Comments on and corrections to ‘Hardware–software co-design architecture for joint photo expert graphic XR encoder’

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Abstract: In the aforementioned paper, Tseng and Lai presented a hardware-sharing design of elementary transform operations for the photo overlap transform and the photo core transform in JPEG XR. In this letter, we point out some errors in their work and suggest the corresponding corrections.

Fig. 1 Original code in [2] and the corresponding function in [1] with our corrections of operations

\[ a \text{ T_odd} \]
\[ b \text{ T_odd_odd} \]

\[ \text{fwd_Scale (a,b)} \{ \]
\[ b := (a + 3 + 0) >> 4; \]
\[ a := a >> 7; \]
\[ b := b >> 10; \]
\[ a := (a + 3 + 0) >> 3; \]
\[ b := (b + 3 + 0) - b; \]
\[ a := a; \]
\[ \} \]

\[ \text{void new_Scale(int *a, int *b)} \{ \]
\[ \]
\[ \text{fwd_Rotate (a,b)} \{ \]
\[ b := (a + 1) >> 1; \]
\[ a := (b + 1) >> 1; \]
\[ \} \]

\[ \text{void new_Rotate(int *a, int *b)} \{ \]
\[ \]

Fig. 2 Original code in [2] and the corresponding function in [1] with our corrections of operations

\[ a \text{ fwd_Scale} \]
\[ b \text{ fwd_Rotate} \]
In joint photo expert graphic XR encoder (JPEG XR), the photo overlap transform (POT) and the photo core transform (PCT) are developed based on a series of elementary transform operations. In [1], the authors modified the original elementary transform operations so that the outputs are computed directly from the inputs, thus some intermediate stages are eliminated. On the basis of the modified elementary operations, the authors also proposed a hardware-sharing design for POT and PCT. However, there are some errors in their work which can be verified by manipulating the corresponding equations derived from the JPEG XR standard [2], or by comparing outputs from programming based on the original and their proposed pseudocodes. The errors are shown and corrected as in the listings in Figs. 1–3. We also extract from [2] the original pseudocodes of the operations and include them in the first part of each listing for convenience purposes.

Owing to these errors, some outputs of each transform operations are incorrect. The errors are especially significant in operations new_Toddodd, new_Scale and new_ToddoddEnc. This is the reason why the implementation in [1] produced lower fidelity in term of peak signal-to-noise ratio (PSNR) compared with other JPEG XR software.

1 References
