

# DSP VLSI Systems

## Homework (IX)

### Processing Elements Design

Deadline: May 15

1. Find the simplest implementation of a serial/parallel multiplier with fixed coefficient when the coefficient is
  - (a)  $(0.011001)_{2C}$
  - (b)  $(0.111011)_{2C}$
  - (c)  $(1.011001)_{2C}$

2. Conversion between RGB and YCbCr digital color video image formats can be performed by the following transformations:

$$R = Y + 350Cr / 256 - 175 / 256$$

$$G = Y - 86Cb / 256 - 178Cr / 256 + 132 / 256$$

$$B = Y + 444Cb / 256 - 222 / 256$$

and

$$Y = (77R + 150G + 29B) / 256$$

$$Cb = (-44R - 87G + 131B) / 256 + 128 / 256$$

$$Cr = (131R - 110G - 21B) / 256 + 128 / 256$$

The color components are quantized to 8 bits. Derive an implementation based on

- (a) Bit-serial multipliers
- (b) Distributed arithmetic
- (c) Compare the two implementations.

Please deliver the homework to the TA:

EEII-332, 陳翊豪 [dspdesign@video.ee.ntu.edu.tw](mailto:dspdesign@video.ee.ntu.edu.tw)

除非為程式作業，作業盡量繳交紙本格式，不過要交電子檔也沒關係