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The Architecture of Instant-Preview Virtual Printing Server for the Preview Affixation Signature under the Mobile Environment

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Abstract. The printing equipments of Information Technology (IT) have grown rapidly and diversely coping with heterogeneous requirements today, especially for those printers, but dot-matrix printers (line printers) break those rules. Although laser-printers and inkjet printers have become very popular and useful for printing issues, the dot-printers are still not faded out from IT-users, especially for those commercial enterprises. The central characteristics are the carbon-papers that are used for some formal and financial information to be printed on them to offer the customers, suppliers, users, official staffs to sign their signatures via the handwriting. Those carbon-papers printing with signature written one time can be divided over two copies with the same handwriting repeated automatically. Today, the laser-printers or inkjet-printers with high-technology can make printing colorful, high-quality, high-speed and multi-functions, but they are almost impossible to do the carbon-papers printing like the dot-matrix printers.

The previous researches proposed in "Template Printing Script Language (TPSL)" and " Virtual Printing Server (VPS)" have solved the template printing (TP) problems in heterogeneous environment including heterogeneous OS versions, hardware, different brand printers or different printers models. But there are some problems for the mobile environment waiting to be solved with the template-printing problems.

More and more users like to use mobile devices like mobile-phone or tablets PC equipped iOS or Android-OS everywhere. Mobile applications working on the platforms of iOS or Android-OS still face the template printing requirements. If mobile-users sign their signatures on the template-printing papers like PC-users, the touch screen with writable characteristic of mobile devices have become useless and unnecessary. The convenience, simplicity and mobility for mobile devices must enrich new functions based on the issues mentioned above.

The study proposes an architecture to extend the visual printer server (VPS) to facilitate the mobile-users to preview the results of the template-printing on mobile environment and confirms the correct information to write their signatures with theirs mobile devices. Finally the instant-preview virtual printing server (IPVPS) merges the mobile-users' signatures into the formal printing results and sends them back to the mobile-users.

Introduction

Background. The reports of information systems (IS) (processing, storing and retrieving transactions during workflows of enterprises in the study) including Enterprise Resource Planning (ERP), Customer Relationship Management (CRM), Supper Chain Management (SCM), General Ledger (GL), Product Development Management (PDM) and Product Lifecycle Management (PLM) ,etc. are critical results mostly. Most reports are printed on papers via printers and offer executives and managers for governance, planning, administration and management to coordinate the optimal

resources utilization. Based on control and administration by manpower, information sharing on terminals is not suitable for workers and administrators, especially, for those workers and administrators in the factories. The styles by paper-based reports are suitable for those workers and administrators under manufacture environments.

In other way, there are some formal information printed on the carbon-papers (which are official and financial reporting and formal documents to customers, supplier, stakeholders ,etc.) and face requirements to print the enterprise' logo, title, telephone, address, formatted table or printed words, which are pre-printed on those carbon-papers, are used to print some financial reports, purchasing order reports, invoice receipts, packing list, etc. as the official documents. The problems for the mobile users using those carbon-paper printing are a new issue, especially for customers, supplier, important users to sign their signatures on them. With those formal signatures, those carbon-papers reports including billings, receipts, invoices are important certificates for accounting payable or accountable receivable. Furthermore, those carbon-paper are made with many papers piled up are used for users to sign their signatures, then the signed reports can be divided into many independent and formal certificates by each paper. The goals of template-printing offer different copies with the complete same contents for different users indeed.

The previous researches[7] proposed the virtual printer device mechanisms to calibrate printings contents printed in exact positions automatically in spite of different brands or models of dot-matrix printers, different installed OS versions, different hardware ,etc. . The furthermore researches use " Template Printing Script Language" (TPSL)" to facilitate the printing contents in exact position more easy with using the script languages[3,6] executed by "Visual Printer Server (VPS)"[4,8] and merge template-printing and profiles of dot-matrix printer into the exact template-printing reports. Related researches have solved the location-variation issues for the template-printing with dot-matrix printers in heterogeneous platforms[4,7,8]. But the template-printing for the mobile users is still the new problems today.

Motivation. The mobile devices have grown rapidly with the progresses of Information & Multimedia Technology (IMT) recently. Based on the reasons, the embedded systems have become the mobile & commercial toolkits for the mobile devices developments. So the related applications for the template-printing based-on previous researches[4,7,8] must make the new extended mechanisms with this critical requirement.

The study wishes to propose an architecture of using visualized methodology under the mobile environments with mobile devices based-on iOS platforms or Android-OS platforms.

Goal. The study wishes to achieve the following goals:

- Make an architecture of the virtual printing server as the web-service instead of re-constructing previous platforms.
- Integrate the mobile devices and the virtual printing server to use the instant & visual handwriting on the touching screen instead of using a pen to write on the printed papers under the mobile environment.

Literature Survey

The Reporting Systems for Information System. The reporting systems of information system could be divided into two types. (a).Type one is the text mode printing. This is the fundamental function for any computer language. The problems for such tools are lacking functions or mechanisms to control the result of the printing. The way of the printing is to print the contents to the text files and send the text files to printers. So the positions for the printing results could be known by the developer at first. If the runtime environments change, the positions for the positions of the printing results will be changed from the original positions.

In spite of such problems, developers use the add-on application like Chinese system (like Eten Chinese System) to improve the printing problems by adding ET printing control code (e.g. ~p24t24w2z2) to adjust the font types and sizes, even the char spacing and line spacing. But the applications don't still handle the homogeneous printing positions for the template-printing.

(b).Type two is the external printing tool like the report generators(e.g. Fox pro ，Visual Fox pro[1]，Visual basic[2]，Delphi，Power builder，Oracle developer 2000,etc.). The report generators are very powerful and easy to use as the tools of designing reports. Those tools improve the performance of application developers due to the heavy duty of mass types reports existed in each information systems. Especially, the visualized environment (What You See What YOU Get (WYSWYG)) [5] for the tools help the designers to design more exact and precise report results than Type one mentioned above.

The Issues for Visual Printer Device Server. The logical and physical positions differ each other including application OS versions, hardware, printer brands or model-types, etc. . Under the type one or type two infrastructures, the developers always know the exact configurations including hardware, software, printer brands, printer model-types and installed OS versions ,etc. . So the final calibrations of all reports follow those configurations, but the essential principles of the printer constrains refer in sec.3[4,7,8] force to re-adjust and to re-modify the applications to fit the new requirements based on the new configurations. If m types(OS versions) * n types(printer brands) * k(printer model-types) cause the endless program-rewriting jobs and essential problems of template-printing as shown in Table 1 .

Table 1 The Printer Banner of Different Printer Models

Printer Banner									
OS	Model	Resolution	Page Size	Print Size	Up Banner	Down Banner	Left Banner	Rigt Banner	Feed Banner
WINDOW 2000	LQ670	180DPI	215.9/279.4	210/271	4.23	4.23	3.10	3.10	3/5
	LQ2500		215.9/279.1	216/279	0	0	0	0	3/5
	LQ500		215.9/279.4	203/279	0	0	6.35	6.35	3/5
	LQ670	360DPI	215.9/279.4	210/271	4.23	4.23	3.03	3.03	3/5
	LQ2500		215.9/279.1	216/279	0	0	0	0	3/5
	LQ500		215.9/279.4	203/279	0	0	6.35	6.35	3/5
WINDOW XP	LQ670	180DPI	215.9/279.4	210/279	0	0	3.10	3.10	3/5
	LQ2500		215.9/279.1	216/279	0	0	0	0	3/5
	LQ500		215.9/279.4	203/279	0	0	6.35	6.35	3/5
	LQ670	360DPI	215.9/279.4	210/279	0	0	3.03	3.03	3/5
	LQ2500		215.9/279.1	216/279	0	0	0	0	3/5
	LQ500		215.9/279.4	203/279	0	0	6.35	6.35	3/5

The mechanisms of the visual printer device server[4,7,8] extend the approaches of the virtual coordination and calibration-parameters to solve the heterogeneous physical position problems of the template printing . It separates the gaps between the physical layers and the application layers, so the developers of the software and applications don't need to consider the changes of the physical layers (i.e. OS versions , printer brands or printer model-types , etc.) and leave such problems to VPDS[4,7,8]. The developers of the software and applications will focus more on detail designs instead of designing those boring repeated printing reports .

The Mechanism based on Extended Visual Printer Device Server

The Transform from the Logical Coordination to the Physical Coordination. The template-printing problems face the printing regions issues when the printing works start. The print banner (PB) and machine banner (MB) is different under different conditions (i.e. operation system versions, printer brands, type models and developing tools).

The mechanisms for the study use the principles of coordination transforming to solve such problems[7,8]. The algorithm lists following:

Step 1 . Let pos.x and pos.y express the locations to print the contents.

Step 2. Let pos(1..n).x and pos(1..n).y to express the locations of the items(1..n) of the total items for the printing contents

Step 3. Calculate the positions of all items(1..n) and store the data of the positions into pos(1..n)

Step 4.Find the most left-top corner of all items. Let origin position equal to the position.

Origin.x := min(pos(1..n).x) , Origin.y := min(pos(1..n).y)

Step 5. Transform position data into logical position data
for I := 1 to n
Logical_Pos(i).x = pos(i).x – origin.x
Logical_Pos(i).y = pos(i).y – origin.y
Step 6. The logical positions are Logical_Pos(i). The physical position is Logical_Pos(i)+origin
The results infer to the formula Physical positions := Origin + Logical_positions+Calibrate parameters
Step 7.Changing the suitable origin.x and origin.y for different printer machines to fit the real physical positions.
Step 8.We can use the calibrate.x and calibrate.y to fit except conditions for special case.

Formula :Physical Position = Origin Position + Logical Position + Calibrate

Physical pos(i).x = Origin.x + Logical_pos(i).x + Calibrate.x
Physical pos(i).y = Origin.y + Logical_pos(i).y + Calibrate.y

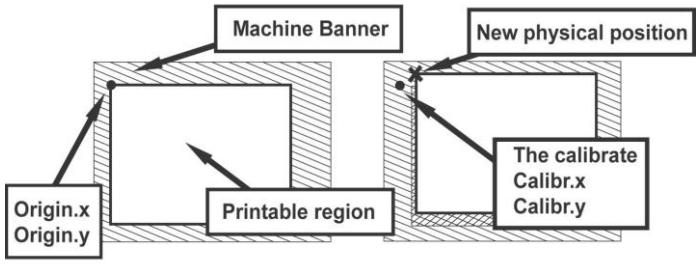

Figure 1 The Calibrate for the Machine Banner under the Heterogeneous Platforms

We can see the printed report as shown in Figure 2 and its printing positions are wrong and displacements happen because of changes of printer model. So the study uses the calibrate parameters to solve such problems to get exact printing results as shown in Figure 3. So the mechanisms of the transform from the logical coordination to the physical coordination is workable.

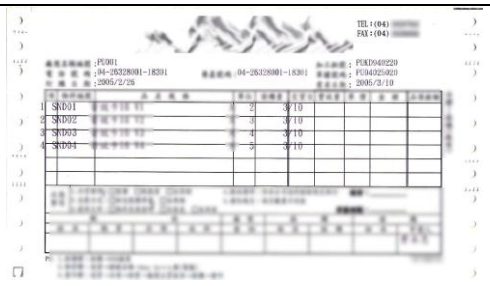

Figure 2 Uncalibrated Printed Report

Figure 3 Calibrated Printed Report

Template Printing Script Language. The study uses the previous techniques, called template printing script language[4], to implementation the mechanisms mentioned above. The mechanisms of template-printing translate the TPSL scripts as shown in Table 2. An example describes following as shown in Table 2.

Table 2 The samples of Template Printing Script Language

Template Printing Script Language	Descriptions
BEGINDOC	Start printing
Setfontdefault	Set font to default
Locate 250,150 Lprint “Tsao, YungChung”	Locate the logical position to 250.150 Print the text “Tsao, YungChung”
Locate 700,150 Lprint “Tsao, YungChung”	Locate the logical position to 700,150 Print the text “Tsao, YungChung”
Locate 250,250 printdate “94/02/26”	Locate the logical position to 250,250 Print the date text “94/02/26”
Locate 700,250 printdate “94/02/26”	Locate the logical position to 700,250 Print the date text “94/02/26”
Locate 250,350 CommaLPrint 200000	Locate the logical position to 250,350 Print the account format text 200,000

Locate 700,350 CommaLPrint 200000	Locate the logical position to 700,350 Print the account format text 200,000
Locate 250,450 printdate “94/02/26”	Locate the logical position to 250,450 Print the date text “94/02/26
Locate 700,450 printdate “94/02/26”	Locate the logical position to 700,450 Print the date text “94/02/26
Locate 950,900 Lprint “Tsao, YungChung”	Locate the logical position to 950,900 Print the text “Tsao, YungChung”
Locate 950,1000 ChineseLPrint 200000	Locate the logical position to 950,1000 Print the Chinese number text “NT$200,000”
Locate 950,1100 CommaLPrint 200000	Locate the logical position to 950,1100 Print the account format text 200,000
ENDDOC	End and turn on the printer machine

The Architecture for Instant-Preview Virtual Printing Server

The Work-flows for Mobile Apps. The mobile users use mobile-devices with apps to view the reports via Internet. The work-flows of apps executions on mobile-device need image-viewer instead of printed-paper. So we can see the work-flows of apps executed in mobile-devices as shown in Figure 4. When users want to view the template-printing reports, apps will send template-printing requests to virtual printing server (VPS) and transmit the template-printing command, which call template printing script language codes (TPSLC) to the kernel of virtual printing server (VPS). We can see the system flows as shown in Figure 5. The virtual printing server (VPS) will translate the TPSLC into template-printing image files and send them back to instant preview agent modules for mobile users to preview their requests.

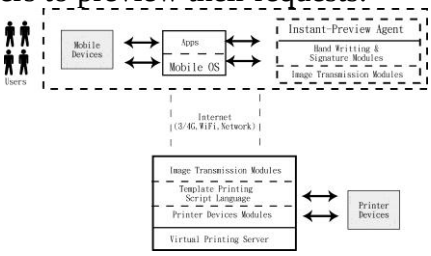

Figure 4 Work-flows for Apps

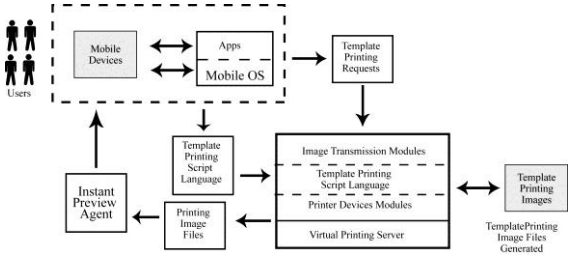

Figure 5 System-flows for Template-Printing Requests

The Work-flows for Signature Processes. The mobile users need to sign their handwriting on those template-printing requests. (a).First, the mobile user request the reports of template-printing as shown in Figure 5 to get the printing images with printing-contents. (b),Second, the study proposes an architecture to achieve the goals for the mobile users as shown in Figure 6. The mobile users preview the image files with printed contents to confirm the exact contents and use the mobile devices to write their signature via touch-panel and generate the signature image-files. The apps will send the signature image-files following with template-printing requests to virtual printing server (VPS) and feedback the merged-image files to themselves as shown in Figure 6. The mobile users confirm their signatures on the merged-image files to virtual printing server (VPS)to finish the complete work-flows.

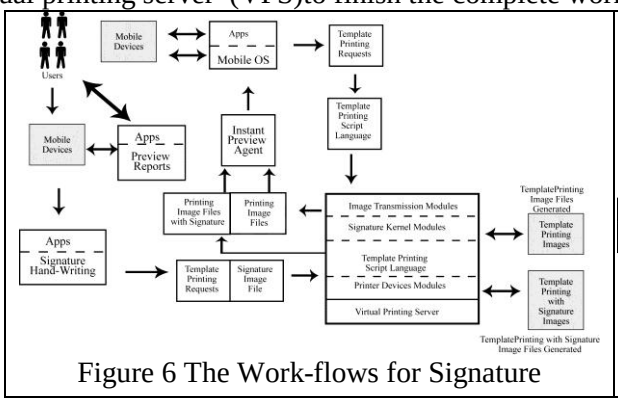

Figure 6 The Work-flows for Signature

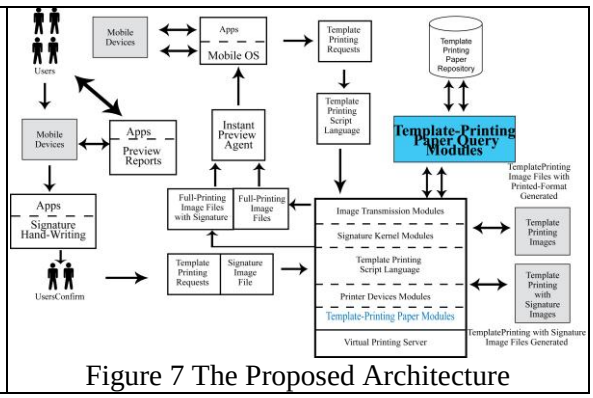

Figure 7 The Proposed Architecture

The Proposed Architecture for Instant-Preview Virtual Printing Server. The architectures of previous researches[4,7,8] have some critical problems in their constrains. The virtual printing server (VPS) is the paper-based mechanism, so the users must view the reports with real printed-paper instead of image-file only. But the mobile users don't want do the same works as those users based on paper-based architectures. So the study enhances the system architectures based on previous

researches[4,7,8] and proposes a new system architecture as shown in Figure 7 and add three modules including template-printing paper query modules (TPPQM), template-printing paper modules (TPPM) and template printing paper repository (TPPR). So the proposed architecture for instant-preview virtual printing enhances the template-printing images with printed-format queried by 'template-printing paper query modules (TPPQM)' from ' template printing paper repository (TPPR)'. The new mechanism allows the mobile-users to preview their printing-images with full information and contents different from previous users based on paper-based architecture. The mobile-users can write their signatures to the system after the confirmation the exact contents and review the fill merged image-files. The study creates a new mechanism and lets the mobile-users use those mobile apps with template-printing functions without the real paper printed.

Conclusions

The study proposes the non-paper based architectures for those mobile-users using the template-printing functions based on previous researches[4,7,8]. The contributions of the study enhance the enterprises' applications into mobile environments and reduce the paper-resources waste. Those approaches in the study maybe give the better reasons and motive for more enterprises to upgrade their information system under the mobile environments in the future.

In the summary, the study is a good paragon of green design (GD). The study inherits not only the original mechanisms of virtual printing server (VPS) but also enhance their scalability and usability under the mobile environments. The related extensions of the study can use in some areas like credit card, package-delivery certification, attendance sheet, payment, etc..

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