

The Importance of Software in Managing and Maintaining Image Quality

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DFE Atlas User Interface Machine Control Atlas Server Print Controllers Drive Electronics IDS Ink Systems







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Comprehensive Software Platform

- Software for end users, machine development, commissioning and support
- Single platform to cover many products
- Supports scanning, single pass, directto-shape and custom applications

Print Systems Integration

- Datapath / electronics
- RIP & Workflow (PDF-VT, JDF, variable data)
- Ink delivery / cleaning systems
- · Vision, monitoring, verification
- Automation, motion, transport
- · PLCs, heaters, dryers, UV curing



Quick Route to Market

- Rapidly develop user interfaces using production-ready components
- Enhance, restrict and customise components for your application
- Compatible with existing software / system platforms

SDK Module Licencing

- Fully customisable interface including fonts, icons, colours and branding
- Easy-to-implement language localisation
- Complete GUI control with the ability to create tools
- Integrate with third-party software

Introduction



Nothing is perfect and digital printing is no exception

Intelligent image management

- Colour correction
- Linearization
- Nozzle density correction
- Nozzle out compensation
- Printhead stitch correction
- Ink flow correction
- Geometry correction

Closed loop vs low latency

 How quickly does correction need to be made?



Real-time workflows





Mime entry points







Colour management



Screening and nozzle correction







Print queue to hardware



Achieving Flat Colours

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- Inkjet systems need to:
 - Stitch printheads without visible joins
 - Print large areas of solids/flat colours
- Drop volumes not always consistent across printhead
 - More apparent the more heads you have in an array
 - "Non-linearity" in drop volume
 - Even small difference can affect final print particularly areas of solid colour
 - We want uniformity flat colours
- Lots of reasons this can happen:-
 - Printhead manufacturing issue drop ejection may not be consistent
 - Temperature variation in ink system affects ink viscosity
 - Piezo activity heavy use of some sections of printhead creates warm areas
 - Electronics uncalibrated/low quality electronics may affect drop volume





Printhead Density Correction

Electronic/printhead solutions

- Depending on printhead technology
 - Trim each nozzle/cluster of nozzles/nozzle bank
 - Trimming can introduce drop alignment problems
 - » (Tuning for volume will modify velocity)

Image correction – offers greatest capability

- RIP'ed data (contone or screened) can be manipulated to:-
 - Reduce the number of drops in given area, or
 - Reduce the size or value of the greyscale drop in a given area





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Digital Printhead Linearization (via image correction)





Linearized printhead —



Hard Stitching - Masking



- Masking (Hard Stitching)
 - Nozzle on/nozzle off
 - Wide variety of options
- Stitches can massively improve output quality & different applications
 benefit from different strategies



Soft Stitching - Greyscale



•Greyscale stitching makes full use of the greyscale capabilities of the head

- Slowly reduces the density of the image printed by one printhead while increasing the density printed by the next printhead
- •Only adds value over masking in areas where the density of the image is greater than the smallest drop size





Printhead 2









Missing Nozzles

- Nozzle sizes are getting smaller
 - More easily blocked or deflected
- Large print bar arrays
 - Many more nozzles
 - Higher probability of issues and lower MTBF
 - Need coping strategies
- Strategy 1 : Double Up Redundancy
 - Add second row of printheads per colour so when one nozzle fails another can be used
 - Expensive
- Strategy 2 : Hide the problem
 - Identify where a nozzle is faulty and spread the jetting responsibility to neighbouring nozzles and/or colours





Nozzle Out Compensation

Isolated nozzles work best

- Clusters of nozzles much more difficult to hide
- Technology works best where there is some substrate bleed/drop overlap

Many different strategies exist using neighbouring nozzles

- Correction in contone or screened data
 - · GIS believes best results achieved with contone correction
- Hide error in same colour plane to neighbouring nozzles
- Hide error in other inks in multi-ink backgrounds
 - If Cyan nozzle fails could add a little black to hide white space
- Works best in mid & light mid tones
 - Also improves dark tones
- Helps disguise/makes the missing nozzle less visible
 - Less white space
- Numerous patents exist



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Nozzle Out Compensation





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Ink Flow Compensation



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Geometry Correction



Challenges of Finishing



- Key challenge is alignment & registration with pre-printed substrate
 - Pieces/sheets or in-line web
- Many different possible distortions (image and/or media) can be solved by:-
 - Mechanical
 - Vision systems + software



Translation (X & Y)

- Product detect (X translation)
- Feeders or software offset (Y translation)



Rotation

•Feeders

• Vision system + fiducials + software

Challenges of Finishing





Trapezoid / Skew

• Vision system + fiducials + software

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Stretch and Compression (X & Y)

Vision system + fiducials + softwareEncoder + product detect



GIS Correction Map For Finishing Layer (inverse of error) Mesh based correction accurately places finishing data in the desired location. Handles all translation, rotation, stretch, compression and skew as well as localized distortion correction

- General software conversion approach
- If you can measure the error it can be corrected

Tubes, Cones & Tubs

- Tubes well established/well understood technology
- Cones or conical/tapered shapes
- Software correction required?
 - Typically no, for small area coverage
 - Yes, for significant or full wrapping
 - Corrects nozzle alignment
 - Provides density correction
 - Ensures no dot gain issues
 - Ensures no screening artefacts
- Tubs

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- Required corrections change during the print
 - Often from pixel to pixel
 - Multi-dimensional nozzle, density and screener correction technology can be adjusted to each surface type and associated application process









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Thank you – Any Questions?



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