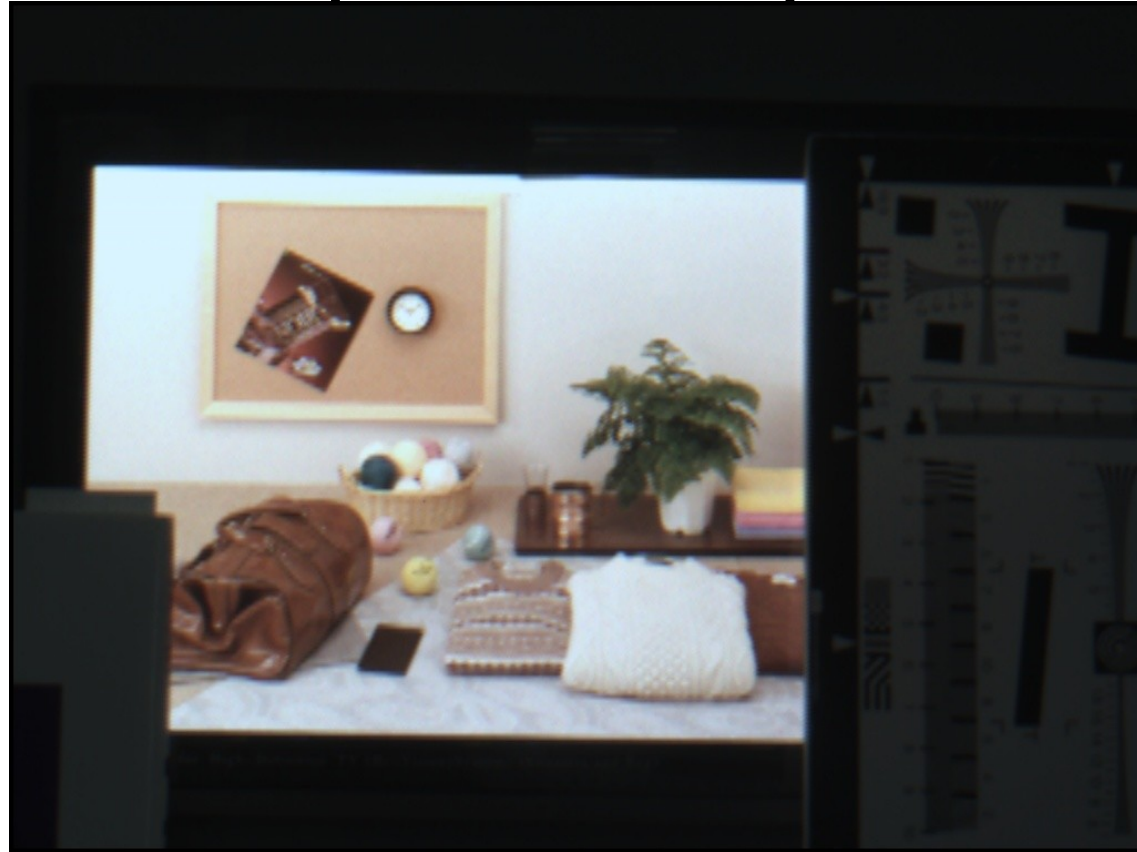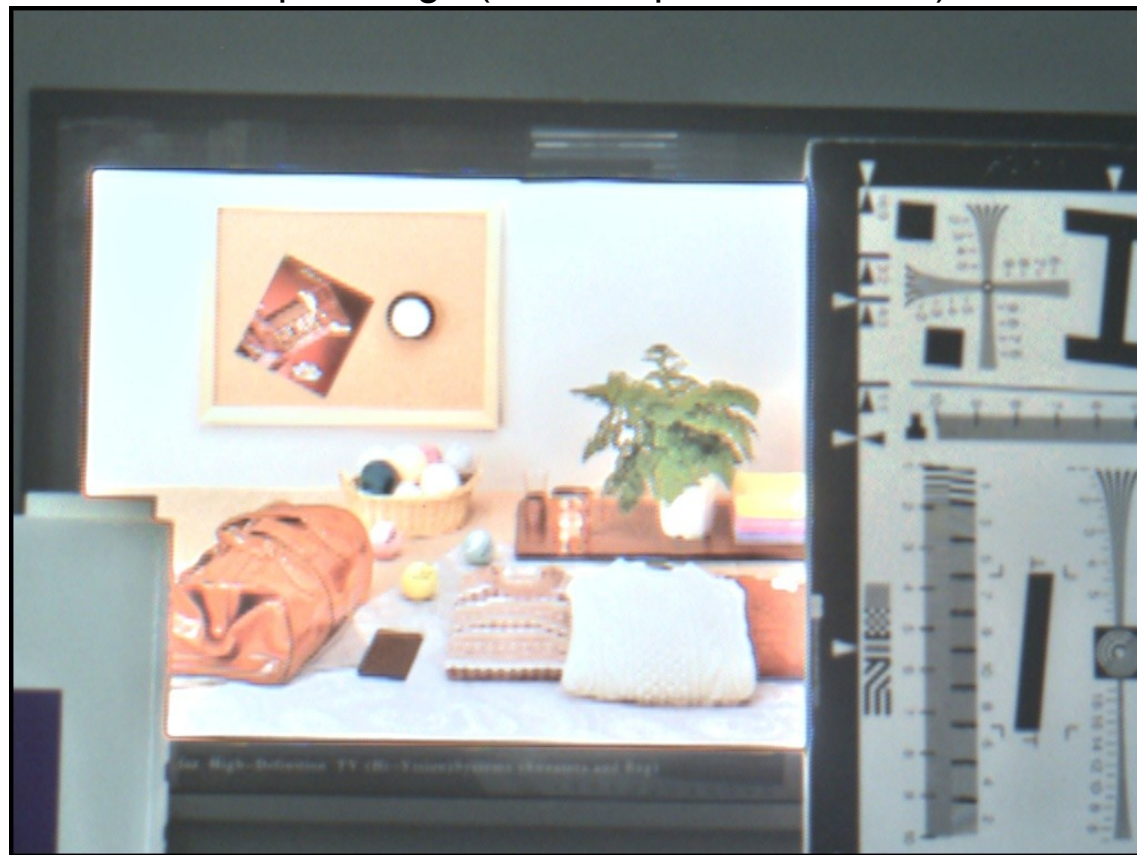# Real-time High Dynamic Range Compression on A Mobile GPU

Kazuhiro Hiwada, Yukiyasu Tatsuzawa and Tatsuji Ashitani   **Toshiba Corporation**

HDR Compression Example

A Input image (960x640pix, 14bit RAW)

HDR compression result (8bit sRGB)

HDR Compression System:

Input:
- from 10bit to 14 bit RAW Bayer image.
- 960 x 640 pixel @ 15fps
  (limited by USB2.0 capture board)

Output:
- 8bit sRGB image
- 960 x 640 pixel @ 15fps

HDR Compression Algorithm:
- Retinex based.
- using simplified bilateral filter.
- implemented as GLSL 1.2 shaders.

Demo System:

GPU:
- Intel Express 4 Chipset
Camera:
- 8M pix. 10bit RAW sensor.
Capture Board:
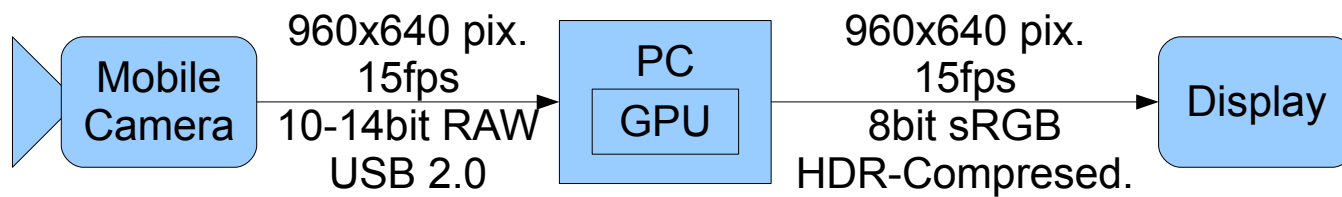- 10bit parallel to USB 2.0 conversion.

Application Area:

HDR Imaging:
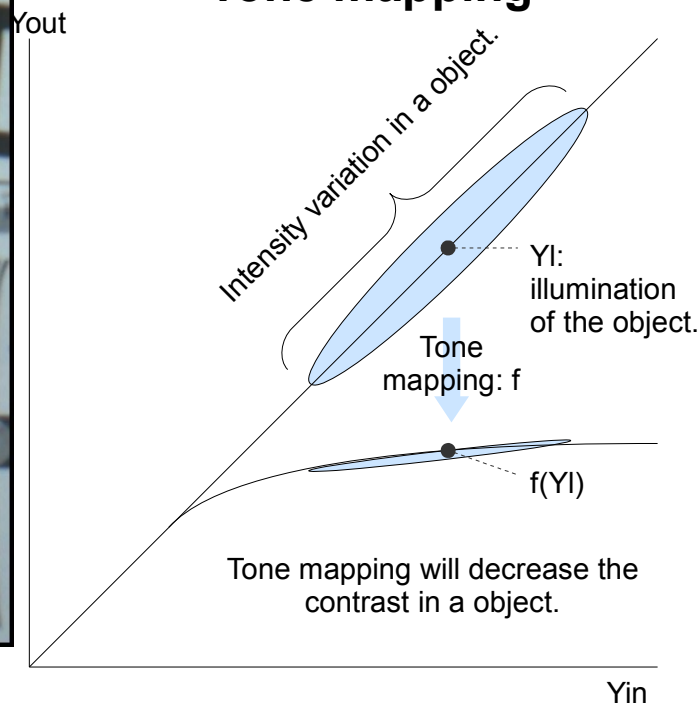- 15+ fps HDR movie.
- real-time HDR artistic effects, etc.
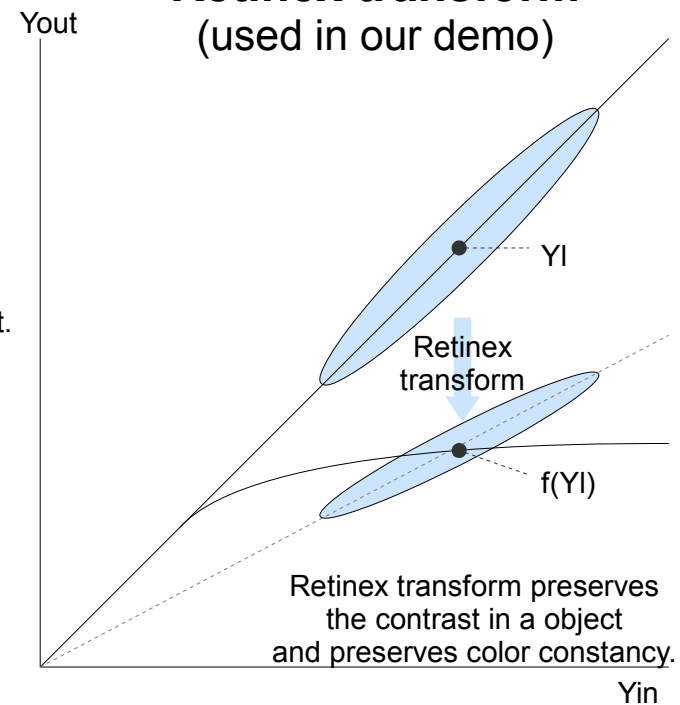**Machine Vision:**
- Image recognition for HDR scenes.

System Diagram

Mobile Camera → 960x640 pix. 15fps 10-14bit RAW USB 2.0 → PC GPU → 960x640 pix. 15fps 8bit sRGB HDR-Compresed. → Display

Tone mapping

Yout

Intensity variation in a object.

Yl: illumination of the object.

Tone mapping: f

f(Yl)

Tone mapping will decrease the contrast in a object.

Yin

Retinex transform
(used in our demo)

Yout

Yl

Retinex transform

f(Yl)

Retinex transform preserves the contrast in a object and preserves color constancy.

Yin

Shaders and Buffer Objects

10-14bit RAW data (packed pixel format)

↓

format conversion

↓

RAW data (16bit float format)

↓

compute Luminance and scale

↓

Luminance (16bit float format)

↓

compute Illumination

↓

Illumination (16bit float format)

↓

Retinex, Demosaic and Gamma

↓

Compressed image (8bit sRGB)