

# Implementation of PNP on the Control Board using Hardware/Software Co-design

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**Abstract :** This paper proposes a control board that includes PNP function with extensibility and effective allocation of allocation. The object of study is to overcome limited extensity of old systems and it is to reuse the system.

The system recognizes automatic subsystem from application of main system with board level that is using hardware and software co-design method. The system has both function of main-board and sub-board. So one system can operate simultaneously such as module of alien system. This system has advantages that are fast execution, according as process functional partition to hardware/ software co-design and board size is reduced as well as offer extensity of development system.

We obtained good result with control board for existent Z-80 training kit.

## 1. Introduction

This paper is research about co-design's system level and the experiment. The co-design's strong point can be shorten size of circuit board and reduce expense of design and minimization of power consumption. Also, The point of the system design using with Co-design method is special method of design that has high effectiveness of Hardware and low cost of software. Usually, Hardware system is as high effectiveness as high cost, but software system has a low cost and low effectiveness. Software is run under hardware environment that performance is given, and it has incorrect operation and a logical error.

However, a software system has low cost because design and implementation is simple. A hardware system has high effectiveness because proffer the correct response and secure of correct behavior. Hardware and software integration design is skill that plans complicated system of high efficiency described at high position step to have performance of most suitable through suitable partition. Put categoricalness of systems design that this paper takes advantage of this integration design method, and consider performance elevation and minimization of design expense etc. and progressed research. Do so that can offer maximum extensity by implementation of

module unit system for extension to cope problem about old system as well as. Also, manufactured module system made to have signal of only external devices and defined the signal to recognize each unit system automatically.

## 2. Classification of Co-design

This paper shows general progress to the actual implementation with research about integration design. This paper is to be classified into three methods to co-design. First is implement method that divide smallest unit such as TTL and software part in hardware itself, the chip level as purity hardware situation. Second divides hardware, layout, simulation that implement coming software in system level. First case correct division.

However, it is truth that can see as well as part of system, kind of hardware. Therefore, it need correct specification. To application program that this utilizes PC's Windows driver for drive. It is usually by method last third embodies system and user interface everything program change and run control baud that is designed. Above three methods have all equal workflows.

The existent integration design method is applied according to that. So that can do and communicate to design first designer's ideas by system specifications, divide second design rearing to hardware and software, share data between hardware and software finally and integration establishment step need. Finished integration board is implemented finally passing through these steps.

However, each methodology has obvious difference at last step. First chip level is composition part as system level. This is part studied as priority in integration design mode, recently great many system vendors gather research and verification about SystemC repeatedly in continuous development participate. The method that uses SystemC divides work to hardware and software. However, it is implemented because implement uses SystemC as the one language. These implementation can progress co-synthesis, co-verification etc. to have consistency. Of course, existent Ptolemy, Co-Ware, POLIS etc. are famous. Most are taking part in SystemC development this vendors present. In second system level,

it is development of integration board. Role of software is important fairly in development of integration board. It is not division for composition differently with system level but each function should be clarified. When it detailed statement first time implementation method about function of system that must divide correctly software part and hardware part. Usually, system program to center processing unit dependently design and implement. Required correct division because it can solve as software among part function of CPU. Lately, actuality practical use with Real-Time OS development is being on the increase. Case of third is familiar to PC windows environment users. That is implementation about driver program that can recognize PC extension card and interface program for users.

### 3. Layout and implementation of system

This paper implements Co-design method on System Board level, this is second method among previous three methods. Fig. 1 is System block diagram that this paper proposes it.

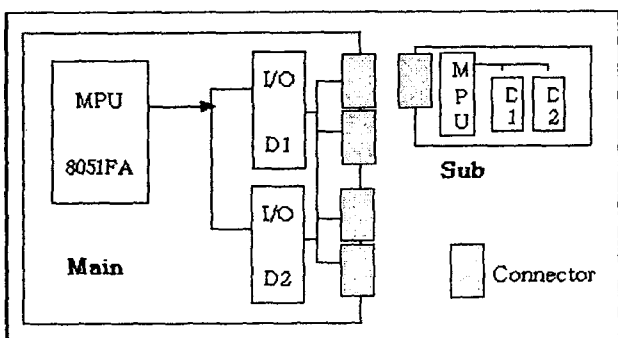


Figure 1. Design circuit diagram

This control board divides into two parts as Fig. 1. The block of board can divide main board part and sub board part. First, Main board sends polling signal to the each ports. If sub board is connected this time then main board receives connection signal from sub board but it is disconnected because of main board sends signal to next port by internal timer. If sub board is connected then main board send interrupt signal to sub board and sub board return information itself to the main board by interrupt routine. If the main board accept signal from sub board then it begin operations through communicate with sub board

### 3.1 Design of control board

The control board is divided as greatly two parts. It can divide main board portion and display Board. First, it sends continuous signal for polling form on each port of main board. If display board is linked this time, if it receives connection signal and unconnected then internal timer sends it on next port automatically. If the display board sends signal then that was linked to the main board but that is not general data analyzing signal this time to suspend interrupt in display board. if was linked. CPU of main board that receive signal sends data and display work achieves. Planed circuit diagram from state that collection of enough data and verification for design of these control board are completed to work of first step. Below figure 2 is circuit diagram of actuality control board.

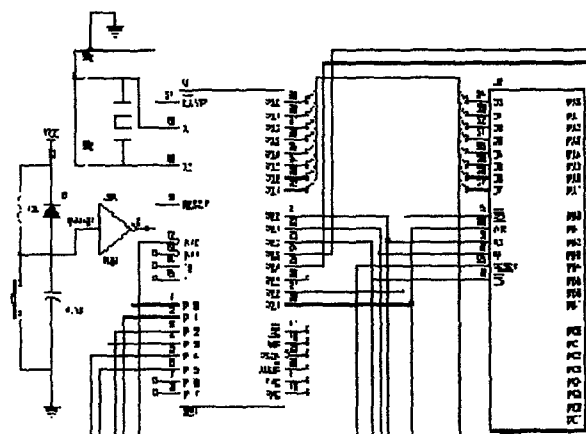


Figure 2. Design circuit diagram

You can know flow of actual program composition of circuit diagram is completed because the programming becomes available according to it. Install one 8051 as CPU to main board if examine circuit diagram and input/output ready of main board is completed by connecting two 8255 to connector. Display board is 7-segment install small size CPU for segment, data check and drive.

### 3.2 Implementation of PNP function

Treat and explain PNP function must have at actuality implementation process of control board developed in this chapter. PNP function Implemented through software interrupts in control boards that see as function that recognize device automatically. Control board has component part such as lower part figure 3.

**Program Language : C-51**  
**Microprocessor : 89C55 , 89C2051**  
**Other Devices : 8255 PPI**

Figure 3. Component part for control board

After parts are consisted, Implemented program according to circuit diagram that it is planed, and complete compilation and executed actual board composition. Below figure 4 shows flow of signal in program. Executed consist in test board and program proving job before composition this time. First, work that analyze correct operating state of 8255 and is required composing devices consisted in main board. That is, executed verification for processing of interrupt and service, last month of data etc.

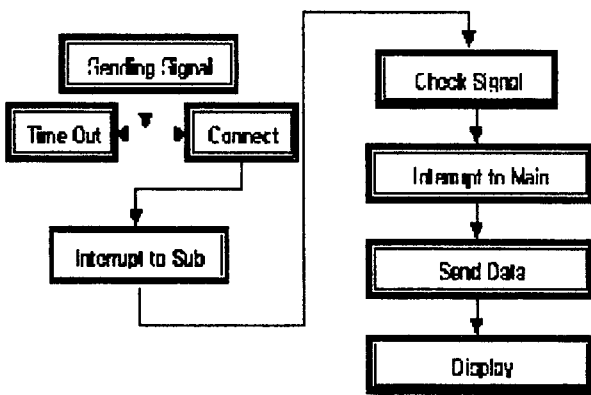


Figure 4. In program flowing of signal

Compose display board by next work and examined action of signal collation and 7 - segment. After all verification work finishes, executed test of printing board that it manufactured printing board, and is manufactured.

#### 4. An experiment and verification

System kit and comparison for education that this control board has most existent extension part and analyze. When analyze importance point speed in implementation and execution that considered number of necessity device and size of board connected directly with expense, analyzed the complexity in function aspect finally. Ticket 1 compares control board for existent education and control board that see.

Table 1. Comparison with old system and control board

	Z80 System	SEM System
Implementation	6 M/M	1 M/M
PNP	None	Proffer
Execute Time	0.6 u/sec	0.2 u/sec
Board Size	30 Cm x 30Cm	20Cm x 20Cm
Expansion	Fix	Unfix

Program scale is small and have 6 M/M development period when allowed absolutism that control board for existent education Implemented considering only input/output according to above Table 1.

This control System take period of development 1 M/M. But, as main system existent system that PNP function is not entirely is connection and incommodiousness that must execute by hand, and control board that see as result that check time required from perception of external device to processing of data in the execution speed shows faster achievement. Show advantage of and so on that according as this control board processes most function to software, execution is fast and bulk of board itself is reduced.

#### 5. Conclusion

Put categoricalness of Systems Design that this paper takes advantage of integration design method, and consider performance elevation and minimization of design expense etc. and progressed research. Implemented so that can offer maximum extensity according as Implement as module unit for extension as well as. Do composition of board by smallest unit in this paper and did so that development may be easy. Also, can know that use input/output by one main module to single CPU and have softness and high extensity by developing relationship necessary devices according to suitable element among others. Also, according as research applies integration design method to be gone abuzz the latest in development methodology, it can enhance scientific technological value of development. Development of product that has technique more if define so that load RTOS to this controlling system and use free protocol is judged to be possible. Also, skill that see PnP function by adding function that implementation is intelligence enemy of real time Operating System by possible in chip level which board level is not is expected that extension of specification system offers easy and to maintenance etc. fair convenience fairly.

## Reference

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