Image Quality Estimation without Reference and Training

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INTRODUCTION

- **Problem** – IQ becomes extremely important for sensitive deep learning based E-beam inspection
- **Challenge** - many existing IQ estimation techniques need reference and deep learning training
- **Goal -** No reference, no training IQ estimation

OBJECTIVES

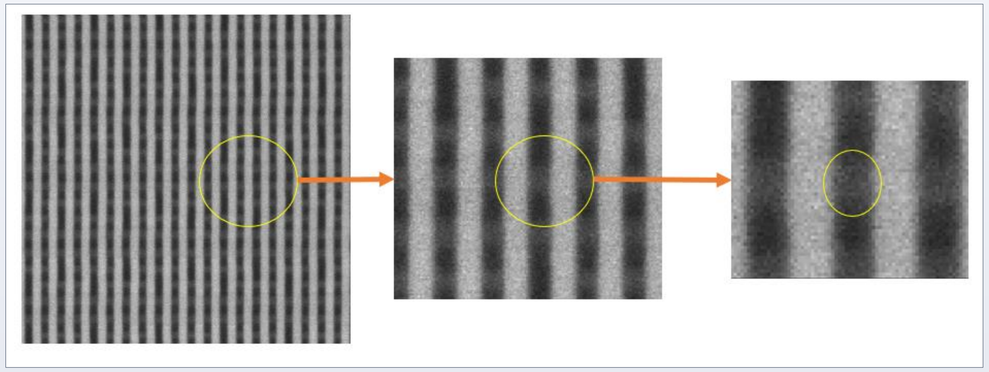
(1) Understand IQ current metrics

(2) Implement basic IQ metrics in python for deep learning training

(3) Literature survey of state-of-the-art Image Quality metrics

(4) Experiment on deep learning based IQ metrics

IMPLEMENTED Metrics

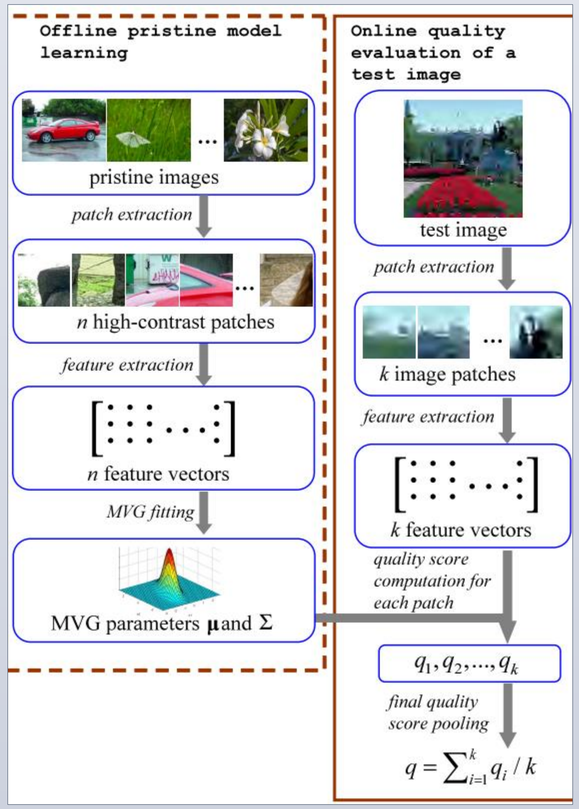


Re-implemented current E-beam IQ metrics in python

- Signal-to-Noise Ratio 6.12
- Contrast-to-Noise Ratio 13.13
- Sharpness 4.55
- Rotation TBD

Defects become smaller and require accurate IQ metric

Next Steps – deep learning based, no training:



- IQ is evaluated on patches of images
- Features are extracted using pre-trained CNN with sharp images
- Model the features using multivariate gaussian model
- Feature model serves as a reference model to predict the quality of the image patches

CONCLUSIONS

- Current non-deep learning based metric is good but too slow
- Deep learning based IQ metric could generate more accurate score and faster
- Deep learning based IQ metric could cover more distortion types

REFERENCES

(1) Making a “Completely Blind” Image Quality Analyzer

(2) A Feature-enriched completely Blind Image Quality Evaluator

(3) Blind Image Quality Assessment via Deep Learning

(4) A Deep Neural Network for Image Quality assessment

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