Inversion of an Experimental Input-Output Color Map for Color Correction.

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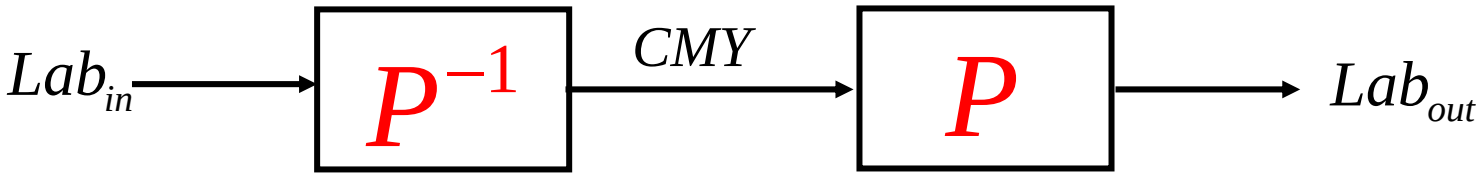
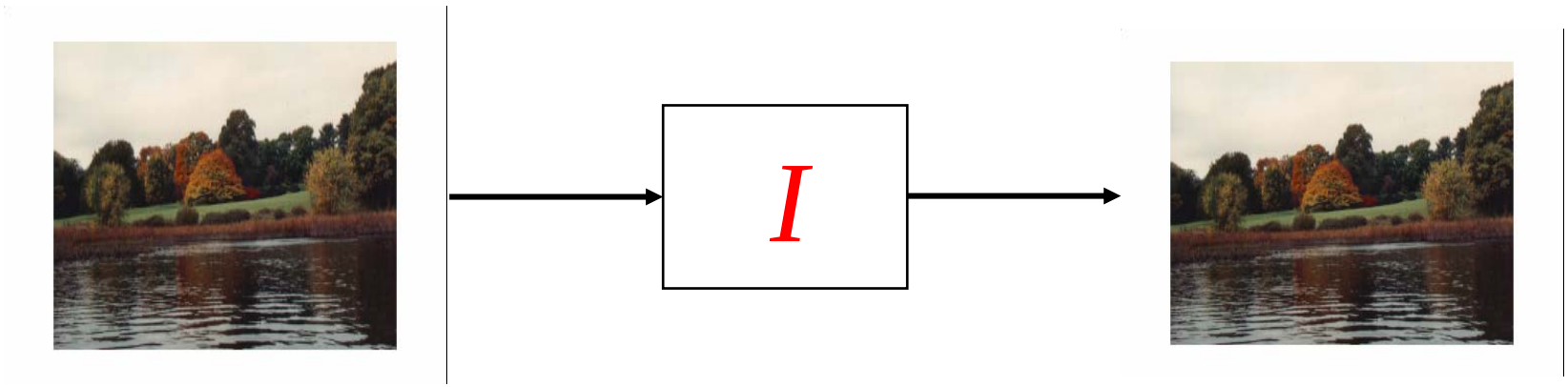
A new algorithm to compute printer inverse LUT with structured input nodes from unstructured experimental data is developed. The algorithm is a gradient-based optimization method with starting point generated through an iterative techniques. The algorithm minimizes ΔE color difference between input and output image.



Input Image

Output Image



$$\Delta E = \left\| Lab_{out} - Lab_{in} \right\|$$

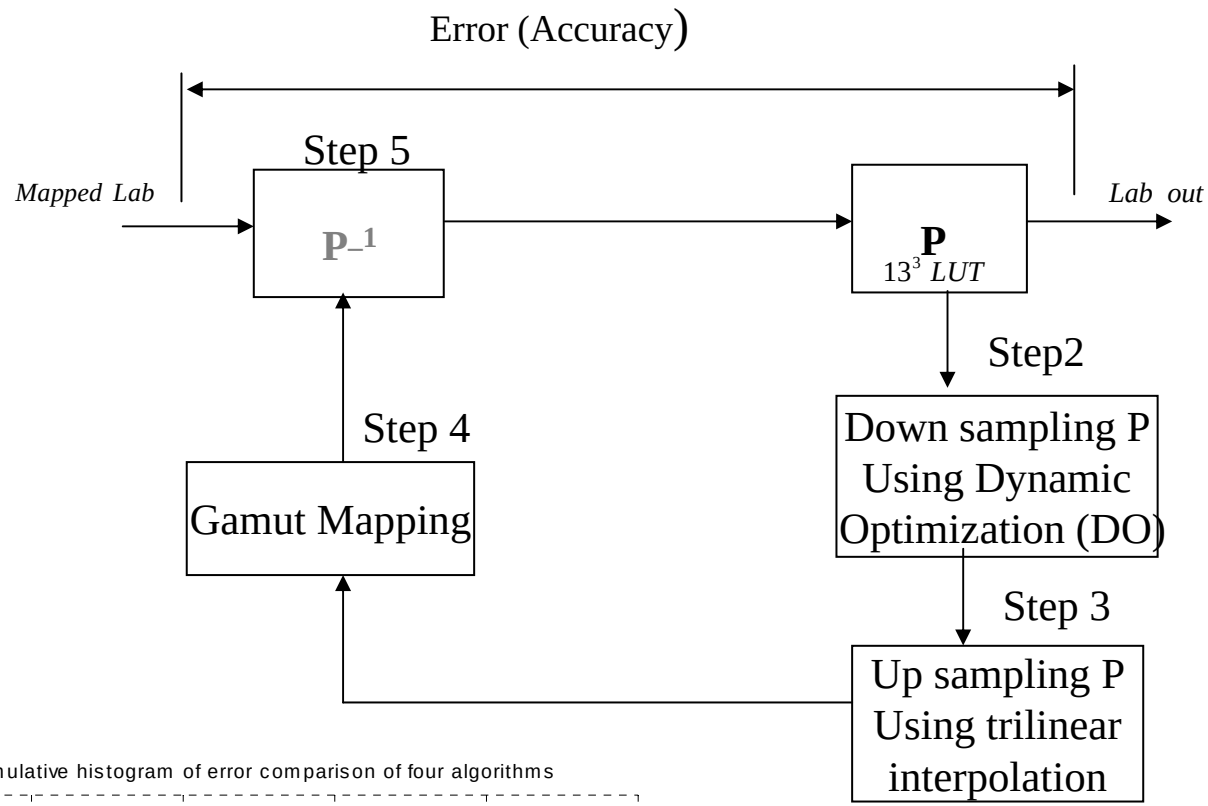
Color Correction

Problem :

One of the most crucial challenges facing today's printer manufacturers is to design printers that accurately and consistently reproduce the desired colors. This is a difficult task because the transformation from the printer's input color space to its output color space is non-linear and drifts over time. A color correction system is needed to account for these variations in order to accurately and consistently reproduce the colors in printed images.

Solution :

A forward printer map is a practical and accurate model of a printer. This forward map takes the form of a multidimensional look-up table and is constructed by performing input-output color experiments on an actual printer. The inverse of this forward map, called the inverse printer map, is needed to convert an input color specification in a device-independent color space to a color in the printer's device-dependent color space before being presented to the print engine. If the inverse printer map is accurate, the print engine will produce a color reproduction that closely matches the original device-independent color specification.



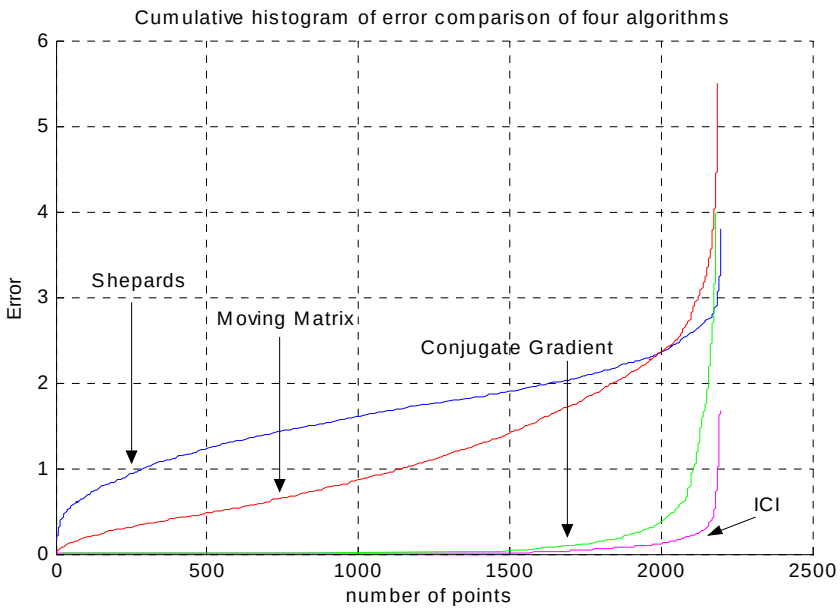


Figure: Cumulative histogram of error comparison of four printer inversion models

Space-Time Block Codes

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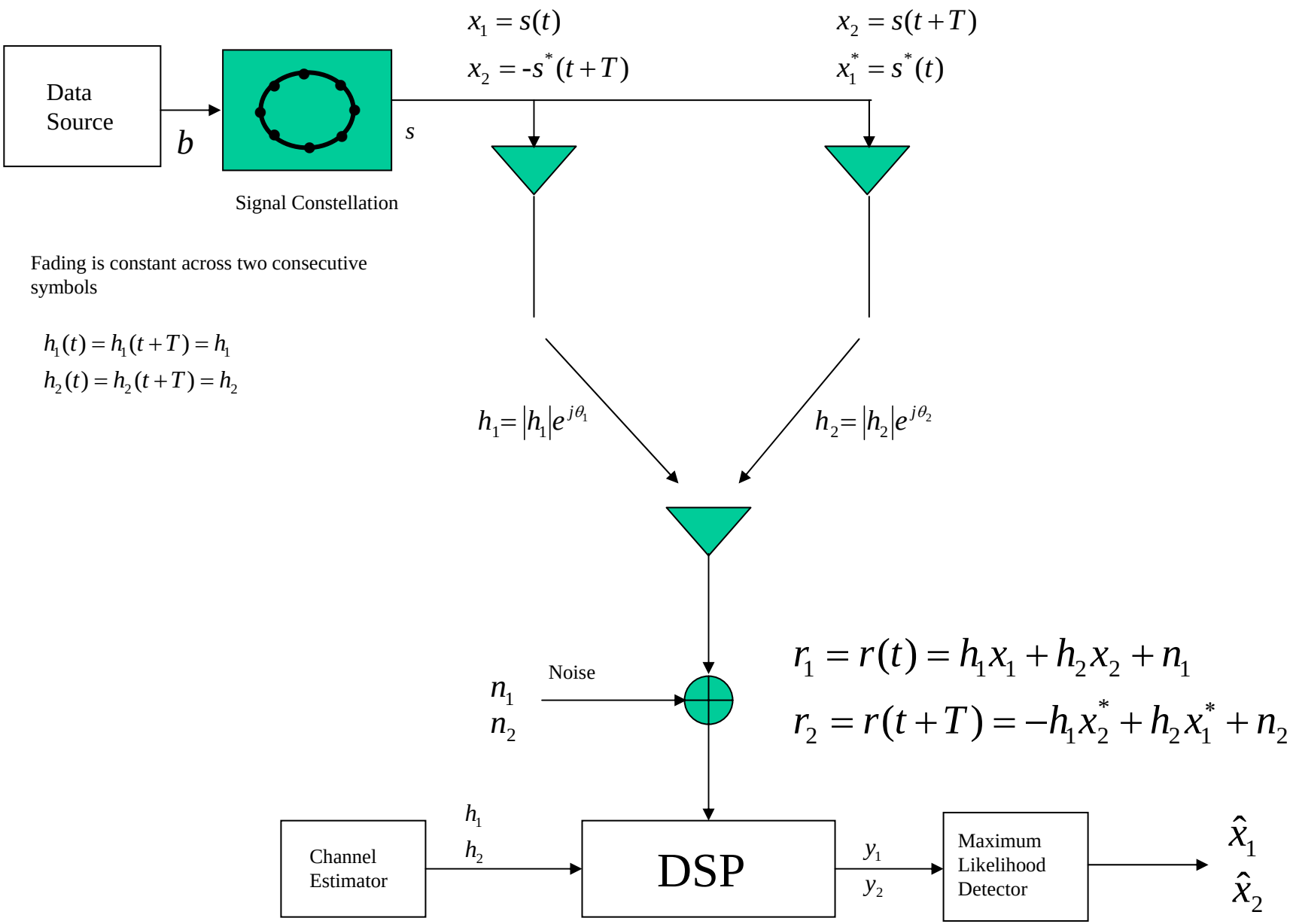
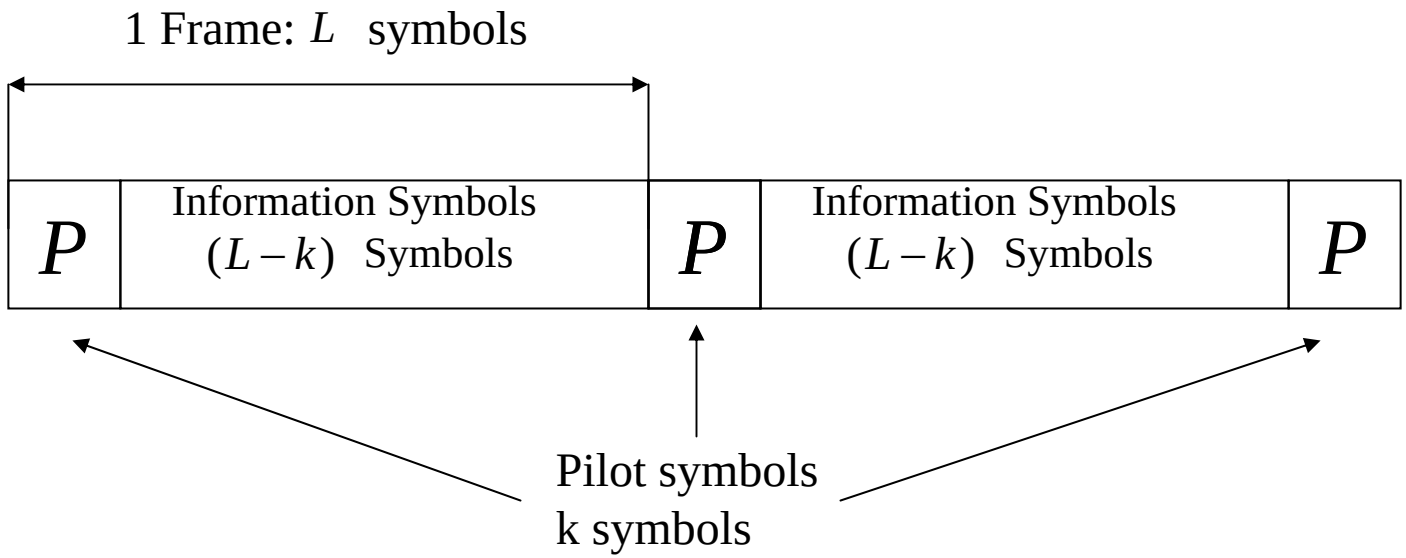


Channel Estimation (Estimating Fading Coefficients)

- Pilot symbols are periodically inserted into the data symbols to estimate the fading.
- Data is formatted into frames of L symbols, with the first k symbols in each frame used for pilot symbols.



- Fading coefficients corresponding to the pilot symbols are estimated using maximum likelihood criteria. The remaining fading coefficients are then interpolated using: Band-Limited Interpolation , Linear Interpolation, Cubic Spline Interpolation

Channel Estimation (Estimating Fading Coefficients)

Simulation Results: BER vs. SNR for 4-PSK using Band-Limited Interpolation & ML channel estimator