Augmented Reality & Video Service Emerging Technologies

SIFT SURF FAST BRIEF ORB BRISK

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SURF

SURF

❖ SURF: Speed-Up Robust Feature

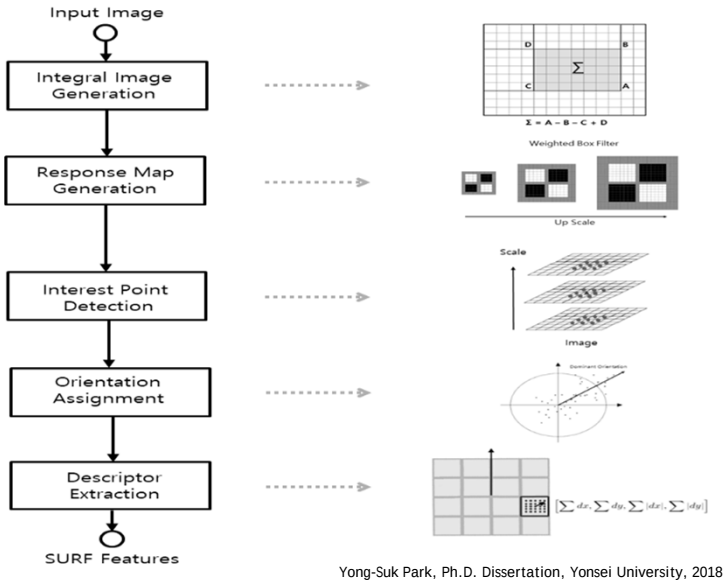
- Approximation techniques are used to get faster yet similarly accurate IPD (Interest Point Detection) results compared to SIFT
- DoH (Determinant of Hessian matrix) is used in the IPD process
- Box filters are used in approximating the DoH

SURF

❖ Hessian Matrix

- Square matrix with second-order partial derivative elements
- Characterizes the level of surface curvature of the image
- Used in keypoint detection

SURF Feature Extraction Process



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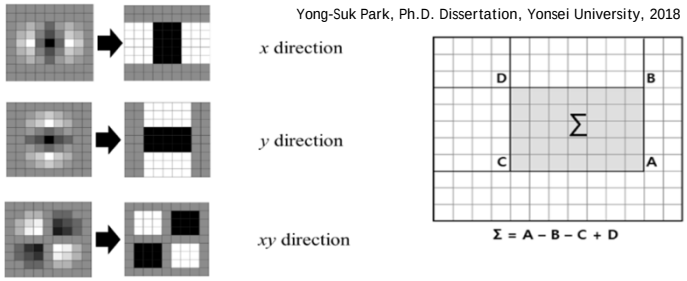
❖ Approximation Process

- Approximates SIFT's DoG with the box filtering process
- Square box filters are used for approximation instead of Gaussian averaging of the image



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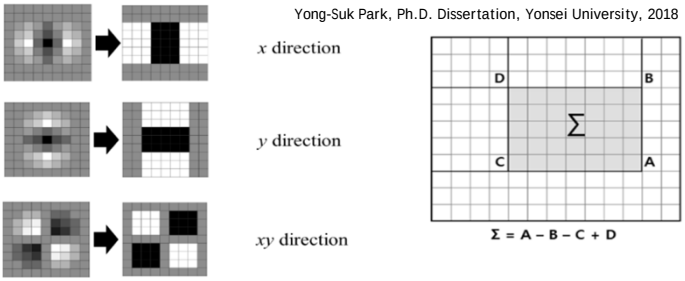
Box Filter Approximations **Integral Image**

SURF

❖ Approximation Process

- Example of Box filters and an integral image used in SURF
  - Enables fast approximation and box area calculation



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Box Filter Approximations Integral Image

SURF

❖ Integral Image Generation

- Integral images are used for fast convolution computation
- Multiple parallel processing of Box Filtering on different scale images are used to approximate the LoG process

❖ IPD (Interest Point Detection)

- Hessian matrix based Blob detection is used in the IPD process

SURF

❖ **Feature Descriptor scheme**

- Interest point's neighboring pixels are divided into subregions
- SURF descriptor describes the pixel intensity distribution
  - Based on a scale independent neighborhood
- Each subregion's Wavelet response is used
  - Example: Regular 4x4 sub-regions

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