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TITLE

Virtual Printing System for Output Preview

ABSTRACT

A Virtual Printer Module, residing in the Operating System, manages printer output without the need to query the capabilities of the printer. When a printer is installed on a User Machine, the printer's firmware and kernel are stored in a database in local storage. The Virtual Printer Module is capable of executing this firmware and kernel to produce a digital version of the printer's actual output. The Virtual Printer Module also uses the database to store format information files to provide the functionality to open, display, and format a plurality of file types for use with printers of different capability. Furthermore, the Virtual Printer Module also provides a graphical user interface for the user to preview and modify the formatting settings of an image in true-to-life form as it will appear on page.

1. BACKGROUND

Problem/Opportunity

Since output devices vary widely in capability and file compatibility, it is often the case that documents designed for one device may not be displayed consistently on a different device. A document formatted to be viewed on one output device may produce less than adequate results on another output device. For example, a file displayed digitally on an LCD computer screen may not be displayed as intended when printing the same file using a printer.

Current systems exist where a printer may be queried to produce true-to-life previews based on a connected printer's capabilities; however, these systems require the printer to be attached to the computer. Since a user may wish to produce true-to-life printer previews on a mobile computing device, or while away from a printer, there is a need to for a system that provides a true-to-life print preview without querying a connected printer.

Background Publications

Previous publications have attempted to address the problems associated with document-device compatibility. However, none of the previous publications were able to address this issue without interrogating printer capabilities.

US Patent Number 7508943 describes a system for storing and playing media files over multiple platforms using a removable storage device. The removable storage device contains the media file, and a plurality of media player applications for several different operating systems, such that the file can be played back on each of these systems without the need for additional software or file conversion. However, this system requires querying the host device to determine the appropriate version of the media player to use.

US Patent Number 6023714 describes a system for dynamically adapting a file's formatting for use with a particular device. The system first queries the output device for that device's capabilities, and then selects an appropriate style sheet to better suit the characteristics of the output medium. While this system does reformat documents appropriately, it does so by querying the display characteristics of the output device.

US Patent Number 7239412 describes a system for creating a true print preview using a method and apparatus contained in a printer. The system sends the output to the printer, which returns a true-to-life representation of what the printed document will look like. However, this system requires querying the printing device and passing the file through the printer itself for this preview.

2. SUMMARY OF THE INVENTION

Invention Summary

The operating system contains a Virtual Print Module, which is responsible for managing file output to all printers which may be connected, either directly or through a network, to a personal computer.

Whenever a printer is installed on the User Machine, the printer firmware and kernel are stored in a Database in local storage. The Virtual Printer Module executes this copy of the printer firmware and kernel to simulate how that printer processes the information sent to it when printing a file. This allows for a User Machine to provide a preview that is true to the printing capabilities of a given printer.

The database also contains records of format information files for multiple file types, such that the Virtual Printer Module can operate as a standalone file viewing system. For example, when viewing text, the Virtual Printer Module would be able to adjust characteristics such as margin size, text size, page size, line spacing etc. to better format the document to the printable area of the printer. Using a different format information file, the present invention may support viewing and modifying presentation or image files to appropriately map attributes such as orientation, aspect ratio, scaling, etc. to printed page dimensions. This allows the Virtual Printer Module to not only be compatible with most

file types, but also makes the module easily adaptable to changes in file format or to new file formats.

Whenever a user chooses to print a file from an application (i.e. web browser, word processor, spreadsheet, etc.) the application signals the Operating System, which in turn activates the Virtual Printer Module. The Virtual Printer Module processes the file to be printed by executing the firmware and kernel for an installed printer, and opens a window in the GUI providing a preview and editing window for the output as it will appear when printed on paper. The user then has the option to select a preview for any of the installed printers for review and printing. The GUI window will also provide graphical user controls over printing properties based on the file type, including but not limited to resolution, color, margins, line spacing, font size, page layout/orientation, paper size, and aspect ratio. This allows a user to effectively preview and reformat a document for any given printer using a true-to-life preview, without needing to query the printer for its printing capabilities.

Unique Concepts

The unique aspect of the present invention is the ability of the Operating System to execute a locally stored version of the printer firmware and kernel to produce an accurate preview of the printer output. It also allows the OS to adapt the output characteristics of a file without the need to query a printer for its unique capabilities. Furthermore, it also provides for an OS-integrated print preview system.

3. DESCRIPTION OF THE INVENTION

Description of Elements of the Output Control Module in **Figure 1**:

The User Machine is a computing device, such as a desktop or laptop personal computer.

The OS is an operating system residing on the user machine, such as Linux, responsible for managing all hardware and software processes.

The GUI is the graphical user interface of the operating system, which provides a graphical means for the user to interact with the system.

The Virtual Printer Module is a module within the OS that executes stored printer firmware to preview files for printing on printers connected to the user machine directly or through a network. It also provides a user interface to edit and reformat a file to adjust for different printer capabilities.

The DB is a database containing copies of the firmware and kernel for installed printers for true-to-life file preview processing, and also contains format information files for a plurality of file type extensions for the Virtual Printer Module to allow for file editing and reformatting.

The format information files (not pictured) contain formatting and data structure information for a plurality of file types to provide Virtual Printer Module with the functionality to open multiple different types of files.

The Network represents any type of network, such as a LAN, WAN, or the internet, through which a User Machine can access a remote printer.

The Printers (A, B) represent a plurality of potentially connected printers connected to the user machine. Printers may be connected directly to a user machine (Printer A) or through a network (Printer B).

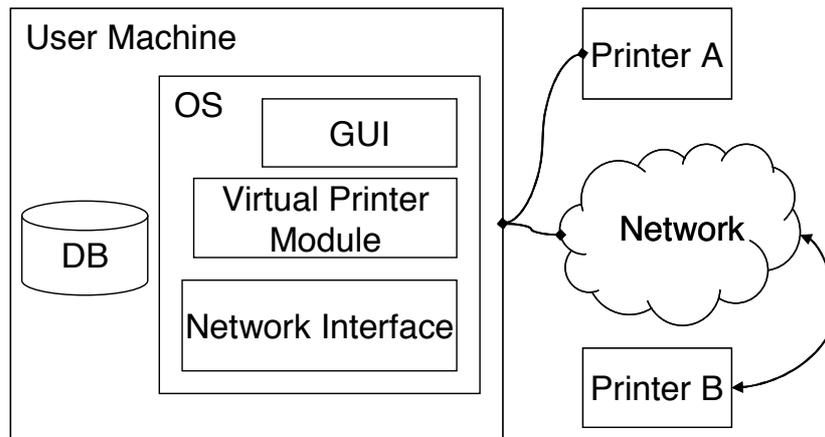


Figure 1. Diagram of the Output Compatibility Module System

Figure 2 depicts the method of using a Printer with the Virtual Printer Module.

In step 1, the User selects the “print” command in an application (such as a web browser, word processor etc) to print a document.

In step 2, the application signals the Virtual Printer Module, which uses the printer firmware and kernel stored locally in the database to process the document for true-to-life previewing.

In step 3, the Virtual Printer Module opens a GUI window, which prompts the user to select a printer to use. Upon selecting a printer, the GUI window displays a true-to-life preview of what the printed document will look like if that printer is used.

In optional step 4, the User adjusts format settings (i.e. page size, orientation, aspect ratio, scaling, margins etc) in the Virtual Printer Module GUI window. Each time a setting is changed, the document is re-rendered using the locally stored copy of the printer’s firmware and kernel.

In step 5, the Virtual Printer Module forwards the printer-formatted document to the printer for output.

The method ends.

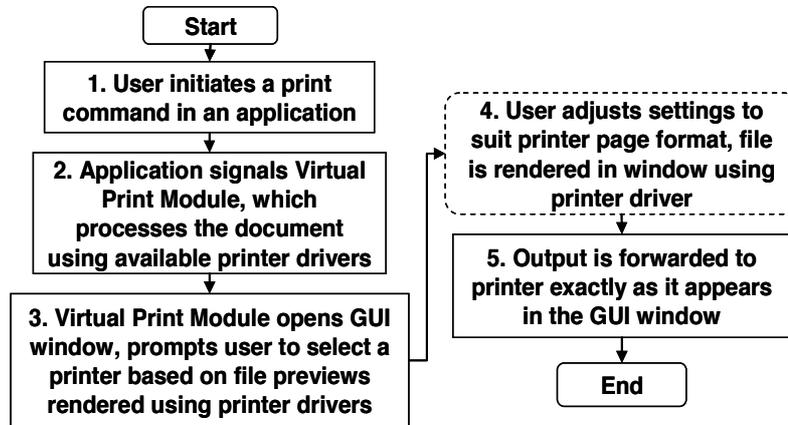


Figure 2. Method of output through the Virtual Printer System