SONY

Independent Sub-pixel Drive Technology

Whitepaper

Independent Sub-pixel Drive technology*1 achieves advanced image quality while minimizing image degradation. This whitepaper describes the features of Independent Sub-pixel Drive technology, how it works, and the background to its development.

The Need to Enhance Display Resolution

Today's medical imaging devices deliver excellent resolution, with a pixel size range of approximately 25 to 100 µm and a pixel count from 4 to 67 megapixels (MP). Unfortunately, medical displays have not kept pace with this progress—the pixel pitch of commonly used high-resolution 5MP displays is 165 µm, but their resolution properties cannot match those of current medical imaging devices.

What happens to an image captured by a high-resolution medical imaging device when shown on a lower-resolution display? Quality and/or image size are reduced. Either the entire native image is converted to a lower-resolution image via sub-sampling done by viewer software, or just one small portion of the native image is displayed with the original resolution (see Figure 1). When the original full-screen image is viewed on a display that supports fewer pixels, the image reduces to less than a third (31%) of the original.

Resolution of major mammography systems and a 5MP display

Mammo system	Pixel size (µm)	Resolution (pixel)
A	25	7080 x 9480 (67.12MP)
B	50	3540 x 4740 (16.77MP)
C	70	2560 x 3328 (8.52MP)
D	100	1914 x 2294 (4.39MP)
5MP Display	165	2048 x 2560 (5.24MP)

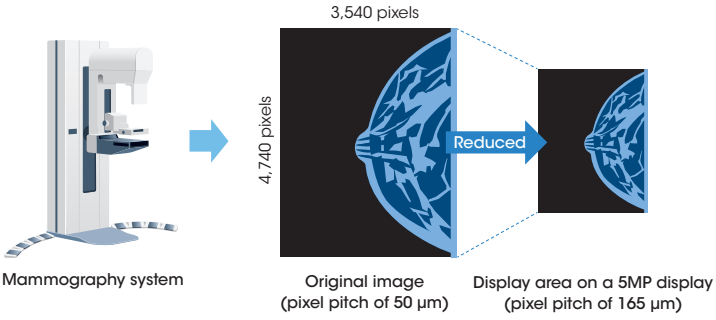


Fig. 1 Reduction of the information volume on display

Benefits of Independent Sub-pixel Drive Technology

- The display with Independent Sub-pixel Drive Technology delivers images that are faithful to the original, but with less image degradation.
- Compared with a conventional 5MP/3MP LCD, Independent Sub-pixel Drive Technology significantly improves image quality without changing the pixel structure and without any adverse impact on luminance and contrast characteristics.
- The pixel pitch of one-third in a horizontal direction (the sub-pixel chain direction) improves MTF*2 and allows images to be more accurately depicted.
- Recently the luminance, contrast, viewing angle, and grayscale features of medical displays have been improved. Now the resolution of medical displays can also be improved, thanks to this cutting-edge technology.

*1 Applicable to the LMD-DM50 and LMD-DM30 only.
To use the Independent Sub-pixel Drive function, special viewer software is required. For details, please contact your nearest Sony office or authorized dealer.
Independent sub-pixel drive is proprietary technology of JVC KENWOOD Corporation.

*2 MTF is the magnitude component of the true measure of resolution (image sharpness) that an imaging system can achieve.

Independent Sub-pixel Drive Technology

A conventional LCD display reproduces images on-screen by means of many small pixels. For example, a 5MP diagnostic display drives 2,560 x 2,048 pixels, while a 3MP diagnostic display drives 2,048 x 1,536 pixels. Generally the shapes of the pixels are square, and one pixel consists of three sub-pixels. (Figure 2) Sony's LMD-DM50 and LMD-DM30 Medical Displays feature Independent Sub-pixel Drive technology that enables sub-pixels to be driven independently on different luminance levels, whereas conventional LCD displays drive three sub-pixels together as only one square pixel with one luminance level.

As sub-pixels are lined up in scanning direction (the sub-pixel chain direction), the process of driving sub-pixels independently results in three times the resolution.

Because Independent Sub-pixel Drive technology does not manipulate original image data during the signal process, it achieves higher resolution on-screen by minimizing the image degradation.

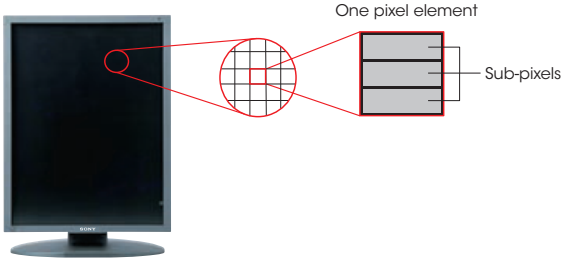
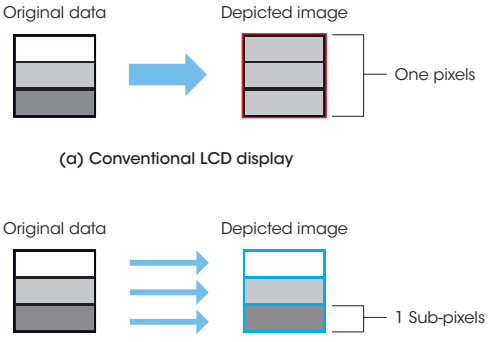


Fig. 2 Pixels and sub-pixels



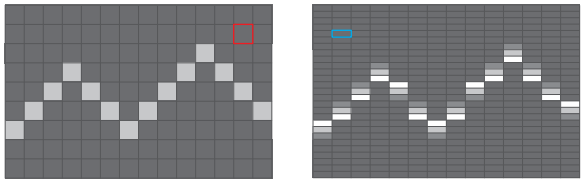
(a) Conventional LCD display

(b) LCD display with Independent Sub-pixel Drive technology

Fig. 3 Difference in luminance level

The working image of the Independent Sub-pixel Drive technology is illustrated in Figure 4. This image depicts the original with greater clarity by driving sub-pixels independently.

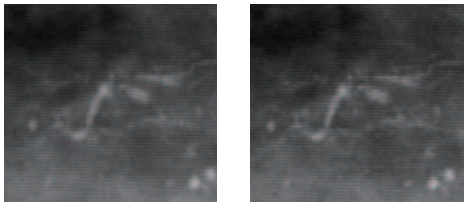
Figure 5 shows another comparison of the same captured image on a conventional 5 Mega Pixel (5MP) LCD display (on the left) and a display with the addition of Independent Sub-pixel Drive technology (on the right). The excellent clarity and high resolution of the Independent Sub-pixel Drive technology display is evident in the micro-calcifications, especially at the edges.



Conventional LCD

LCD with Independent Sub-pixel Drive technology

Fig. 4 Working Image of Independent Sub-pixel Drive technology



Conventional 5MP LCD display

LMD-DM50

Fig. 5 Image comparison

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