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(54) **RECONSTRUCTION OF IMAGE IN A BAYER PATTERN**

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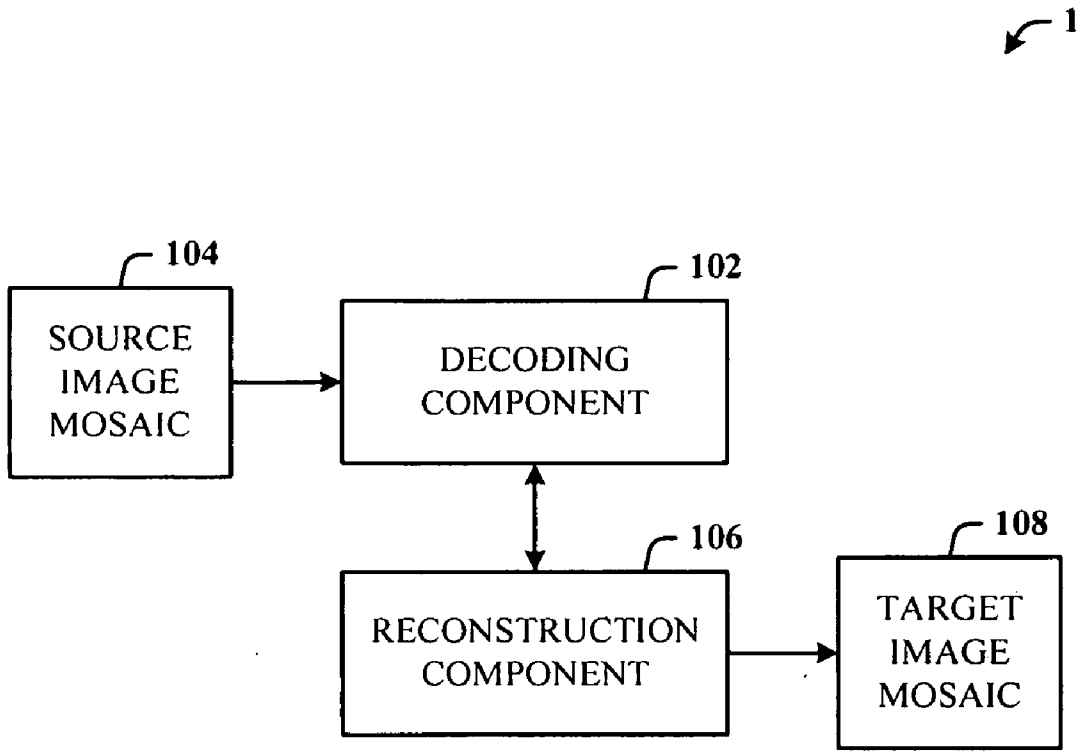
(57) **ABSTRACT**

Architecture for decoding (demosaicing) a source image and performing reconstruction directly from the Bayer pattern to reduce memory size and improve communication bandwidth. The architecture can be easily implemented in hardware such as in field programmable gate arrays (FPGAs) and application-specific integrated circuits (ASICs).



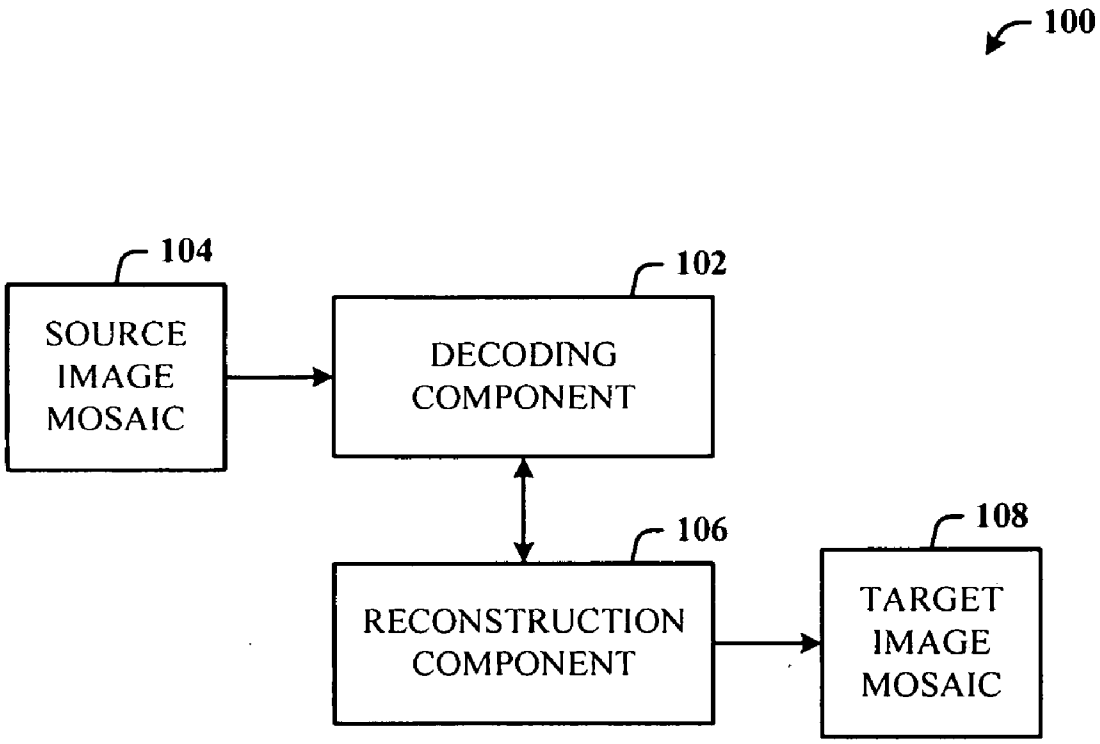


FIG. 1

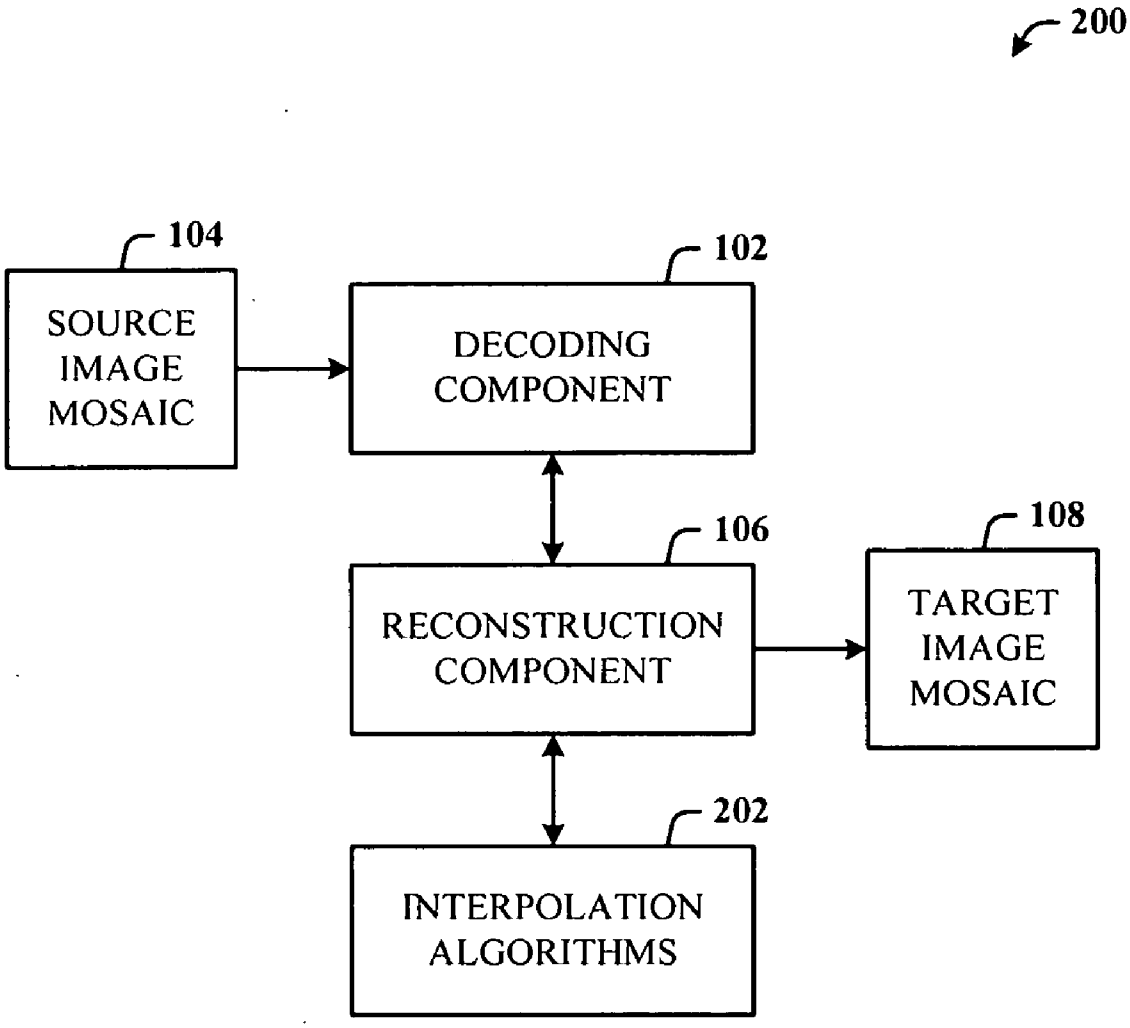


FIG. 2

300

302

$$R(X_t, Y_t) = R(x,y) = \begin{bmatrix} 1 - \frac{\Delta x}{2} - \frac{\Delta y}{2} + \frac{\Delta x \Delta y}{4} \\ \frac{\Delta x}{2} - \frac{\Delta x \Delta y}{4} \\ \frac{\Delta y}{2} - \frac{\Delta x \Delta y}{4} \\ \frac{\Delta x \Delta y}{4} \end{bmatrix}^t \cdot \begin{bmatrix} R(X,Y) \\ R(X+2,Y) \\ R(X,Y+2) \\ R(X+2,Y+2) \end{bmatrix}$$

304

$$R(X_t, Y_t) = R(x,y) = \begin{bmatrix} \frac{1}{2} - \frac{\Delta x}{2} - \frac{\Delta y}{4} + \frac{\Delta x \Delta y}{4} \\ \frac{1}{2} + \frac{\Delta x}{2} - \frac{\Delta y}{4} - \frac{\Delta x \Delta y}{4} \\ \frac{\Delta y}{4} - \frac{\Delta x \Delta y}{4} \\ \frac{\Delta y}{4} + \frac{\Delta x \Delta y}{4} \end{bmatrix}^t \cdot \begin{bmatrix} R(X-1,Y) \\ R(X+1,Y) \\ R(X-1,Y+2) \\ R(X+1,Y+2) \end{bmatrix}$$

306

$$R(X_t, Y_t) = R(x,y) = \begin{bmatrix} \frac{1}{2} - \frac{\Delta x}{4} - \frac{\Delta y}{2} + \frac{\Delta x \Delta y}{4} \\ \frac{\Delta x}{4} - \frac{\Delta x \Delta y}{4} \\ \frac{1}{2} - \frac{\Delta x}{4} + \frac{\Delta y}{2} - \frac{\Delta x \Delta y}{4} \\ \frac{\Delta x}{4} + \frac{\Delta x \Delta y}{4} \end{bmatrix}^t \cdot \begin{bmatrix} R(X,Y-1) \\ R(X+2,Y-1) \\ R(X,Y+1) \\ R(X+2,Y+1) \end{bmatrix}$$

308

$$R(X_t, Y_t) = R(x,y) = \begin{bmatrix} \frac{1}{4} - \frac{\Delta x}{4} - \frac{\Delta y}{4} + \frac{\Delta x \Delta y}{4} \\ \frac{1}{4} + \frac{\Delta x}{4} - \frac{\Delta y}{4} - \frac{\Delta x \Delta y}{4} \\ \frac{1}{4} - \frac{\Delta x}{4} + \frac{\Delta y}{4} - \frac{\Delta x \Delta y}{4} \\ \frac{1}{4} + \frac{\Delta x}{4} + \frac{\Delta y}{4} + \frac{\Delta x \Delta y}{4} \end{bmatrix}^t \cdot \begin{bmatrix} R(X-1,Y-1) \\ R(X+1,Y-1) \\ R(X-1,Y+1) \\ R(X+1,Y+1) \end{bmatrix}$$

FIG. 3

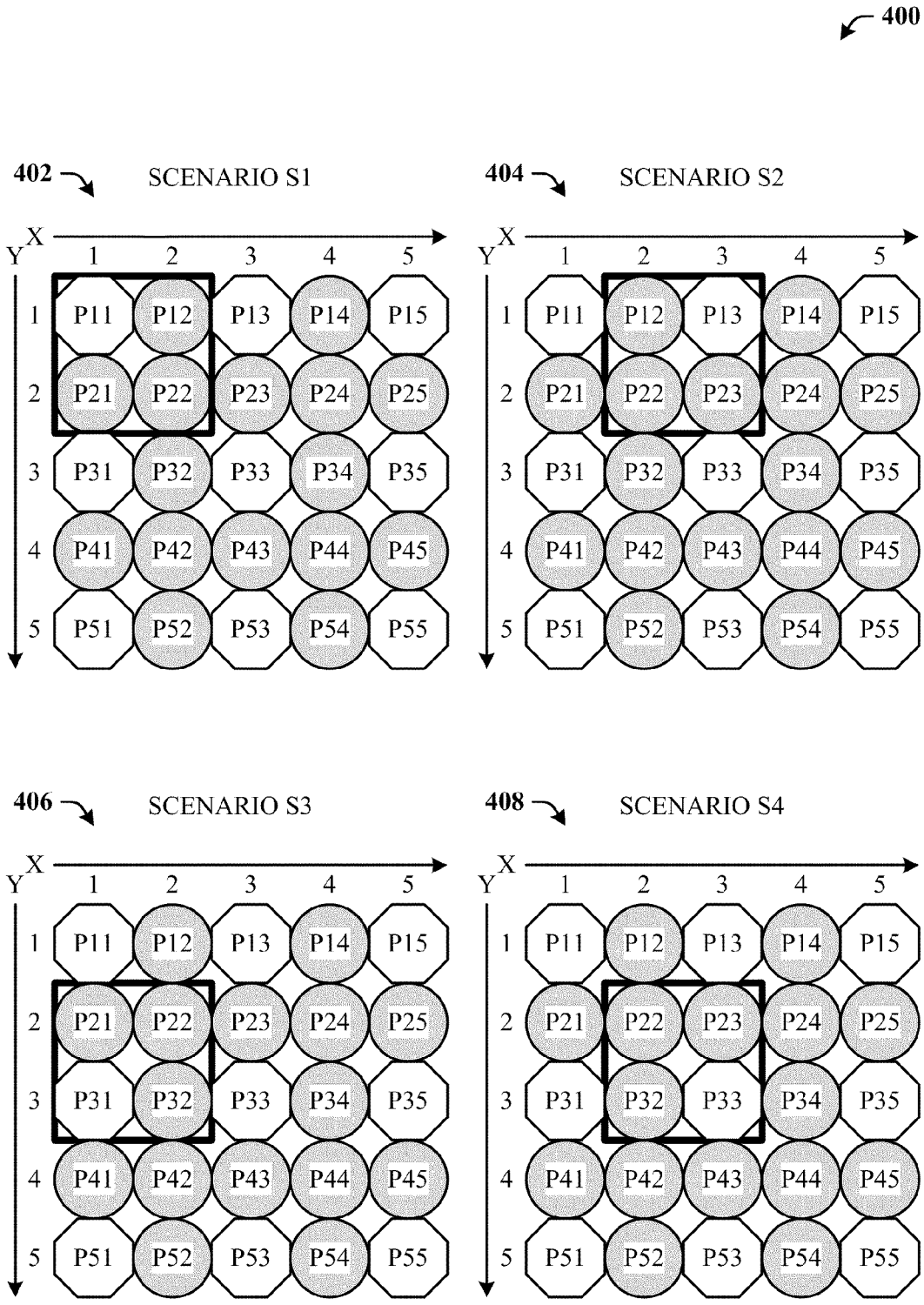


FIG. 4

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