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DEVELOPMENT OF SOFTWARE FOR REAL-TIME EVALUATION OF TU MOR DOSE FROM TRANSMISSION DOSE

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INTRODUCTION

In radiation therapy, it is a critical matter to focus radiation dose on tumor, because suc cess of radiation therapy depends on it.

For accurate monitoring of delivery of prescribed dose to tumor, several methods have b een used, such as in-vivo dosimetry or measurement of entrance dose to calculate tumor dose. Though in-vivo dosimetry is a direct and accurate method, it is impractical to place dosimeter into patient's body every time.

We have developed an algorithm for calculating tumor dose from transmission dose and made 9 channel ion chambers and electrometers for "On-Line Dosimetry system".

In this paper, we describe a PC-based data acquisition system and graphical user interface for our purpose. By using this system, real-time evaluation of tumor dose and user-frien dly system control is enabled.

METHOD

We developed the system suitable for a laptop PC with windows 95/98/NT environment.

Graphical user interface (GUI) was developed by LabVIEW graphical programming lang uage from national instruments.

Hardware of data acquisition system consists of two parts, a control board and a data a cquisition card. In the control board, two analog multiplexers (DG-508A, Harris) is used t o successively transfer 9 channel signal into data acquisition card through 2 analog signal lines. PC-controlled digital channel selection signal was used to control the multiplexers.

The data acquisition card from national instruments has a 12-bit resolution and a maxim um range of -5V to +5V. In order to enhance the accuracy of measurements, the gain of the ADC is software-controllable.

Database is administrated by MS-Access (Microsoft) and can be connected to main GUI using SQL toolkit (National Instruments).

RESULT

Fig. 1 shows the main menu of "On-Line Dosimetry System" GUI. Functions of each menu are as follows.

1)Beam Data Input : measurement of beam data which will be used to convert transmissi on dose to tumor dose(Fig. 2)Patient Treatment Setup : add and edit patient treatment s etup data for radiation therapy

2)Patient Dose Acquisition(Fig. 3) : real-time evaluation of tumor dose in radiation thera py by displaying measured value with the expected value of tumor dose which is calcu lated from beam data and prescribed treatment setup data.

3)Patient Database(Fig. 4) : administration of patient database and showing statistics of tr eatment data of each patient such as treatment error(%)

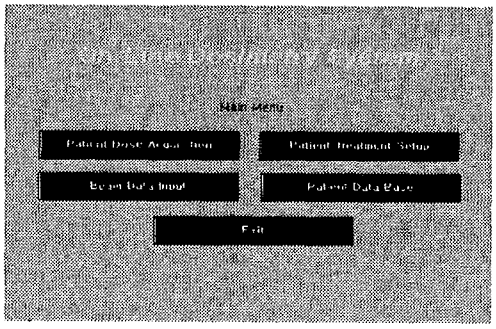

Fig. 1. On-Line Dosimetry System main menu

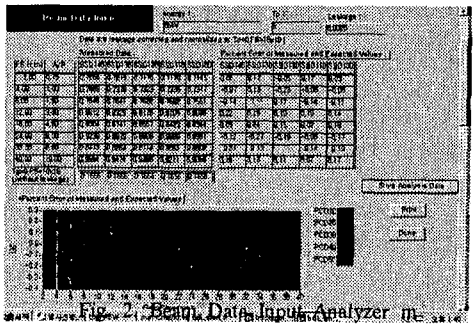

Fig. 2. Beam Data Input Analyzer menu

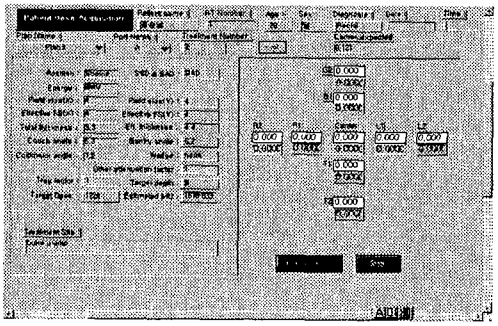

Fig. 3. Patient Dose Acquisition menu

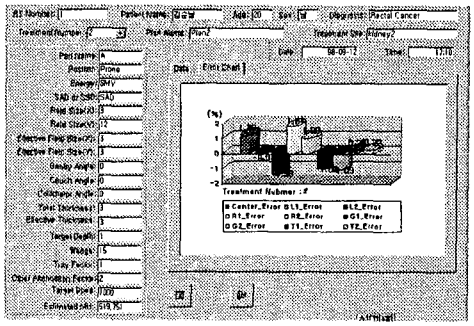

Fig. 4. Patient Database menu

DISCUSSION

Multi-channel transmission dose can be easily measured and can be converted to a tumor dose using the developed GUI.

We can find a zero drift and leakage current negligible but system calibration is performed by a software. This includes a zero drift and leakage current of an ion chamber and loss of a signal in the multiplexer and the offset voltage of ADC.

CONCLUSION

It was successful to predict tumor dose within ±5% error by using our algorithm. User can easily operate the system through the developed user interface. After phantom test and improvement of GUI, if needed, clinical test will be performed to evaluate the system.