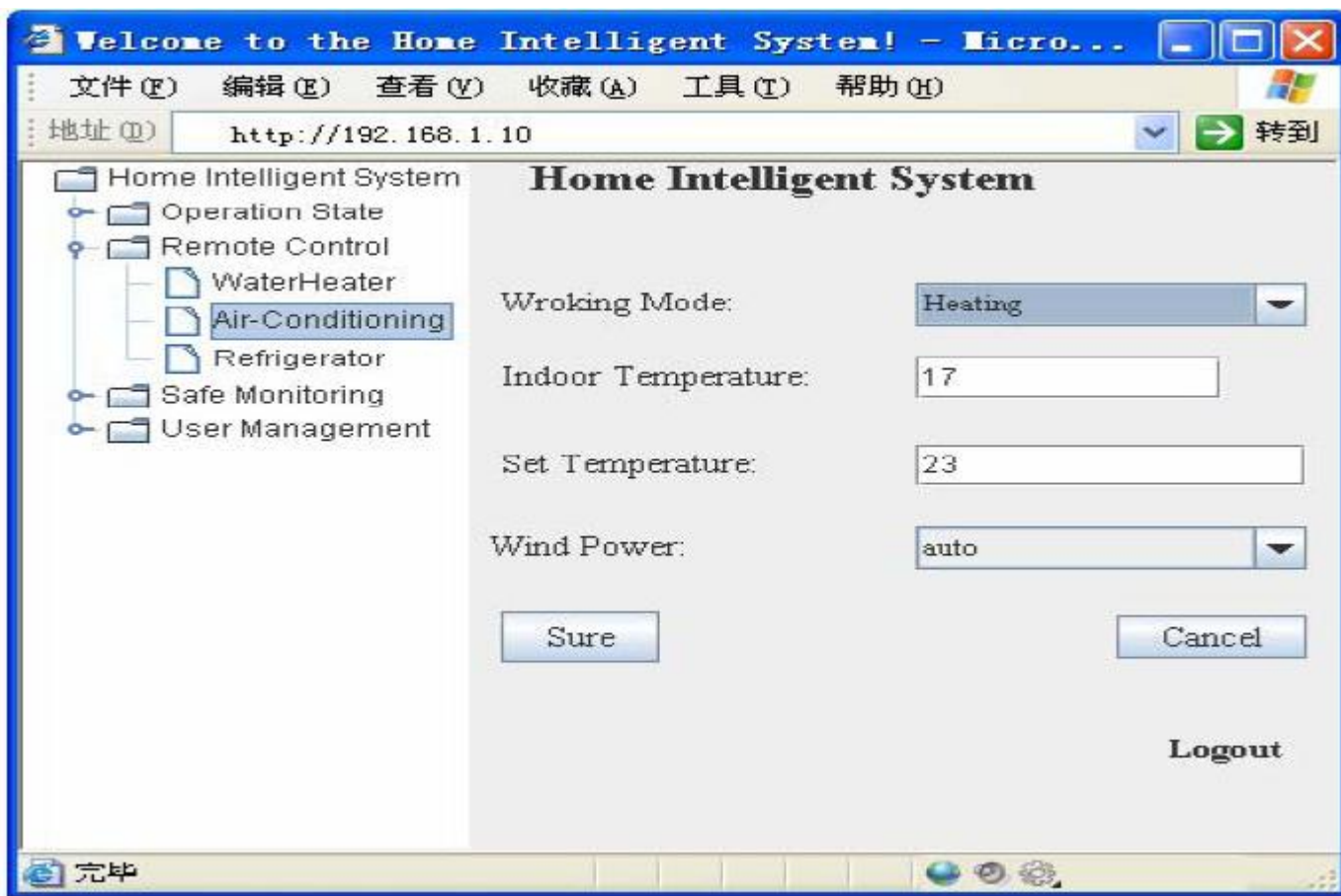
- Embedded Web Server has unified interface and communication protocol.
- It can provide unified operation mode and control interface based on Internet Explorer.





Test and application of system

- Take a comprehensive test
 1. communication interface
 2. data transmission
 3. the performance





Conclusion

- Modern Smart Home
 - is combined with Internet gradually
 - security
 - convenience
 - efficiency
 - intelligence
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References

- Xiang Yang, Yuanyi Zhang and Rongyang Zhao, “Study and Design of Home Intelligent System Based on Embedded Internet”, *International Conference on Embedded Software and Systems Symposia (ICESS)*, p 344-349, 2008.
- http://en.wikipedia.org/wiki/Main_Page



THANKS