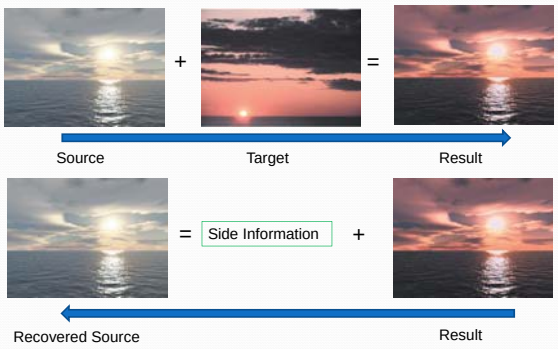
Reversible Color Transfer

- Color transfer is a forward process:
- source + target → result image

- Can we reverse color transfer process?
- Reverse process:
- result + side information → recovered source

Forward and Reverse Process



Immediately Reverse pixel processing

Forward $R(x,y) = \left\lfloor \frac{d_t}{d_s}[S(x,y) - m_s] + m_t + 0.5 \right\rfloor$ Eq. 1

Reverse $S(x,y) = \left\lfloor \frac{d_s}{d_t}[R(x,y) - m_t - 0.5] + m_s \right\rfloor$ Eq. 2

R(x, y): pixel (x, y) in the result image

S(x, y): pixel (x, y) in the source image

Side information

d_t: standard deviation in the target image

d_s: standard deviation in the source image

m_s: mean in the source image

m_t: mean in the target image

Source

Recovered Source

Source and Recovered Source may not be exactly identical

How similarity are they?

Quantify image quality using a metric

Peak Signal Noise Ratio: PSNR

https://en.wikipedia.org/wiki/Peak_signal-to-noise_ratio

Fourth Assignment

- Write two programs to implement reverse color transfer and PSNR value, respectively!
- Deadline: 3/18 23:30 (not 23:59!!)
- Input: result images: tr1, tr2, tr3, tr4, tr5, tr6
- Output:
- 1. color transfer results, tr1, tr2, ..., tr6
- 2. recovered source images: rs1, rs2, ..., rs6
- 3. PSNR xlsx files: PSNR_result1, PSNR_result2, ..., PSNR_result6
- Submit your assignment in separate directories:
  - 1. Source images: in a director "source" containing s1, s2, s3, s4, s5, s6
  - 2. Target images: in a directory "target" containing t1, t2, t3, t4, t5, t6
  - 3. Color transfer result images: in a directory "ct-result" containing tr1, tr2, tr3, tr4, tr5, t46
  - 4. Recovered source images in a directory: "recov-source" containing rs1, rs2, rs3, rs4, rs5, rs6
  - 5. Reverse color transfer program in a directory: "ctr-program" containing color transfer program and its execution code (if applicable)
  - 6. PSNR program in a directory: "PSNR-program" containing PSNR program and its execution code (if applicable)
  - 7. Measured Peak Signal Noise Ratio (PSNR) in a directory: "PSNR-result" containing PSNR_result1, PSNR_result2, ..., PSNR_result6 (6 .xlsx files)
- Note: PSNR is measured between source (si) and recovered source (rsi) and please report PSNR values in six excel files
- Note: s1, s2, t1, t2 are selected from Kodak image database and you are freely to select the rest of four cases, s3, s4, s5, s6, t3, t4, t5, t6 by your own choice.
- Note: example images courtesy of 孔繁安同學