COMPRESSION BASED ON A GEOMETRIC TRANSFORMATION OF ECHOCARDIOGRAPHIC ULTRASOUND IMAGES

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Introduction:
Ultrasound echo-cardiographic imaging has become an important modality in the field of medical imaging system. This emphasizes the growing need to develop an efficient method to compress and store these images, while preserving image fidelity. Due to the nature of the transducer and the sampling methods, images obtained from an echocardiography show a strong circular component. Therefore, the use of polar coordinates (radius ρ and angle α) should be more suited for this kind of images.

Method:
In echo-cardiographic images, the region of interest (ROI) that contents most clinical information does not occupy the whole image. In fact the ROI represents a sector of a circle. This ROI is scanned from top to bottom, by increasing the length of the radius (ρ) and the scanning angle(α), and vice versa. The new pixel value, expressed in polar coordinates is interpolated from the four closest pixels of the original image. Images obtained with the polar transformation exploit the fact that correlation among pixels is higher along the arcs and radius than along vertical and horizontal lines.

Results:
The classic JPEG compression algorithm has been applied to the transformed image and the results were compared to those obtained with the original data (size of 640X480 pixels). The transformed image takes into account only the region of clinical interest, yielding a smaller image. Numerical results show the performance of the proposed transformation. For a fixed quality of 38dB of the decompressed image, the compression ratio obtained with the original image is 16:1 (Q=35), while for the transformed image, it becomes 19:1 (Q=75) when scanning along the radius, and 18:1 (Q=75) when scanning along the arcs.

Conclusion:
In this work a new way of interpreting the information given by an echocardiography image is presented. The image is scanned taking into account the way in which it has been obtained from the transducer output data (i.e. in polar coordinates), and stored as the Cartesian representation in order to exploit the specific correlation inherent to ultrasound images.