

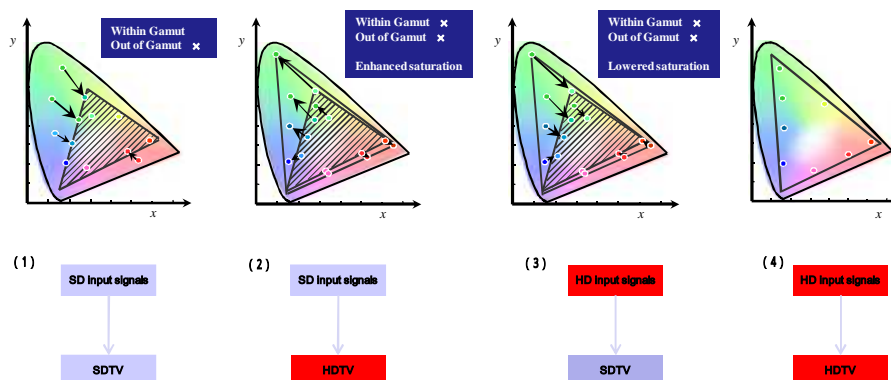
# An Analysis of Practical Gamut-Mapping Algorithms on TVs

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## Input Signals and Display Devices



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## Assessment of Three Gamut-Mappings

Reproducing the input signals...

1. As is onto a different-gamut display device.
2. After white-balance correction.
3. After color conversion w.r.t. the correct white point and the gamut of the input signals.

Input signals ITU-R BT.709

Display device SHARP 46-inch RX5

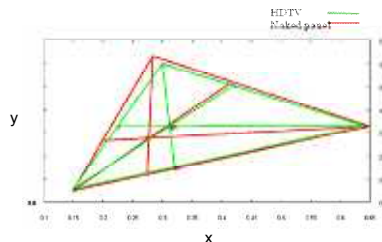
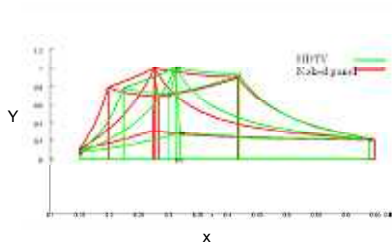
- 1920\*1080 pixels, CCFL backlight, max. 450 cd/m<sup>2</sup>, larger gamut than HDTV input signals.



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## Method I: Direct Reproduction of HDTV Signals

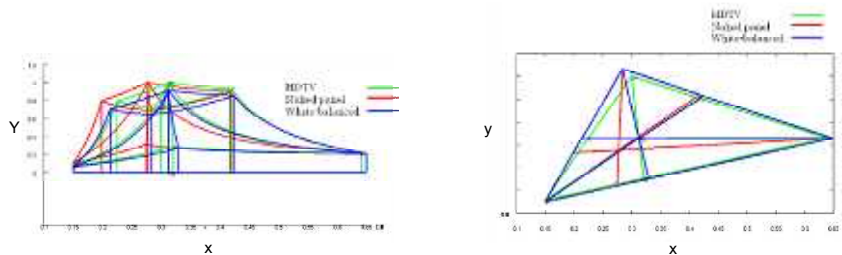
- (+) Keeping brightness.
- (-) Reproduced color may be incorrect.
- (-) Especially, incorrect white-balance.



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## Method II: White-Balance Correction

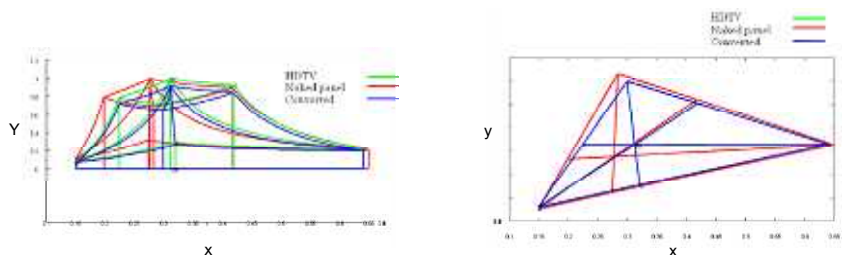
- (+) Guaranteeing the correct white-balance.
- (-) Other colors may be incorrectly reproduced.
- (-) Expanding the area of “memory colors”.
- (-) Reducing brightness.



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## Method III: Color Conversion w.r.t. White + Input Signals

- (+) Correct reproduction of colors.
- (-) Reducing brightness.
- (-) Wasted space in a display's gamut.



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## Pros. and Cons. Table for Gamut Expansion and Gamut Compression

Gamut Expansion		
	Pros.	Cons.
Method I	* Keeping brightness.	* Incorrect white-balance. * Skewed colors.
Method II	* Correct white-balance.	* Other colors are still skewed. * Expanding the area of "memory colors". * Reducing brightness.
Method III	* Correct reproduction of colors.	* Reducing brightness. * Wasted space in a display's gamut.
Gamut Compression		
	Pros.	Cons.
Method I	* Keeping brightness.	* Incorrect white-balance. * Skewed colors.
Method II	* Correct white-balance.	* Other colors are still skewed. * Shrinking "memory colors". * Reducing brightness.
Method III	* Correct reproduction of "memory colors".	* Saturating the out-of-gamut colors. * Reducing brightness.

## Pros. and Cons. Table for Gamut Expansion and Gamut Compression

Gamut Expansion		
	Pros.	Cons.
Method I	* Keeping brightness.	* Incorrect white-balance. * Skewed colors.
Method II	* Correct white-balance.	* Other colors are still skewed. * Expanding the area of <b>"memory colors"</b> . * Reducing brightness.
Method III	* Correct reproduction of colors.	* Reducing brightness. * Wasted space in a display's gamut.
Gamut Compression		
	Pros.	Cons.
Method I	* Keeping brightness.	* Incorrect white-balance. * Skewed colors.
Method II	* Correct white-balance.	* Other colors are still skewed. * Shrinking "memory colors". * Reducing brightness.
Method III	* Correct reproduction of <b>"memory colors"</b> .	* Saturating the out-of-gamut colors. * Reducing brightness.

## Conclusions

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- Three patterns of gamut-mappings
  - Direct reproduction
  - White-balance correction
  - Color conversion w.r.t. the correct white point and the gamut of input signals.
- Advantages and disadvantages in all methods for both gamut expansion and compression.
  - Wanting to take their advantages but moderate disadvantages.
- Keyword: “memory colors”.

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