Windows programming – Maximum Intensity Projections with direct export to avi

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Introduction

The fast development of information technologies touches also the area of data processing and imaging in nuclear medicine. Today it is usual that acquisition and processing consoles of the cameras and scanners are networked together with the other computers at the departments. This, of course, enables the improvement of hospital information systems by binding the text and picture information together and consequently improves the Picture Archiving and Communication Systems (PACS) in the hospitals.

Even though the consoles delivered with the cameras are often unix-based machines, the PCs at the departments are usually running with MS Windows. As the price of the PCs is much lower than the price of unix workstations with processing software, one can try to transfer a part of the routine work from the consoles to them. Therefore wide accessibility and machine time-saving are the main reasons why PC viewers are created.

Maximum Intensity Projection

Maximum Intensity Projection (MIP) is one of the computer graphics methods which can help the physician to evaluate the investigation. The principle of the method is the projection of the data along a ray and representing them by the maximal value on the path [1]. This method is often modified by using the summation along the path (Integral Intensity Projection) or distance weighted maximum or summation. Another possibility used in radiology is the so called Local Maximum Intensity Projection (LMIP) [2], where the first maximum above the selected threshold is taken into account.

This projection method is used to present numerous centres of [18]FDG consumption in PET whole body scans, because the particular slice can not display all of them. Either only frontal projection is used or a set of projections from different directions, which, when animated, evoke a 3-dimensional image of the radiopharmaceutical uptake in the body.

Resulting program

A program Elmip was written to provide avi files with MIP data (see screenshot in Fig. 1). The main goal of this program is to enable the user to easily create, play and save sets of projections (animations). Therefore the program is designed as a main win-

Figure 1. Screenshot of the program Elmip.

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dow with more possible sub-windows. Each of these sub-windows contains its own projection or set of projections and is independent on the others. Therefore more projections of the same data can be seen at the same time. Each sub-window is managed by the common control panel, which offers users the choice of colour table, angle of projection, thresholds, threshold for LMIP projection (if selected), zoom, contrast, create and play animation. Because of the independence of particular sub-windows, more than one animation can be created in the memory at the same time.

Creating animations usually consumes much time; the special thread is determined for this computing, which means that other sub-windows are available for user interactions e.g. user can abort this time-expensive process. The created animation can be saved as a sequence of individual bitmaps or as a one avi file — in this case users can choose the compression codec installed on the computer to reduce the size of the avi file and set the time per frame in the avi file as well. Because the voxels are not always cubes, users can adjust the size of the projection bitmap and achieve the actual measure of viewing data. Another useful option enables the user to flip data (left/right and up/down) if necessary.

The Elmip program was written in Borland C++ Builder 5.0 for Win32 platform. A part of this program is library toavi.dll, which should be located in the same directory as the main program. The input data formats for this program are Interfile 3.3 [3] and ECAT Matrix, the native CTI/Siemens format.

Conclusions

Data imaging and processing on PCs represents a complementary approach to evaluation and reporting. Own programs can offer more methods, modifications or tools but one has to be careful in their usage and decide if one's problem fulfils all the assumptions for their usage.

The program Elmip offers MIP with direct export to avi files which can be easily linked to any presentation. The program is easy to use, offers context help and is free of charge. It can be downloaded from http://www.sweb.cz/nukmed.

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