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The Design and Implementation of Dynamic Printing Based on FastReport

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Abstract:

   The output function of data is essential for an information management system. How to output data dynamically is the key process. In order to meet the flexibility of data output and the easiness of operation, the printing process uses FastReport to customize a print template. We add or delete some data items on the template, these data items represent output information, and then it can achieve user defined output through mark escaped date item in the template. This function achieve dynamic print through modifying the template data item instead of modifying the system code.

Keywords — **FastReport, Template, Data item, Dynamical Print**
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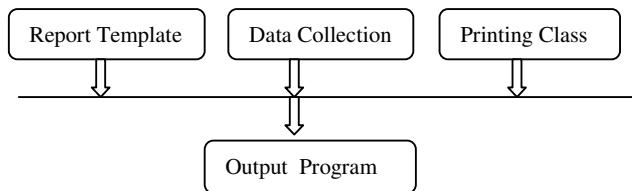
I.   INTRODUCTION

   The output function of Management information systems (MIS) is very important, and whether the print function can meet the complicated user requirements is also one of the important issues to be considered. Now the general information systems display and print by the fixed template as they are immobilized on the print function. When the demand changes, such as adding or deleting some data information, it require modifications to the system source code, which will be in serious trouble, they are weak in output function, poor in maintenance and not flexible. Therefore, this article presents a new method of printing, combined with reports, namely combine FastReport with print function to custom a print template, and then achieve user-defined print. When the print data requirement changes, you only need to change the template change, namely change the data item in template, which is easy and not need to modify the source code to achieve dynamic print function in information system data. Meanwhile, in order to ensure the high resolution of the output, we need to remake the template, and then output it,

II.   FUNCTION DESIGN

A.   *Mentality of designing*

   According to printing requirement, and in order to meet the flexibility and maintainability of the print function, this article exemplifies the following design idea when designing the dynamic print function:
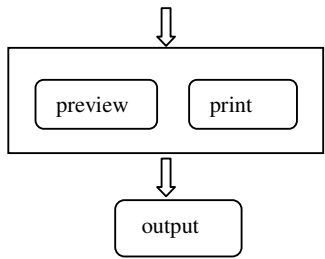
   1)   Using template technique to archive user-design template format and the Data item in user-design template, the data format of Data item is also design by you, which is convenient for text conversion. The format and position of data item in template is also plan by you.

   2)   Use the Report Wizard. The system guides user to select or enter certain data, and then automatically generates a report template, which embody the intelligent of report. Using guild helps us generate a part of the template to reduce our workload.

   3)   Template redraw realize high-precision printing. As the output print provides by FastReport cann't meet the high resolution of the output, we use the redraw technology to redraw the escaped template on the canvas.

   4)   Archive functional versatility. It can be used with any MIS System. The dynamic printing function of the template can be combined with other MIS System.

B. *Functional Structure Drawing*

The printing system include reporting template, MIS data collection, report printing and reporting output.

1) Report Template Module: It is a template generated by the Report Wizard. User use the Report Designer to design in the module, place FastReport control to represent the data item, each data item represents an output message, and set the format of the data item is design by yourself. And then save the template as a fr3 file .

2) MIS Data Collection Module: Include the mapping relationship between MIS systems data management and data item in template. Some data item on the template have the one-to-one correspondence with the data in the information system database. The data item represents the value for certain fields in the database.

3) Report Printing Module: Its main achievements are the initialization of report, the loading of database in information system, the data escape of data item on the report templates and the output function of report.

4) Reporting Output Module: Archive the dynamic print and output for report after escaping the template, and saving as multiple formats.

III.   FUNCTION IMPLEMENTATION

The develop environment of this article is C++ builder2010, and the report tool is FastReport. It aims to achieve the dynamic output function for information data based on the report, combined with a Medical information system.

FastReport is a highly flexible report designer, the report data can be obtained from any type of data source, including the character list, BDE database, ADO data source(not use BDE) , Interbase(use IBO), and Pascal array and record. FastReport is able to provide more flexibility and custom for end user.

Compared with other report tool, using FastReport to design and make report in C++ builder has the following Obvious advantages: the design and production of report are more flexible, fast, comprehensive, and powerful.

FastReport has not only the ability to change the report design for end user, but also the capability to adapt to the change in the enquery and database[1].

As one of the most essential report generating module, TfrxReport is mainly used to edit report. You can open the designer window to edit a report by double-clicking the component. A TfrxReport element constitutes a report, this component has all the load, save, design and all the attributes and methods to view a report [2].

This article only introduces some of the key issues to achieve the function for lack of space.

A.   Design The Report Print Template

Design the report print template and save as fr3 file. Use the report designer of FastReport to design the template. We can use the Report Wizard of FastReport. A report in form generally can be classified into the header, body, and footer. General report system saves the typical header, body and footer structure in the report database in the form of templates, the Report Wizard can call the header, body and footer of the template to achieve report design template, and design report quickly. Report Wizard consists of f setting the report data set, properties, header, body,and footer [3].

Placed controls provide by FastReport on the design machine, and these controls are correspond to the data item.

We agreed well in advance of the data formats for the data item, for example, we can put TfrxMemoView controls for the text data item, use a pair of [] for the data item which need to be printed in information system, if the data item is directly derived from the certain field of a database, then add the table name as a prefix, for example, [CdsPatient.Name] indicates the data item comes from name file in Patient database table.

For the data which is not from a database table, use a symbol directly. For example, [Date] represents the print date, [HospitalName] on behalf of the hospital name, that tag name as defined.

If it is a picture data, then place the TfrxPictureView control to load or redraw the picture. If it is a line item, then place TfrxLineView control and so on. According to the specific means of the data item, we place the appropriate control.

So, the design of template is placed in advance of the required data, the data display format and location also decide the final report output style, and a data item represents an output message.

Of course, the data item can output its true meaning only through the print escapement which will be mentioned later in this article.What information you want to print, and then design the appropriate data in the prescribed format. The following figure is the report templates for the medical information system [4].
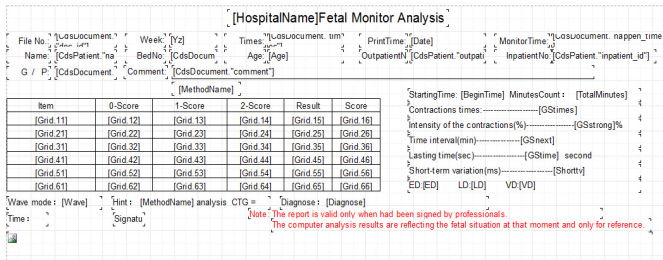

Fig 1 Example of template

You can see from the template that the pre-designed data item is placed on it, including text item, namely TfrxMemoView control, picture data item,namely TfrxPictureView control and so on.

Some data tag is without escaping, so you can't see its real value. Interface layout template completely controlled by these data items. The layout of the template interface is completely controlled by these data items.

B. Design The Report Print Type

Design the report print type FrxPrintReport, it is the essential part to achieve the dynamic output function. The type is mainly to achieve the initialization of report, information system data item load, escaping of data item on the report template, template redraw, report output and other functions.

1) The Initialization of Report:

InitReport(String fr3Name), to initialize a report object TfrxRepor through loading the pre-design report template which means loading fr3 file by the function, namely instantiating the template. When you operate the object, you can operate the template. The key code is frxReport->LoadFromFile (fr3Name),the template is named as fr3Name.

2) Information system data item load:

PutMapData(String Key, String Value).The value mapping relationship between the database table field are stored in a container, through which all data needed in information

system is advanced placed in a map container, the key code is: mapData.insert(pair<String,String>(Key,Value).

The data tag is parameter Key, value is corresponded to a field in a database table, so it makes the data tags associated with a value in a database table. When you need to know the value represented by the tag, traverse the map container, you can obtain its Value, namely finish the data item escape.

3) Escaping of data:

ItemChangeText(System::WideStringAStr,TfrxMemoView * mv),the function main to achieve the escape function in text data tag, and the value saved and escaped by parameter Astr , parameter MV represents text data. When the data item loads on the information system, the corresponding relation between the tag data item and the true meaning it represents which means the value in database table field, had been saved in a map container. By traversing the map container, we can find the value represented by the marked text data, namely is the value in map container, and finally replace the marked text data by the value to archive text escape function.

4) Drawing pixels:

SetDevicePixelPerCmX(int pixelPerCmX,int IpixelPerCm-Y),this function sets the resolution adopted by drawing by getting the device pixel, to make sure that the file output resolution consistent with the equipment. Parameter IpixelPerCmX is the per centimeter pixel in the equipment horizontal ordinate, parameter IpixelPerCmY is per centimeter pixel in the equipment vertical coordinate.

5) The drawing of template:

PaintFrxReport(Graphics::TCanvas*Canvas),This function is mainly to achieve to draw the escaped report template on a canvas. Re-painting on a canvas aims to ensure high resolution. For complex curve, will be very blurred, so, we repaint on the canvas to make sure the high resolution, as the print fetal heart rate curve in medical information system requires the output resolution. The key code for redraw template is:

```
Canvas->FillRect(Canvas->ClipRect); //clear up canvas
  for (int i = 0; i < k; i++) {
//Traversal all controls of template
  TComponent* cmp =frxReport->Components[i];
  if(dynamic_cast<TfrxPictureView*>(cmp)) {…}//picture
  if (dynamic_cast<TfrxMemoView*>(cmp))
  {//text
   …
   TfrxMemoView*      mv      =     dynamic_cast<
   TfrxMemoView*>(cmp);
   // text data item change
   String sText = ChangeText(mv->Text)
   …
   }
  if (dynamic_cast<TfrxLineView*>(cmp)) {……}//line
  …
}
```

C. Report Output

After completing the above steps, you can finally output a report. Use the report print class to

generate an example, Initialize relevant data, load information system data, access to device pixel, such as a screen or printer's resolution, call the related function, and other related operations, to archive report output. The resolution of output file is determined by the device.

If you are redrawing the output in an image control's canvas, then you can achieve preview and save function. If you are redrawing the output in a printer's canvas, then you can achieve the print function of report. You need to set the size of canvas when preview and print. The key code is: SetPaperSize(frxReportPrin->pWidth, frxReportPrint->pHeight). The parameter is the Length and width of template. Combining with the medical information system, the final print figure of my article shows as follow:
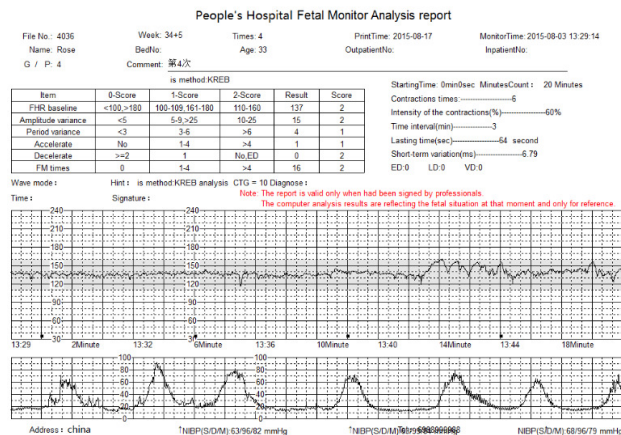

Fig 2 The final print figure

Data items on the template are escaped correctly, normal displayed, like above picture data are properly escaped in the fetal heart rate graphs, text item tags are replaced with the correct value.
So when the information we want to print changes, such as the length of custody to be printed, we can add the corresponding text data [Monitoring time:] [CdsDocument.monitor_minutes] to the template, no need to modify the system code, modify the

template directly can achieve the requirement of printing needs change.

IV.   CONCLUSIONS

In this paper, we elaborate the design and implementation method of dynamic printing function based on report, using report combine with the print function to implement a custom and high-precision dynamic print function. Focus on the report template and the design of report printing class. According to the print demand, when the printed content is changed, users only need to customize the report template, dynamically add or delete data item on the template and dynamically change the template, they can meet the needs of print. By modifying the report template, rather than changing the system code, we can reduce the workload of the system developers. And use the report wizard to design output also saving a lot of work, which is flexible and intuitive, and maintainable. And the modification of this template is very easy, and users are able to modify it by following the formatting. So we only need to perform maintenance on this template, that we can make the print output change according to the change of demand, which achieves a custom and high-precision printing functionality.

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