CYCLOPEAN IMAGE BASED STEREOSCOPIC IMAGE QUALITY ASSESSMENT BY USING SPARSE REPRESENTATION

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Introduction & Motivation

Currently,SIQA methods firstly evaluate the left and right views of stereoscopic image respectively, and then they combine the two scores as the quality of the tested image. Actually, in our brain, we firstly merge the left and right views into a binocular single vision (named cyclopean image or fusion image) . And then the brain processes the fusion image to judge the quality of the image.

Methods:

Firstly, we get the color cyclopean image, and then learn and train the sparse dictionary D applying the color cyclopean image. Secondly, we reconstruct the tested color cyclopean image on the trained dictionary D. Due to the lost information in the process of reconstruction, we use the corresponding color cyclopean image to compensate the reconstructed cyclopean image before feature extraction. Finally, spatial and spectral entropy is used to extract the features of reconstructed cyclopean image and corresponding color cyclopean image respectively. And we weight the above two kind of features to obtain the final feature. And the final quality score is obtained by the support vector regression (SVR).

Contribution:

- a color cyclopean image is used to better simulate the process of image processing in human brain, which is also very suitable for evaluating the quality of asymmetric distortion image
- Meanwhile, for during sparse reconstruction some important information will be lost, we use the corresponding color cyclopean image to do compensation before feature extracting.

Methods

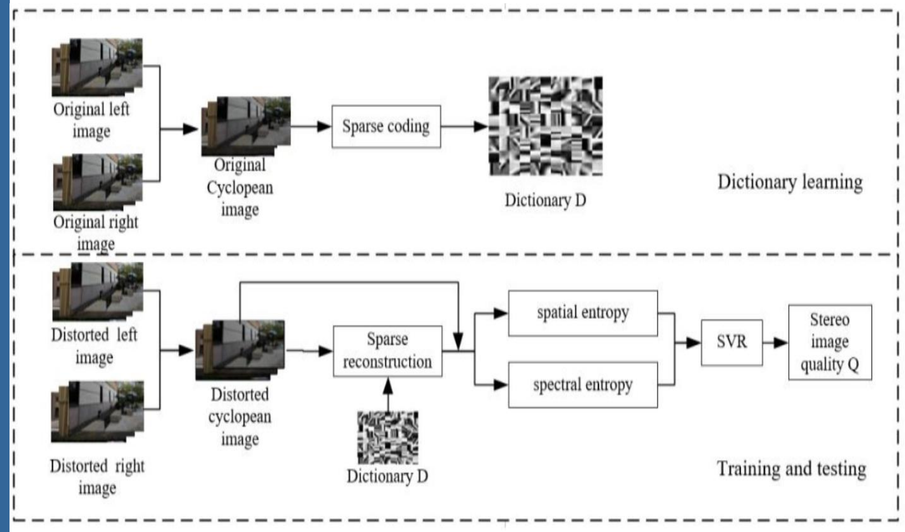

Fig.1. The proposed method flow char

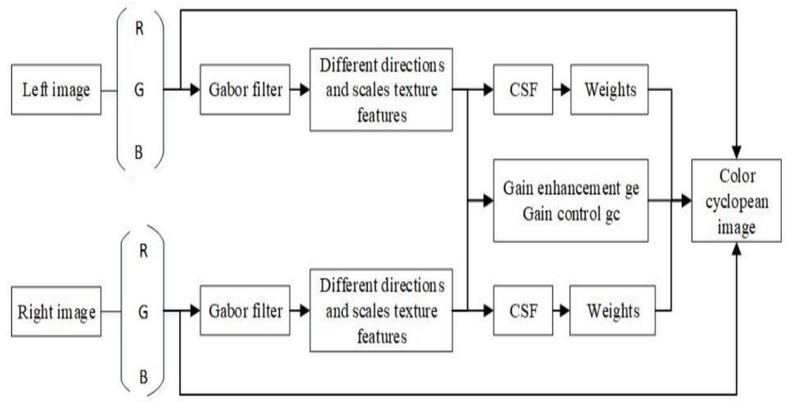

Fig.2. Color cyclopean image method flow char

Fig.1 shows the structure of proposed method and Fig.2 shows the structure of color cyclopean image

Results:

Table 1. Overall Performances on LIVE 3D image database

Performance compared to other methods on LIVE database	LIVE I		LIVE II	
	SROCC	PLCC	SROCC	PLCC
Xu [9]	**0.948**	**0.949**	0.910	0.926
Ma [10]	0.9282	0.9301	0.9175	0.9213
Lu [22]	0.9402	0.9444	--	--
Lin [23]	0.9314	0.9366	0.8824	0.8984
Proposed	0.9394	0.9467	**0.9402**	**0.9504**

Table 2. Performance comparisons on LIVE I

LIVE I	SROCC			PLCC		
	OCC	NCCC	Proposed	OCC	NCCC	Proposed
BLUR	**0.9655**	0.9617	0.9606	**0.9737**	0.9690	0.9733
FF	**0.6485**	0.6071	0.6178	**0.8266**	0.8026	0.8044
JPEG	0.7787	**0.8056**	0.7778	0.8094	0.8265	**0.8305**
JP2K	0.8188	**0.8646**	0.8550	0.8682	**0.9383**	0.9234
WN	0.9113	0.7240	**0.9299**	**0.9603**	0.7084	0.9415
ALL	0.9263	0.9063	**0.9394**	0.9448	0.8901	**0.9467**

Table 3. Performance comparisons on LIVE II

LIVE II	SROCC			PLCC		
	OCC	NCCC	Proposed	OCC	NCCC	Proposed
BLUR	0.9270	**0.9748**	0.9122	0.9867	**0.9892**	0.9845
FF	0.9330	0.9270	**0.9557**	0.9648	0.9544	**0.9670**
JPEG	0.8052	0.7670	**0.9209**	0.8642	0.8301	**0.9426**
JP2K	0.8670	**0.9330**	0.8487	0.8998	**0.9420**	0.8884
WN	**0.9757**	0.9548	0.8243	**0.9811**	0.9646	0.8791
ALL	0.9379	0.9329	**0.9402**	0.9462	0.9433	**0.9504**

OCC refers to: the sparse representation is lost based on our proposed method.
NCCC refers to: the compensation of corresponding color cyclopean image is lost based on our proposed method.

Conclusions:

In this paper, a stereoscopic image quality metric based on the spare representation is proposed.
The color cyclopean image includes more rich information, which is very suitable for the asymmetric distorted images. Spatial and spectral entropy can extract effective features. Different experiments show that the combination of the color cyclopean image and the reconstruction cyclopean image is a good choice. And our proposed method has better generalization performance.

References:

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