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November 2022

## A METHOD TO MITIGATE PAPER JAM AT PRINTZONE FOR INKJET PRINTERS

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### Recommended Citation

INC, HP, "A METHOD TO MITIGATE PAPER JAM AT PRINTZONE FOR INKJET PRINTERS", Technical Disclosure Commons, (November 04, 2022)

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## ***A method to mitigate paper jam at printzone for inkjet printers***

This is a solution to mitigate paper jam using spot sensor mounted on carriage. Spot sensor is a light emission and light receiving sensor. With carriage movement, spot sensor shines light on printzone and reads reflected light to determine paper presence, printed pattern response etc. This article describes two applications using spot sensor: detect paper skew before and while printing; detect paper jam in printzone after print job.

After paper is picked and fed into printzone, paper tends to have more skew if paper is not loaded into tray nicely, or width adjustor is not adjusted properly. In these cases, paper may have bad skew to lead to paper jam in printzone and cause printhead crashing on jammed paper. Below algorithm is to detect paper skew. If skew is worse than a threshold, abort printing and eject paper slowly to avoid printhead crash.

### **Top skew detection**

This is to detect top skews in media that happened before going through the printzone.

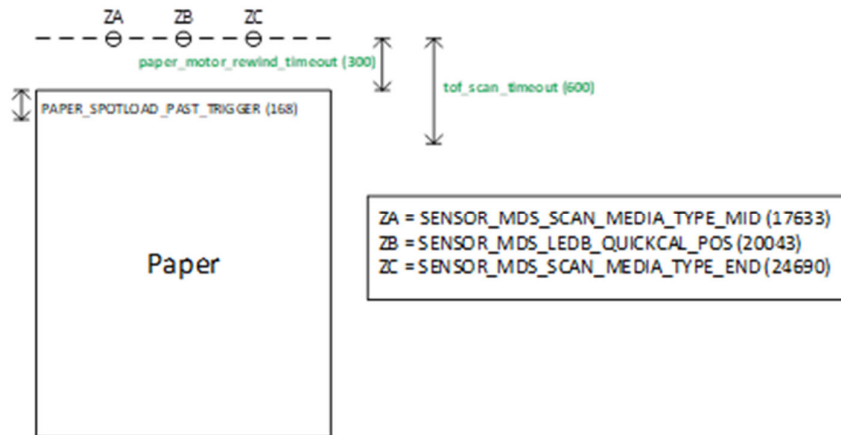


Figure 1: Top skew detection

#### Details

- 1) When a print job is triggered, the printer will base on the user set media size to estimate the ZA and ZC locations
- 2) Move the carriage to the ZA position for Top-Of-Form detection. Record the distance the media move before spot sensor detects the media as YA
- 3) The media is reversed, and the carriage is moved to the ZC location. Move paper forward, and record the distance the media move before spot sensor detects the media TOF as YC
- 4) Based on the delta Y distances
  - a. The media skew could be calculated based on  $(YC-YA)/(XA-XC)$
  - b. If the skew is within the printer allowable skew threshold: printing will proceed; if skew is higher than skew threshold: abort print, slowly eject media and prompt to user that skew is too much and need to reload paper nicely.

### **Side skew prediction**

This is to detect skew in the media that happens during printing, by checking paper left and/or right edges locations.

#### Details

- 1) Once the printer passes TOF skew detection, printing starts.
- 2) At the end of each print swath (or after a few print swaths) the carriage will turn on spot sensor to scan the side edge (Side-Of-Form)
  - a. This flow can be integrated into carriage movement during printing, not an extra move to detect SOF, therefore there is less impact to throughput compared with an extra carriage scan move after a print sweep move.
  - b. If the detected SOF exceeds the allowable distance from the zero column, printer will abort print job, slowly eject media, and prompt user to reload the media nicely.
- 3) SOF positions on different print swath are also compared to see if the SOF position shifted drastically even if individual points are within allowed range. Shifting in SOF position drastically means skew is too much. Same as above, bad SOF position shifting will also trigger print job aborted.

#### **Media jam in printzone after print job**

This is to detect paper jam after print job. On many inkjet printers, there is no sensor to detect paper being successfully ejected. In some cases, paper is jammed after printing, however as it may not cause carriage jam, printer may incorrectly report print job successfully done. When user finds out and open printer door to clear paper jam, printer may respond as ink change request and starts to uncap and move carriage to ink change position, which may crash on user's hand. The following algorithm detects printzone jam after printing:

#### Details

- 1) After each printed job, turn on spot sensor and carriage moves to scan printzone to check if there is high reflection. if there is no paper, response is low level. If there is paper or paper debris, there will be high reflection points, which means paper jam.
- 2) If there are jammed media inside printzone, prompt user to clear jammed media.

#### **Smart feature to maximize the customer experience**

User can enable smart feature to allow the printer to enable/disable the different types of skews prediction, to optimize speed and user experience

- 1) The type of sub-solution can be set during out of box depending on the region and date the user set
- 2) Using the region + date: the printer will know the climatic conditions and seasons the printer will experience
  - a. we have the profile of the different skews occurrence rates under different printer climatic conditions
  - b. Thus, it is possible to make high probability prediction of the different skews the user will experience, e.g., during high humidity season like wet and humid raining season, the printer will prompt and suggest to the user to enable skew detection and jam detection etc
- 3) This will be constantly updated in FW upgrade based on the following
  - a. Telemetry data collected from the different printers
  - b. Field failure/customer rating
- 4) The printer will also select the different skew prediction on each printed page, based on high probability related skew the user will experience based on
  - a. Size and type of media selected
  - b. Ink density of print files of each page to be printed
  - c.

***Disclosed by Tong Nam Samuel LOW, Wei Pau KIAT, Aiqiang YANG, Hong Hor THE, HP Inc.***