Subjective and Objective Quality Assessment of Stitched Images for Virtual Reality

Pavan Chennagiri Madhusudana and Rajiv Soundararajan

Department of Electrical Communication Engineering,
Indian Institute of Science, Bangalore - 560012

Introduction

- Virtual Reality (VR) involves immersive viewing of wide field of view images in head mounted displays (HMD)
- Wide field of view images obtained by stitching multiple images with overlapping fields of view

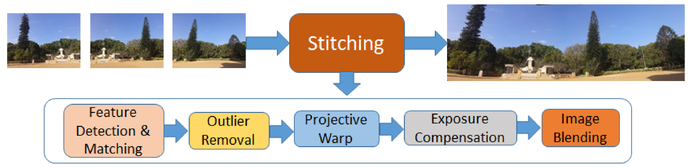


Figure 1: Pipeline of Stitching Algorithm

- Need quality assessment (QA) models to benchmark, compare and fine tune stitching algorithms

Problem Statement

Design a QA model to capture perceivable stitching induced artifacts

Assumptions
- QA model knows the stitched image and individual images that are stitched.
- QA model does not know the stitching algorithm.

Challenges
- No reference stitched image to compare against
- Stitching induced distortions different from classical distortions

Contributions

- Develop IISc stitched image quality assessment (ISIQA) database
- Design stitched image quality evaluator which correlates well with human ratings
- Bivariate Gaussian mixture model to capture ghosting artifacts

Stitching induced Distortions

(a) Ghosting

(b) Color Distortion

(c) Blur

(d) Geometric Distortion

Subjective QA

- **Database** - 264 stitched images from 26 scenes.
- **Artifacts** - Ghosting, blur, color and geometric
- **Subjective Study** - Quality ratings from 35 subjects for images shown on a Samsung Gear VR.

Stitched Image Quality Evaluator (SIQE)

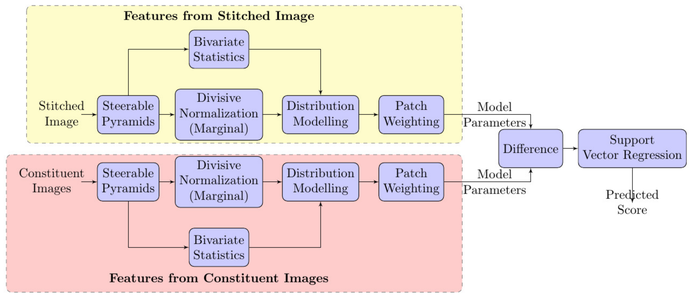


Figure 2: SIQE Framework

Bivariate GMM for ghosting artifacts

Ghosting introduces additional edges as well as increases correlation when compared to the constituent image.

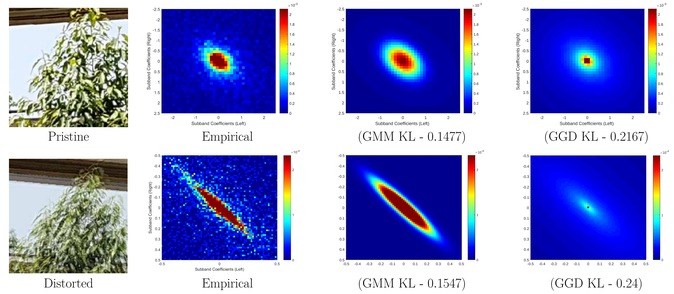


Figure 3: Bivariate statistics of neighboring subband coefficients

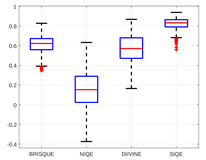
Eigen values of covariances of GMM components used as features
Patch features are weighted using texture measures

Results

Figure 4: Median correlation across 1000 iterations

Figure 5: Box plot of SROCC distributions over 1000 trials

	SROCC	LCC
BRISQUE*	0.6224	0.5914
NIQE	0.1524	0.1051
DIIVINE*	0.5706	0.5897
SIQE	**0.8318**	**0.8380**
SIQE-WOR	0.6650	0.6929



NIQE* and DIIVINE* trained on ISIQA database
SIQE-WOR does not use features from individual images

Paper citation

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