

A SAA7146-Chip Based Design of the TAMIC

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Abstract: - The distributed processes and managements are already been wildly used for the large scale Computer, but, up to now almost all the Personal Computers (PCs) are still in the single monitor and single processor mode. In this paper, we focus this defect and propose a Two Active Monitors-Interface Controller (TAMIC). First of all, the imaged micro-chip SAA7146A is used to transfer the traditional PCI system Interface of PC into the high performance USB transmission system Interface and extract the image data of the original monitor in the PC into the temporary registers of TAMIC. Subsequently, we design a Driving Program to interconnect the Hardware structure of the proposed TAMIC and PC to facilitate the transferring of the image data of the PC into the other monitor. We have made numerous simulations in different types PC and obtain some successful results.

Key words: Distributed processes, Personal Computers, SAA7146A, Two Active Monitors-Interface Controller

1 Introduction

Personal Computers (PCs) are one of the most important tools in the world. The applications of PCs have been wildly used in many fields, such as, the business, industrial, agricultural, education, ..., etc. The distributed processes and managements technology are already been used for the Large scale Computer. However, PCs are still of the type with the single monitor and single processor mode. Up to now, there still have some inconveniences or glitches for the users during the PCs operation, such as; the window screen cannot be extended in the single monitor PC if there are more than one window been opened; or it is inconvenience for the users to switch two different opened window, moreover, they don't know the processing procedure of the job in the implicit window of the PC. The Two-monitor PCs is one of the changing developments for the PCs Processor companies (for example, the famous Intel Company) or Interface layer companies (the monitors, mouse, keyboards Companies). Nowadays, since the applications of the micro-chip processor technologies have become more matured, the distributed control and managements for the PCs seems to be a trend. It is the last thing to be seen for the Processor Companies that PCs own the Two-monitor function, since it cannot enrich the profit of the Company. However, the Interface layer Company, especially, for the Monitor Companies are very glade to see that as well as the users. The

Monitor Companies can have the chance to sell one more Monitor in a set of PC trade; the users are also the winner since the functions of the PCs are upgrade.

In previous research [1], we have proposed a newly design -A Research on Micro-Chip Based Electric Keyboard, Mouse and Monitor Switch Controller. The paper in [1] is based on the micro-chip technology to propose a 4-1 Electric Keyboard, Mouse and Monitor Switch Controller. The major contribution the Electric Switch Controller [1], we can use only 1 set of Interface Equipment (Keyboard, Mouse and Monitor) to control 4 sets of PC main body. And the performance of the Electric Switch Controller is efficiency and there is a detailed description in [1]. This is the distributed control used in the PCs Interface Device using the proposed Electric Switch Controller to integrate 4 sets of (Keyboard, Mouse and Monitor) into only 1 set of (Keyboard, Mouse and Monitor). One very interesting question strike to the author, why the single PC cannot be used by two different users? Or, is that possible for the single PC with Two Active Monitors? In the traditional PCI screen interface card stage [2], if the users want to have the function of a single PC with Two monitors, then, it is necessary for the PC should own two different screen interface cards. Subsequently, in the AGP screen interface card stage [3], although there is the utility of the D-SUB Interface [4]-[6] in PC, but it is still necessary for the PC should own two different screen

interface cards in order to have the function of two monitors in a PC. Although PC has the ability that own the two monitors function in both stages of PCI and AGP by using two different screen interface cards, but, it should be noticed that the PC show the SAME data in two different monitors. In the other world, the distributed processes and managements are still not on the way in PC. Several papers that are concerned with the Interface Layer in PC, such as, the multi-functions of the Monitors [7]-[14]; the performance of Processors in PC [15]-[18], and the corresponding Interface card used to upgrade the performances of PC [19]-[23]. However, there are few documents related to how to use the technology of micro-chip to implement the single PC with Two Active Monitors.

The object of this paper is based on the corresponding technology of micro-chip to propose a Two Active Monitors-Interface Controller (TAMIC). The proposed TAMIC is compact and is easy to be installed in PC, we can use the TAMIC associated with the high performance USB transmission connect the PC with another monitor (Slave Monitor). It should be noticed that both the monitors in the PC are **Active**; in other worlds, the single PC can be used by two different users; one of the users use the Keyboard to operate the PC in normal simulation in one opened window in the original Monitor (Master Monitor); the other one use the Mouse to operate the PC in another opened window in the Slave Monitor (such as, Playing game, Watching movie,..., etc.). It is very convenient for the user the execute the PC with Two Active Monitors function, for example, the engineers, she/he can monitor and control the processing procedure of the different jobs executed in the two opening window of PC; the office operator, she/he can operate the official jobs in one opened window in the Master Monitor and can play game or watch movie in another opened window in the Slave Monitor in PC. There are some special features in the proposed TAMIC, 1. The expense of the TAMIC is Economy, 2. The product of the TAMIC is Compact and is easy to be installed, 3. A single PC has the function of Two Active Monitors, 4. A single PC can have Two Users, and 5. No need to have two different screen interface cards.

The paper is organized in the following manner. The system structure of the Two Active Monitors-Interface Controller (TAMIC) is presented in Section 2. Section 3 presents the operation method. Finally, we make a brief conclusions in Section 4.

2 The TAMIC Hardware Structure and Software Procedure

For the purpose to achieve the goal of the single PC with Two Active Monitors function, in this paper, we based on the imaged micro-chip SAA7146A [24] to design a Two Active Monitors-Interface Controller (TAMIC). The proposed TAMIC associated with the high performance USB transmission are used to connect PC with another monitor (Slave Monitor) and enable the PC with Two Active Monitors function. In this paper, the imaged micro-chip SAA7146A is used to transfer the traditional PCI system Interface of PC into the high performance USB [25] transmission system Interface. Therefore, we can use the proposed TAMIC associated with a proposed software (the TAMIC Driving Program described in the following) to connect the PC with the Slave Monitor. There are two major parts in the proposed Two Active Monitors-Interface Controller (TAMIC); the Hardware Structure and the Software procedure.

2.1 The Hardware Structure of TAMIC

The Hardware Structure of the Two Active Monitors-Interface Controller (TAMIC) is shown in Fig. 1. There are three units in the Hardware Structure of the Two Active Monitors-Interface Controller; 1. The Processor Unit -Micro-Processor 89C51, 2. The Image data Processor Unit-the imaged micro-chip SAA7146A. 3. The Temporary buffer Unit-the Register RAM. In the following, we describe the function in the TAMIC.

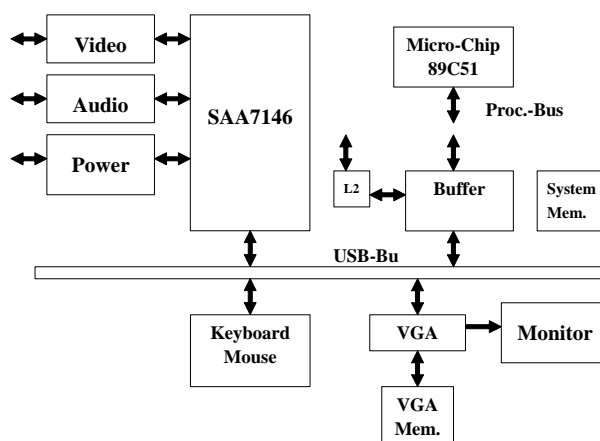


Fig. 1. Hardware Structure of the Two Active Monitors-Interface Controller (TAMIC)

2.1.1 The Processor Unit- Micro-Processor 89C51:

The functions of the Processor Unit in the TAMIC are to control and drive the imaged micro-chip SAA7146A to extract the image data of the Master Monitor in the PC into the temporary registers of TAMIC. And waiting the instructions come from the chief processor of PC, such as the user open another window in PC and use the Mouse to transfer the opened window to the Slave Monitor or the user use the Mouse to switch the construction within the two Active monitors,...,etc. The Micro-Processor 89C51 is quit stable and efficient in many industrial applications and the expense of that chip is Economy. We use the Micro-Processor 89C5 as the central control center in the TAMIC.

2.1.2 The Image data Processing Unit-the imaged micro-chip SAA7146A

We use the Micro-Processor 89C51 to control the processing procedure of the Data transferring and extracting. The functions of the Image data Processing Unit in the TAMIC are to transfer the traditional PCI system Interface of PC into the high performance USB transmission system Interface and extract the image data of the Master Monitor in the PC into the temporary registers of TAMIC. In the following, we describe the procedure of the imaged data processing.

In general the resolutions of the monitor in PC are including 800x600, 1024x768, 1280x768 [6]. The optimal resolutions of monitors are different since the different size of monitors in PC. In this paper, we adopt the general formula resolution 1024x768 of the PC monitor. Once, the imaged data is extracted into the Image data Processing Unit through the high performance USB transmission system Interface, the Processor Unit- Micro-Processor 89C51 send three Control instruction to the imaged micro-chip SAA7146A. First of all, order the imaged micro-chip SAA7146A to copy the extracted image data of screen and extend it into 2-time of the original one. In the other worlds, the function of the imaged micro-chip SAA7146A is to copy the image data in the Master Monitor screen into the two equivalent resolution (1024x768) image data and store it in the Temporary Buffer unit. Subsequently, the Processor unit- Micro-Processor 89C51 orders the imaged micro-chip SAA7146A to divide the image data of the resolution 2048x768 into the two equivalent resolution (1024x768) image data. At last, if the Command Instructions are received (such as the users want to move a opened window screen into the Slave

Monitor), then the Processor Unit- Micro-Processor 89C51 commands the imaged micro-chip SAA7146A to transfer the image data to the Slave Monitor through the high performance USB transmission system Interface and VGA.

2.1.3 The Temporary Buffer Unit- the Register RAM.

We use two sets of 1G RAMs to formulate the Temporary Buffer Unit. The functions of the temporary buffer are to store the image data of the Master Monitor in the PC extracted by the imaged micro-chip SAA7146A. And the Temporary Buffer Unit associated with the USB transmission Interface is also the bridge between the PC and the other monitor.

2.2 Software Procedure of the TAMIC

We use the corresponding technology of the Dynamic Link File-VCAP.DLL and SVIDEO.DLL [25] and the Dynamic data library AVICAP.DLL and MSVIDEEO.DLL [26] to design a executing file named TAMIC.EXE (the TAMIC Driving Program). The Software procedure (the TAMIC Driving Program) of the TAMIC is shown in Fig. 2. The purpose of the Driving Program is to interconnect the Hardware structure of the proposed TAMIC and PC to facilitate the transferring of the image data of the PC into the Slave Monitor. There are four units in the Software procedure of the Two Active Monitors-Interface Controller; 1. The Extracting of Image data, 2. The Duplicating of Image data, 3. The Dividing and position Fixing of Image data, and 4. The Transferring Image data. And we will describe in the following:

2.2.1 The Extracting of Image data

The object of this part is to facilitate the Hardware-the Image data Processor unit associated with the Hardware-the Temporary Buffer Unit to extract the Image data through the high performance USB transmission system Interface into the temporary registers of TAMIC.

2.2.2 The Duplicating of Image data

The object of this part is to facilitate the Hardware-the Image data Processing Unit associated with the Hardware-the Temporary Buffer Unit to copy the extracted image data of screen and extend it into 2-time of the original one. That is to copy the

image data in the Master Monitor screen into the two equivalent resolutions (1024x768) image data and store it in the Temporary Buffer unit.

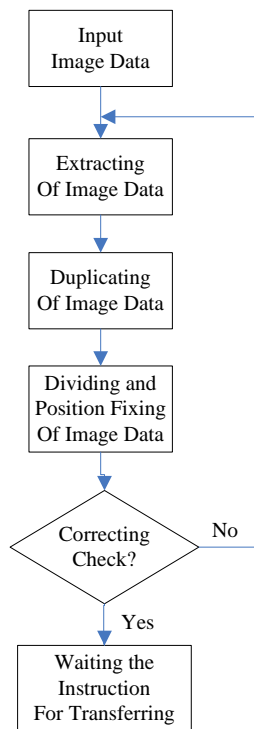


Fig. 2 Software Procedure of the TAMIC

2.2.3 The Dividing and position Fixing of Image data

The object of this part is to facilitate the Hardware-the Image data Processor unit associated with the Hardware-the Temporary Buffer Unit to divide the image data of the resolution 2048x768 into the two equivalent resolutions (1024x768) image data. And the two equivalent resolutions (1024x768) image data are repositioned by the Hardware-the Processor Unit (Micro-Processor 89C51) during the data processing.

2.2.4 The Transferring Image data

The object of this part is to facilitate the Hardware-the Image data Processing Unit associated with the Hardware-the Temporary Buffer Unit to transfer the extracted image data through the high performance USB transmission system Interface and VGA to the Slave Monitor in PC.

It should be noticed that the Software procedure (the TAMIC Driving Program) of the TAMIC is controlled by the Hardware- the Processor Unit (Micro-Processor 89C51). And the TAMIC Driving Program is installed in the Window XP Operation System [27] to facilitate the operation of the proposed TAMIC and the Slave Monitor in PC.

2.3 The corresponding technology of the image processing micro-chip SAA7146A

The image processing micro-chip SAA7146A is used in this paper for processing the image data of monitor. There are some special features of SAA7146A stated in the following:

- with the ability to support the full speed and volume image data transferring between the pseudo registers of system and the buffer.
- with the ability to support the pseudo registers (4MB for every channel Direct Memory Access)
- with the ability to process 4095 columns and there are 4095 sampling points in one column.
- with the ability of the Register Programming Sequence (RPS) which can simultaneously process two sets of asynchronous data.
- with the ability of the Memory Management Unit (MMU) which can support the pseudo registers management of Windows, Unix system.

The block diagram of the image processing micro-chip SAA7146A is shown in Fig. 3. In Fig. 3, we briefly describe two major functions used in this paper. The first one is the High Performance Scalar Unit (HPS Unit). The HPS Unit can be used to process the positioning, scaling, and lighting of the image data. Furthermore, the HPS Unit also supports the adjusting function of the colors (Red, Green, and Blue) for the image data. The HPS Unit can also process two dimensions of image signal data. We can use the proposed Micro-processor associated with the corresponding Buffer to control the HPS Unit. The other one is the Binary Ratio Scalar Unit (BRS Unit). The BRS Unit can support the second CHANNEL between the USB and the Image connector. The BRS Unit can transfer the full size image signal data to the Common Intermediate Format (CIF), Quarter Common Intermediate Format (QCIF), Quarter Quarter Common Intermediate Format (QQCIF) signal. Furthermore, the image processing micro-chip SAA7146A also support the utility for scaling and adjusting of the image data; the Vertical Direction scaling and adjusting is 1:256; the Horizon Direction scaling and adjusting 1:256.

Therefore, we can extract the image data (1024x768) of the main screen come from the monitor through the USB transmission into the Temporary Buffer Unit. First, we use the technology of the image processing micro-chip SAA7146A to expand the original image data (1024x768) into of the formulation (2048x768). Subsequently, the

proposed Micro Processor 89C51 will control image processing micro-chip SAA7146A to divide the image data (2048x768) into two equivalent sets image data (1024x768). At last, reposition the address of the two equivalent sets image data (1024x768) and wait for the Command Instructions to transfer the processed image data to the screen of the Slave Monitor in PC.

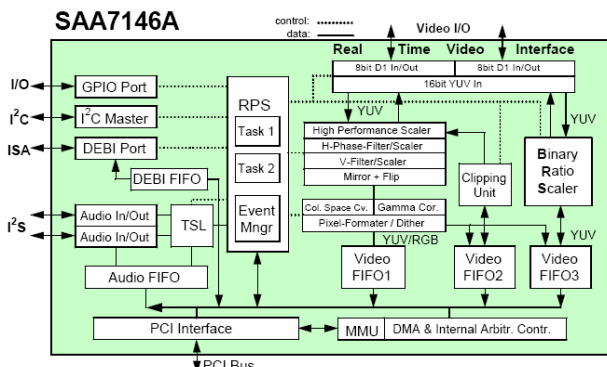


Fig. 3. The block diagram of the image processing micro-chip SAA7146A

3 The TAMIC Operation Method

We use the Pentium 4 PC as our experiment Computer. The CPU processor speed of Pentium 4 is 3.2GHZs; the memory RAM of it is 1000 Mbytes. In the following, we describe the Step of the Installation of the TAMIC and PC.

Step 1: We connect the proposed TAMIC with the Pentium 4 PC (There is a set of standard interface including, Keyboard, Mouse, and two Monitors).

Step 2: Opening the PC and checking whether the PC is in the Window XP Operation System.

Step 3: In the Window XP Operation System, Checking whether there is the Hardware device (the proposed TAMIC) in the PC.

Step 4: Installing the proposed Software Program (the Driving Program of the proposed TAMIC) in the Window XP operation system in PC.

Step 5: In the Window XP Operation System, Opening a window and using the Mouse to move the opened window screen in Master Monitor into the Slave Monitor in PC.

Step 6: If the Slave Monitor appear the image data of the transferred window screen, then the Installation is complete. Otherwise return to *step 1*.

The complete Installation graph of the proposed TAMIC with the PC is shown in Fig. 4.

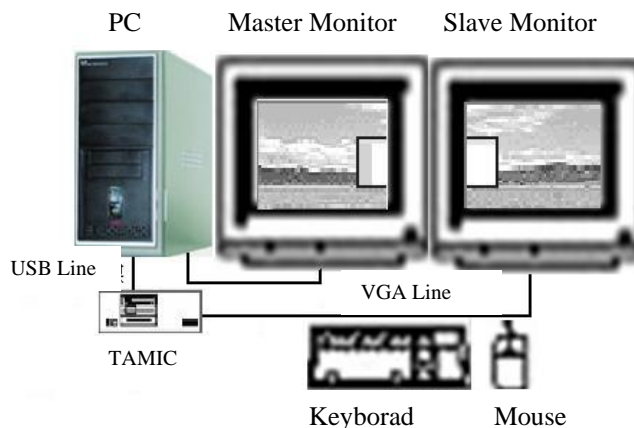


Fig. 4. The Complete installation graph of the proposed TAMIC with the PC.

4 Conclusions

In this paper, we propose a Two Active Monitors-Interface Controller (TAMIC). First of all, the imaged micro-chip SAA7146A is used to transfer the traditional PCI system Interface of PC into the high performance USB transmission system Interface and extract the image data of the original monitor (Master Monitor) in the PC into the temporary registers of TAMIC. Subsequently, we design a Driving Program to interconnect the Hardware structure of the proposed TAMIC and PC to facilitate the transferring of the image data of the PC into the other monitor (Slave Monitor). We have made numerous simulations in different types PCs and obtain some successful results.

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