No.10

Seminar I on Agricultural Process Engineering
農産加工学演習　I

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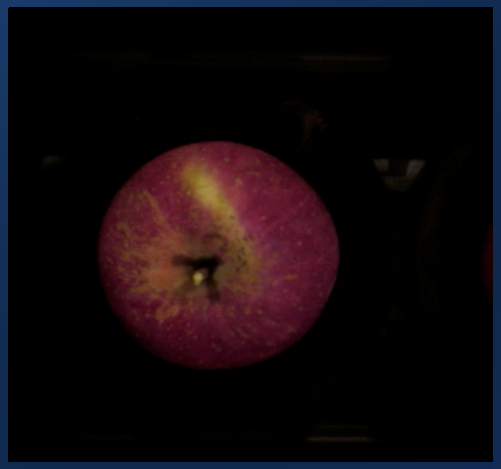
農学研究科　地域環境科学専攻

近藤　直・清水　浩

Practice

1. Color analysis
2. Size measurement
3. Shape analysis
4. Defect detection in tomato
5. Spot detection

Objects for defects


Choose three apple fruits and detect brown spots on the surface.

Application of 2-D Fourier Transform to image analysis

The definitions of the transform and the inverse transform are given below:

$$F(u,v) = \iint f(x,y)\exp\left[-j2\pi(ux+vy)\right]dxdy$$

$$= SUM\left[f(x,y)\exp(-j2\pi(ux+vy)/N\right]$$

$$f(x,y) = \iint F(u,v)\exp\left[j2\pi(ux+vy)\right]dudv$$

$$= SUM\left[F(u,v)\exp(j2\pi(ux+vy)/N\right]$$

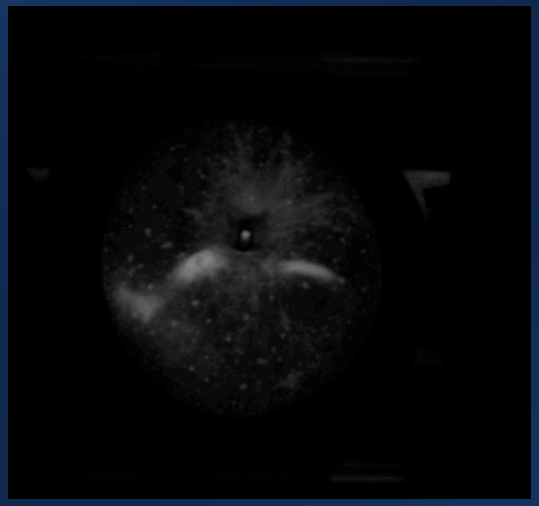
where u = 0,1,2,...,N-1 and v = 0,1,2,...,N-1 x = 0,1,2,...,N-1 and y = 0,1,2,...,N-1

j = SQRT(-1)

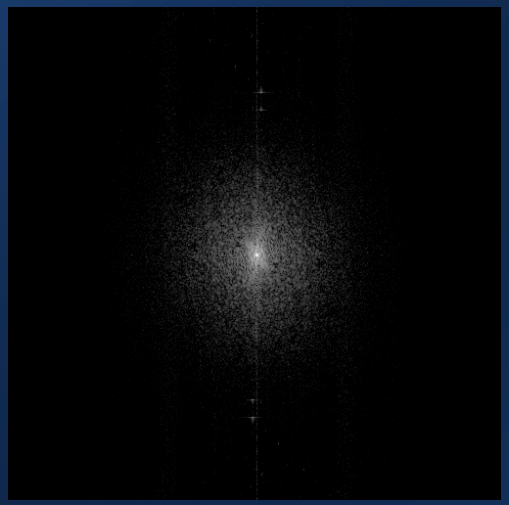
SUM means double summation over proper x,y or u,v ranges

Detection of spots using FFT and i-FFT

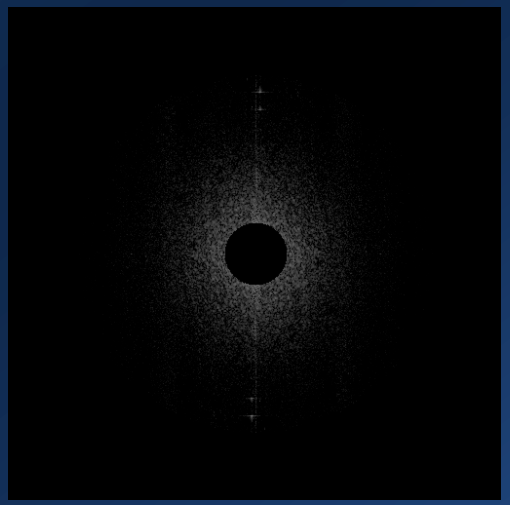
Original image



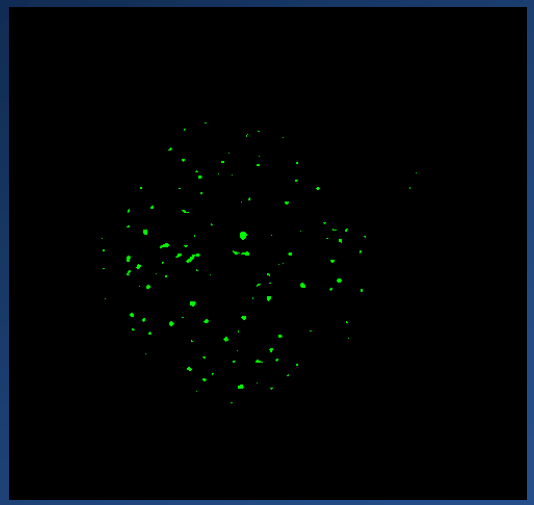
Green plane



FFT



Filtering of FFT image



i-FFT and thresholding

Assignment: Show spot detection result (Binary image) with original image.