Implementation of an Image Grabber System for Medical Image Examination

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Abstract: The researching content of this article is to implement the image grabber system for use the dental hospital image examination. It receives the NTSC analog image through CCD optical camera, which is using the close photographing. we made the image grabber board, which gathers and obtains the analog image, by PCI format. We developed the C++ application and device drive to operate this board so that we totally could implement and confirm this Image grabber system.

Keywords: Image Grabber, Medical, Examination, MIEAS, DICOM

1. INTRODUCTION

The change is appearance of medical image diagnosis sub-system to use for diagnosis, which is used the medical image information to be gained through variety optical device as like CCD, CMOS, infrared rays in the diagnosis of patient and medical examination system.

The case, which is the method to use existing analog film or diagnosis of doctor's eye, includes many errors to read the result between doctors and hospitals. It is need the wide space to install the medical device because of the big size and it can be huge burden to small personal hospital because of the high price. Also it takes long to wait the patient for diagnosis and it can be take long to diagnosis by contrast. Unfortunately, we should visit to cure for many times.

2. THE NECESSITY OF MEDICAL IMAGE EXAMINATION ASSISTANT SYSTEM(MIEAS)

For improve or supplement the above problems, we propose the "Medical Image Examination Assistant System" as one solution(we could say the "MIEAS"). The "MIEAS" appeared to promote the objectivity of information and the efficiency of diagnosis in the stage of diagnosis so that obtain the patient information through medical image and use to diagnosis data. The doctor can be provide the objective data of the nature of a disease to diagnosis through "MIEAS" in the position of doctor. Also, the patient can be provide the speed and accurate diagnosis service and efficient patient information management in the position of patient.

This research was supported by the Program for the Training of Graduate Students in Regional Innovation which was conducted by the Ministry of Commerce, Industry and Energy of the Korean Government.

The level of social and culture is improved for rapid industrialization and there is an advanced age for improvement the level of life in the present. So, the necessity of these systems as like "MIEAS" will be increase as days go by and it is prospected to increase the social need large.

3. TITHE IMAGE GRABBER SYSTEM FOR MEDICAL IMAGE EXAMINATION

The core part of element of medical image diagnosis assistant system is 『Medical Image Grabber』 module, which is compress and capture the digital format to convert the received medical image. This article is to implement this 『Medical Image Grabber』 module in consist of PCI format board and application s/w and to confirm it in the based on the pc environment.

This article's topic is to implement the close photographing image grabber system, which can be use in the dental hospital. First of all, we made this board with PCI card form to use easily.

We made it in the based on the GUI environment of Windows to use easily that person, who is not skilled the computer. It has good circulation for use BT878a chip, which is used ordinary and provide the high performance, which is satisfied all of spec to be needed the this system with compare low price. we optimized the composition of circuit to possible the implementation small size to consider the usage of embedded system, which is contacted later.

3.1. The analysis of the analog input image

The image grabber PCI board is core partition of medical image diagnosis system to need the patient diagnosis and it is charge of the function, which is convert analog image to the digital and print the converted image data to the screen and compress and save the image data through suspension image compression algorithm.

The method to print one screen in the monitor is format to orderly inject from number 1 to number 525 and the computer monitor injects the 525 lines with method of non-interace by contrast TV. The non-interace injection method is to inject the 525 lines as follow, that is, 1~263 is Odd Filed and 264~525 is even filed. (Reference the Fig. 1)

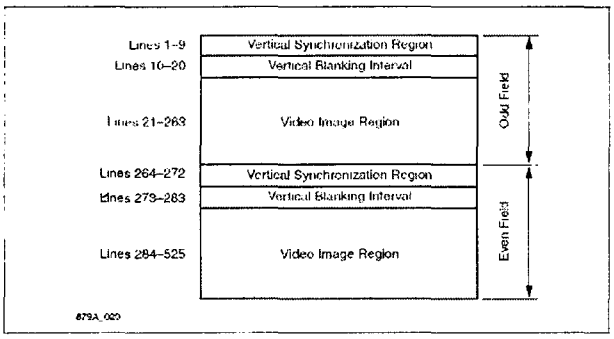

Fig. 1. Regions of the NTSC video frame.

A equipment for refer image must possess the user interface which has become special according to business character. The aim of the system is that it sees to be applied in personal dentistry hospital diagnosis and research objective. Therefore, we can satisfied a demand condition from level of clinical image inquiry system degree

We should consider the usable space of medical image, which is used in the dental hospital. If we display the image on the CRT monitor(32cm×24cm) 17", the size of 1 pixel in the resolution of 320×240 is 1mm×1mm and the size of 1 pixel in the resolution of 640×480 is 0.5mm×0.5mm.

If we think that the size of men's teeth is about 6cm×6cm and the size of one tooth is 1cm×1cm, it can be provide the usable image quality to the general dental diagnosit in the resolution of 320×240. Even if, we do the precise diagnosis, we can obtain the high quality image to be thoroughly used the precise diagnosis to gain the image of 640×480 resolution.

3.2. The composition of image grabber PCI board circuit

We made the image grabber PCI board to use the conexant's BT878a chip, which is satisfied the request spec to be commented prior and composed of low price.

As "Fig. 1", if it is inputted the image on the RCA input part through CCD camera, it can notice the activity channel, which is connected the one channel of the multiplexer's 4 channel and carry out the video decoding through BT878a chip. it brings the gained RGB(8:8:8) digital image to pc through PCI connector.

In the "Fig. 2", it print the inputted image by PCI connector to monitor through control of application program and it can save or capture the image through the JPEG suspension image compression algorithm.

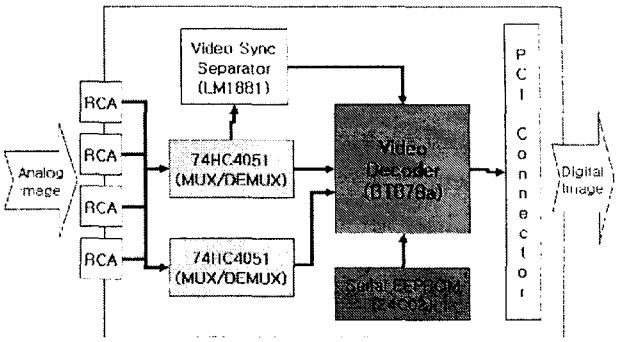

Fig. 2. The architecture of pci image grabber board

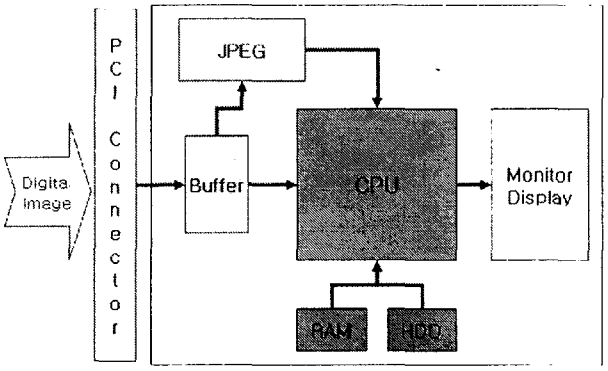

Fig. 3. The data flow on the pc environment

3.3. The image grabber PCI board pcb artwork

The working of the PCB artwork was used the OrCAD 9.2.3's "Capture CIS" and "Layout Plus". First of all, it was defined the wiring of the accessories and circuits as like "Fig. 4".

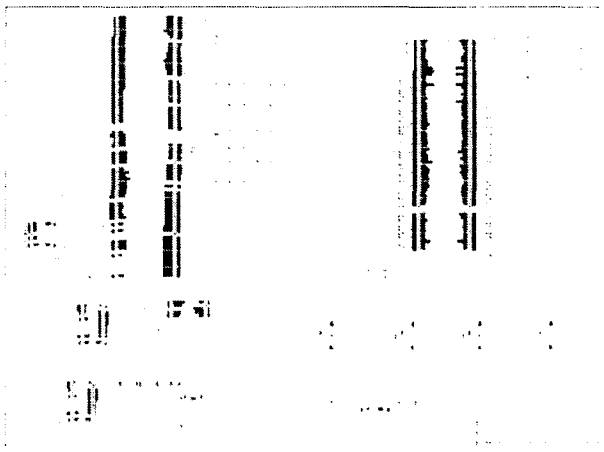

Fig. 4. Schematic work

When an analog medical image is input through the RCA jack, 74HC4051 chip scan the number of channel. After that, The LM1881 chip extracts the VSYNC signal and the ODD/EVEN information of image. The BT878a chip convert an analog image to a digital image using these information.

When the digital image information is transferred to pc through PCI connector, the role of the PCI grabber board became end. After this, the rest operation must be worked in the application program of a pc. After this, the rest operation must be worked in the application program of a pc.

Like "Fig. 4", after all composing the schematic, it verifies DRC. If there is not an error, it extracts the netlist file. It brought this netlist file and it used composes an actual partsarrangement and the PCB board to work artwork Layout Plus and.

"Fig. 5" shows the layout plan that is completed an artwork operation and is finished DRC verification.

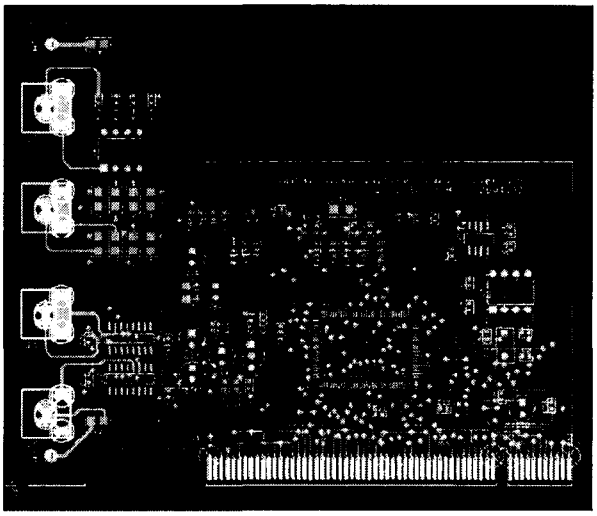

Fig. 5. Layout work

4. THE VERIFICATION OF THE FULL SYSTEM

The full system composed with PCI image grabber board on the pc board and application program.

4.1. PCI Grabber Board

It shows the real image grabber PCI board, which is adhered the BT878a chip in the "Fig. 6".

This board requests actually at the pcb enterprise and it produces the board. Soldering did by the direct hand.

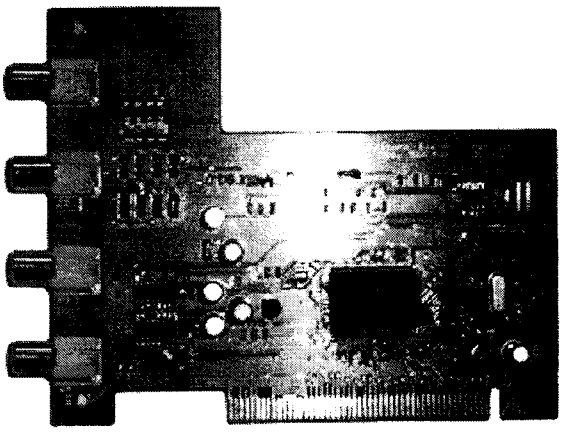

Fig. 6. The image grabber pci board

4.2. Application Program using C++ language

The "Fig. 7" shows the application program to start and confirm the full system. It provides the function to multi-output and capture to be inputted the dental medical image through the camera.

It is possible to save the maximum 6-divided screen and provided the basic filed to input the patient personal information and diagnosis information to be based the DICOM standard documents.

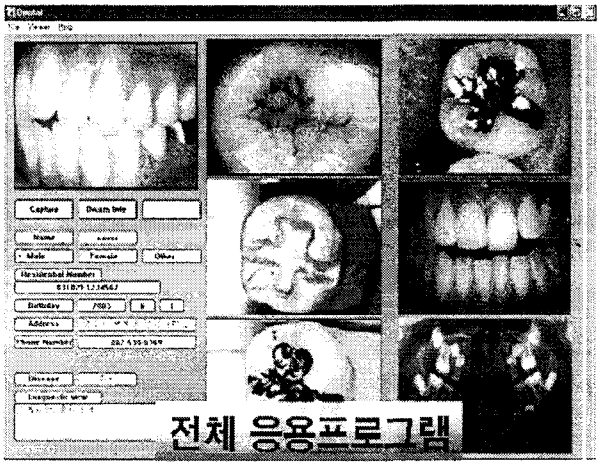

Fig. 7. Application program

"Fig. 8" shows image view field that display a foundation information of patient of DICOM field information. "Fig. 9" shows series information DICOM field information. And "Fig. 10" shows patient, study information of DICOM field information. Finally "Fig. 11" shows equipment information field of DICOM field information.

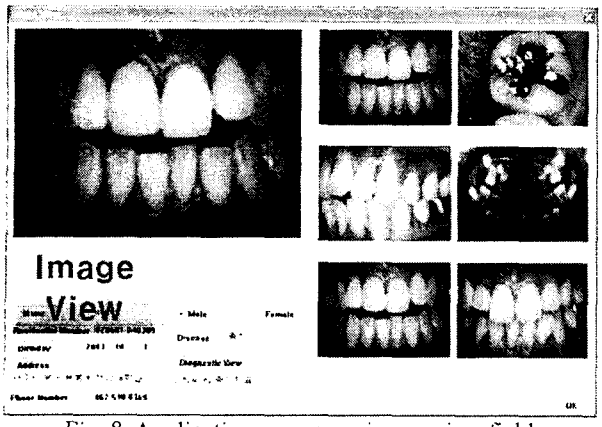

Fig. 8. Application program - image view field

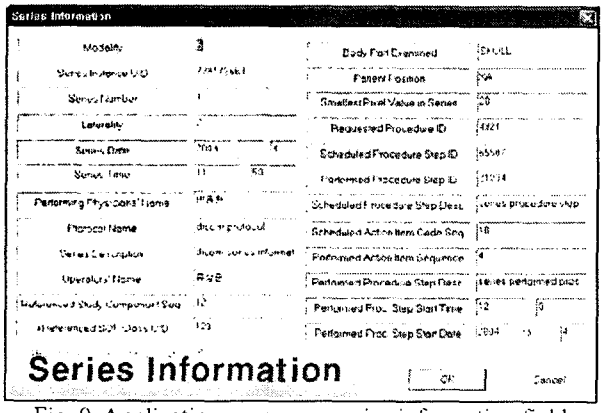

Fig. 9. Application program - series information field

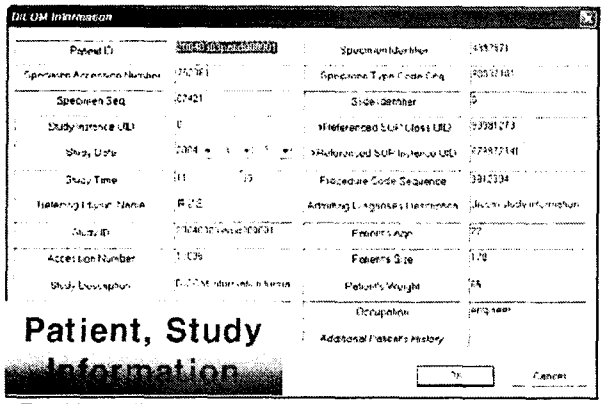

Fig. 10. Application program - patient, study information field

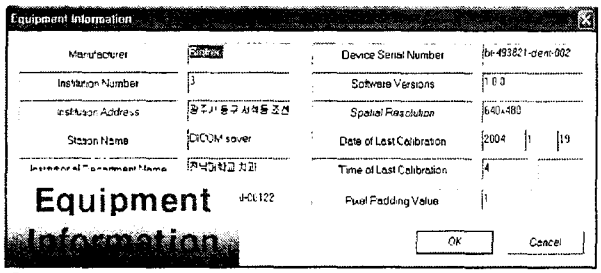

Fig. 11. Application program - equipment information field

5. CONCLUSION

The constraints conditions of the medical image diagnosis system are resolution to be requested on the the size, price, applying filed and convenience of usage, facility of portable. This article is focused the elements which of size, price, requested resolution, facility in the these constraints conditions. It can use to attach the used pc originally because of making with the PCI format and it is easy to use it because of developing on the windows environments. we also are focused on the performance to be satisfied the image spec, which is requested in the dental diagnosis and the reducing the price burden.

We expect that this architectures and knowledges, which are obtained to this article are using to make the system and active on the developing of the medical image diagnosis embedded system for later.

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