Universidad Popular del Cesar

Tratamiento de Señales

Version 2022-I

Transformaciones geométricas & Interpolación

[Capítulo 3]

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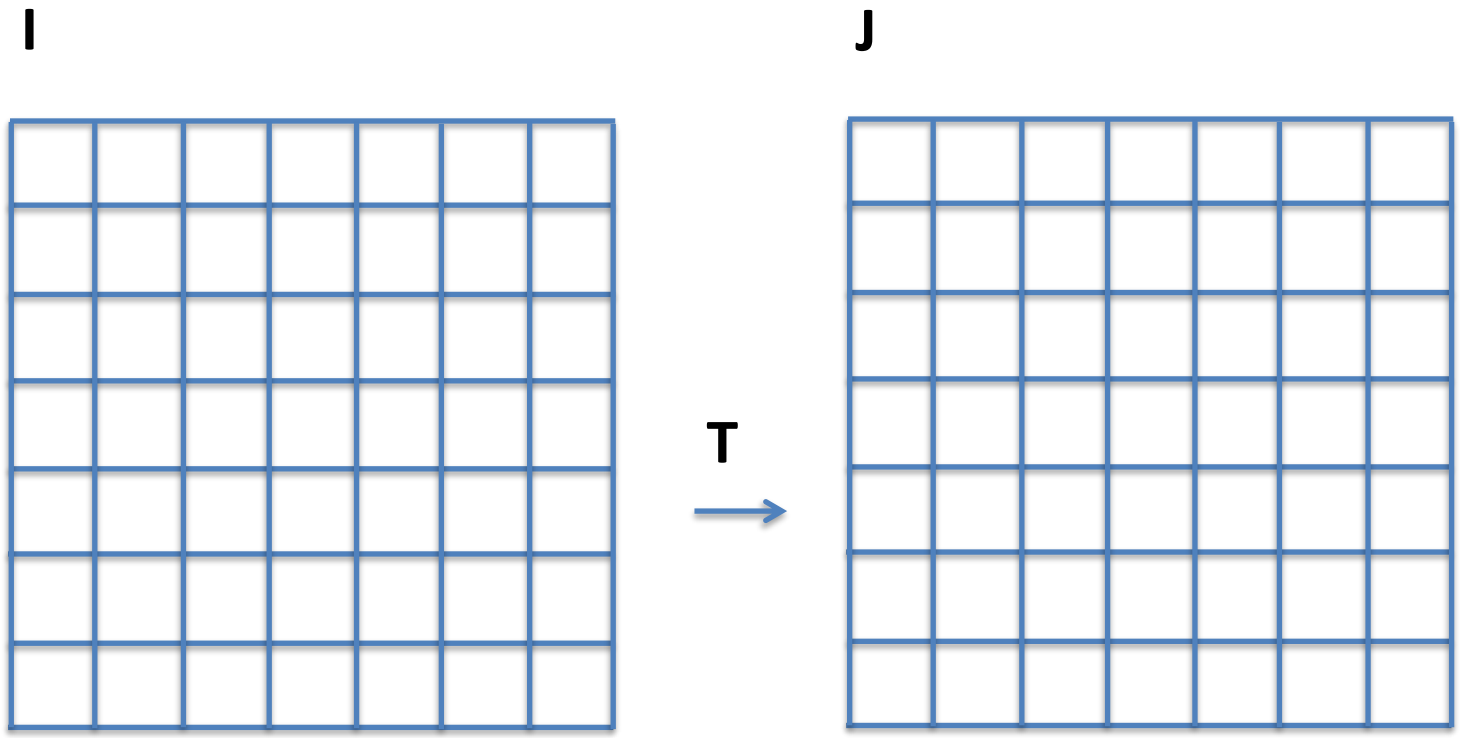
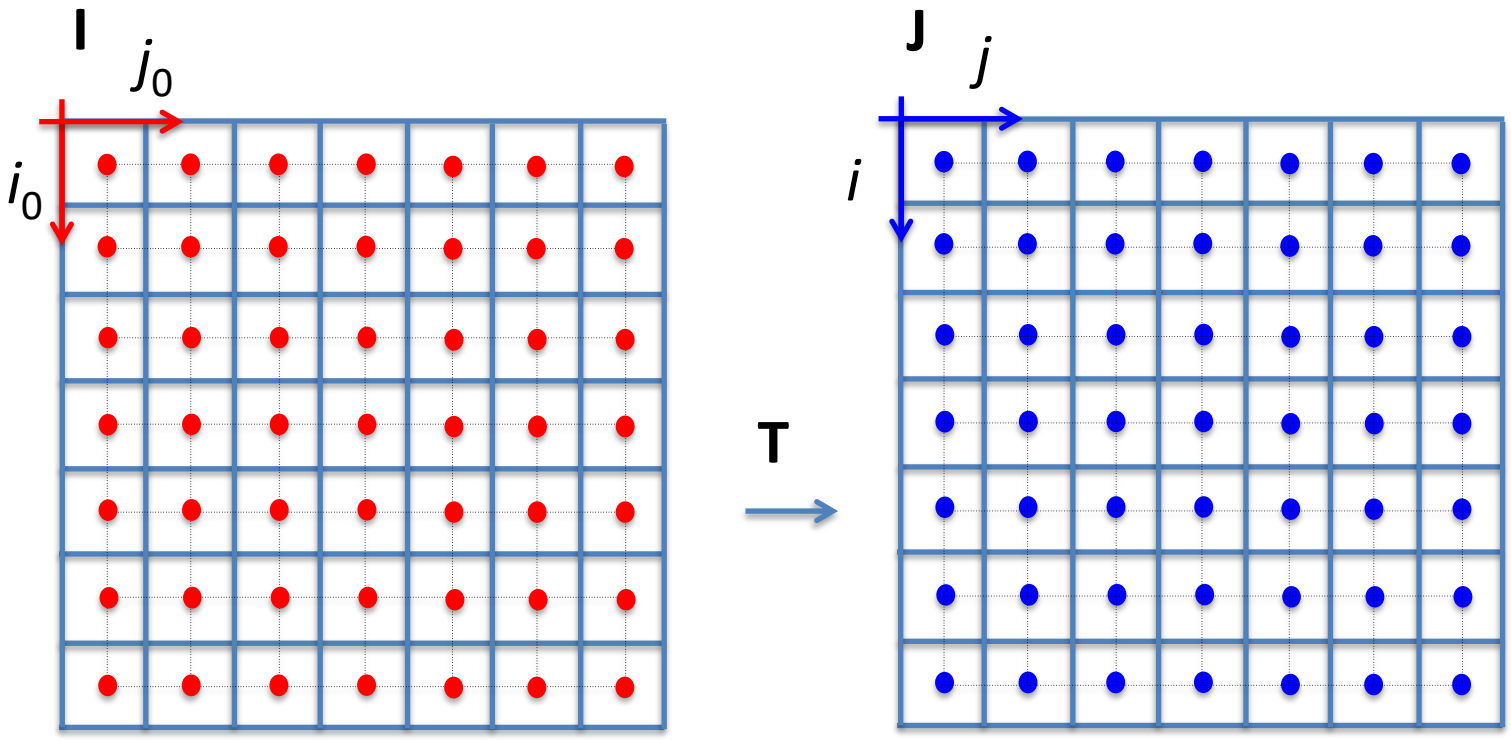
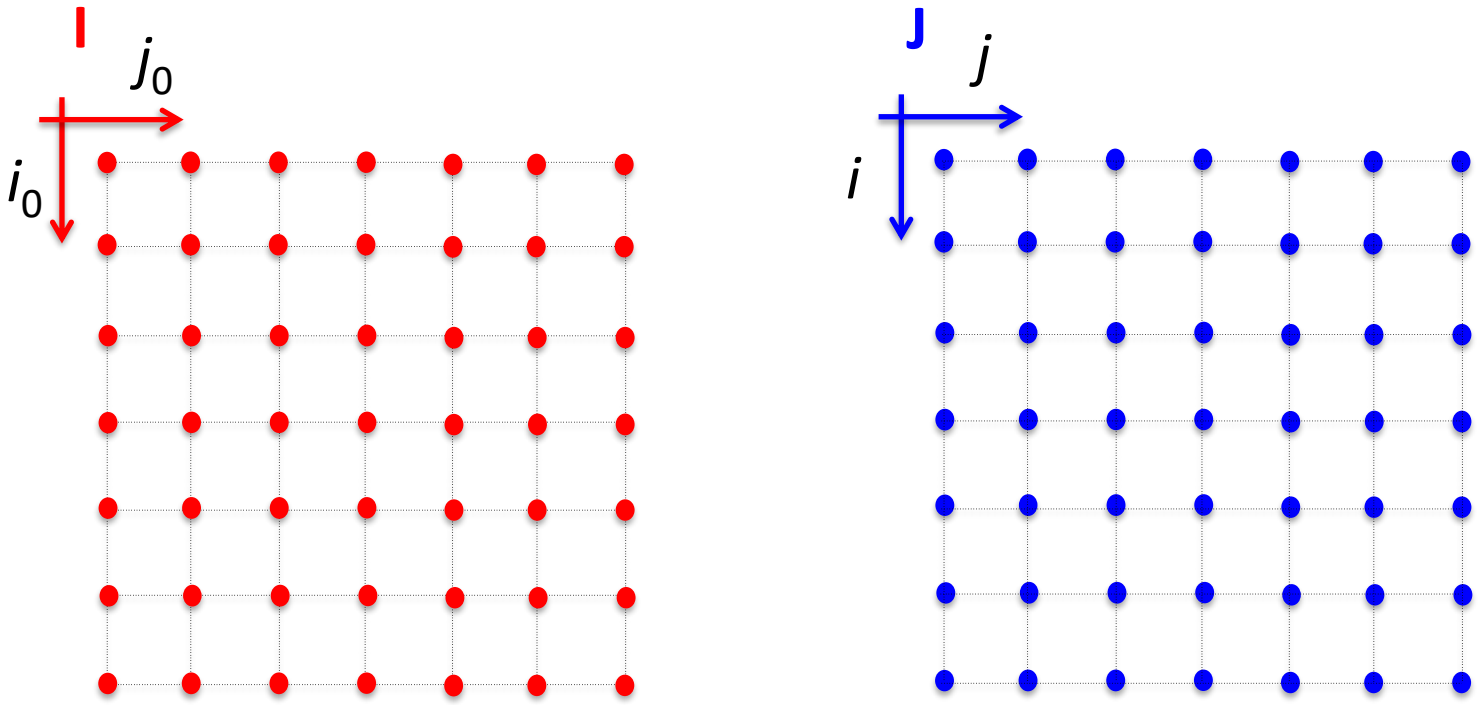
Director Semillero TRIAC

Ingenieria Electronica

Universidad Popular del Cesar

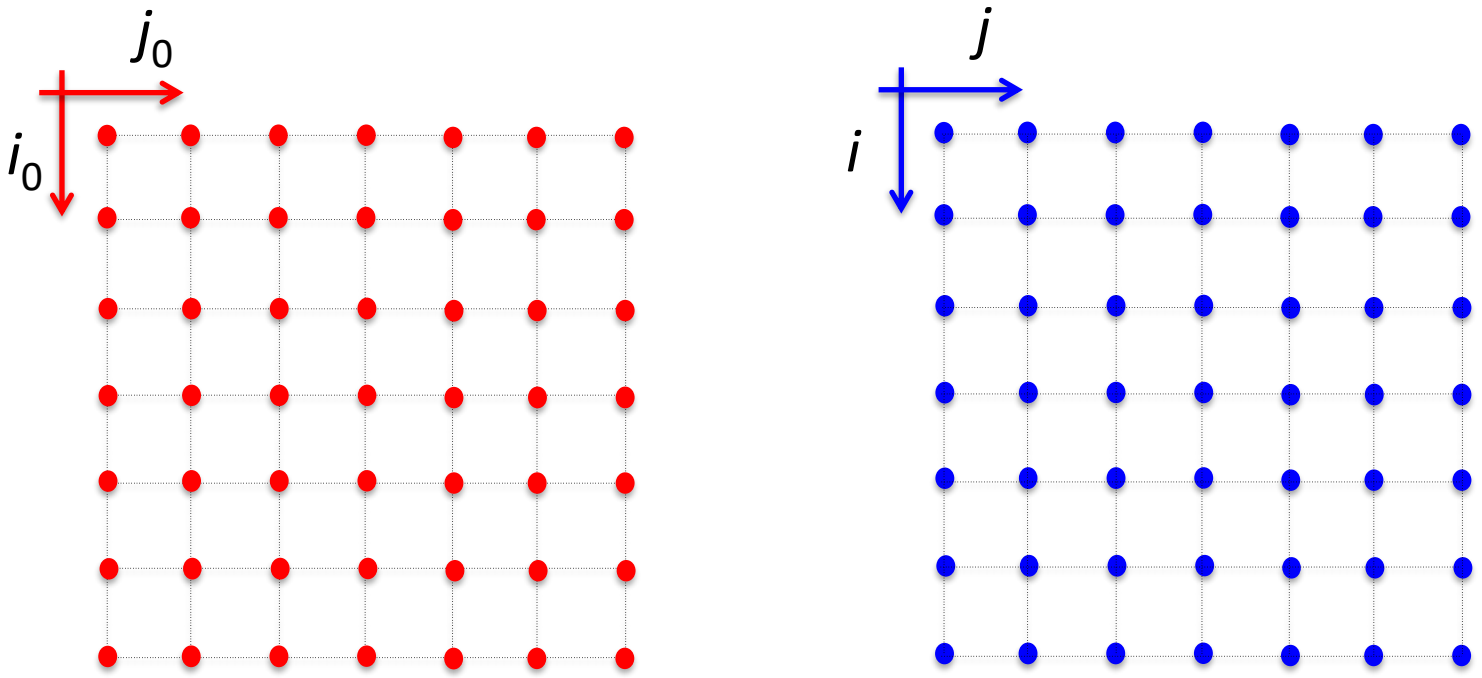

I
J
T


I
j_0
i_0
T
J
j
i



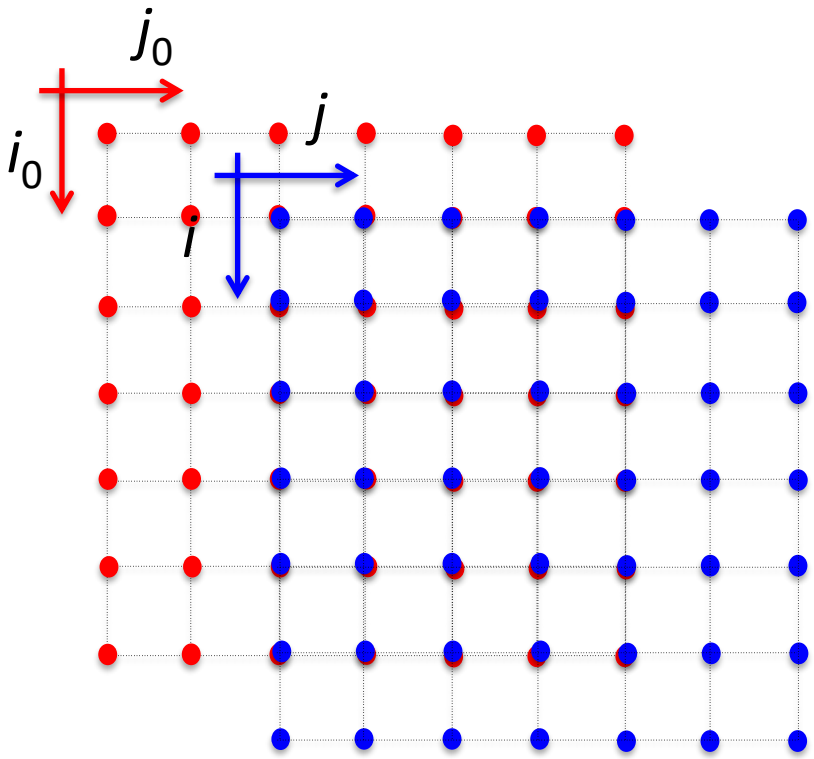
Coordinate Transformation: $i_0 = f_i(i,j)$

$j_0 = f_j(i,j)$



Coordinate Transformation: $i_0 = i + 1$
(Example: Translation)

$$j_0 = j + 2$$



Algorithm:

1) For each (i,j) of J compute (i_0,j_0).
2) $J(i,j) = I(i_0,j_0)$

Coordinate Transformation: $i_0 = i + 1$
(Example: Translation)

$$j_0 = j + 2$$

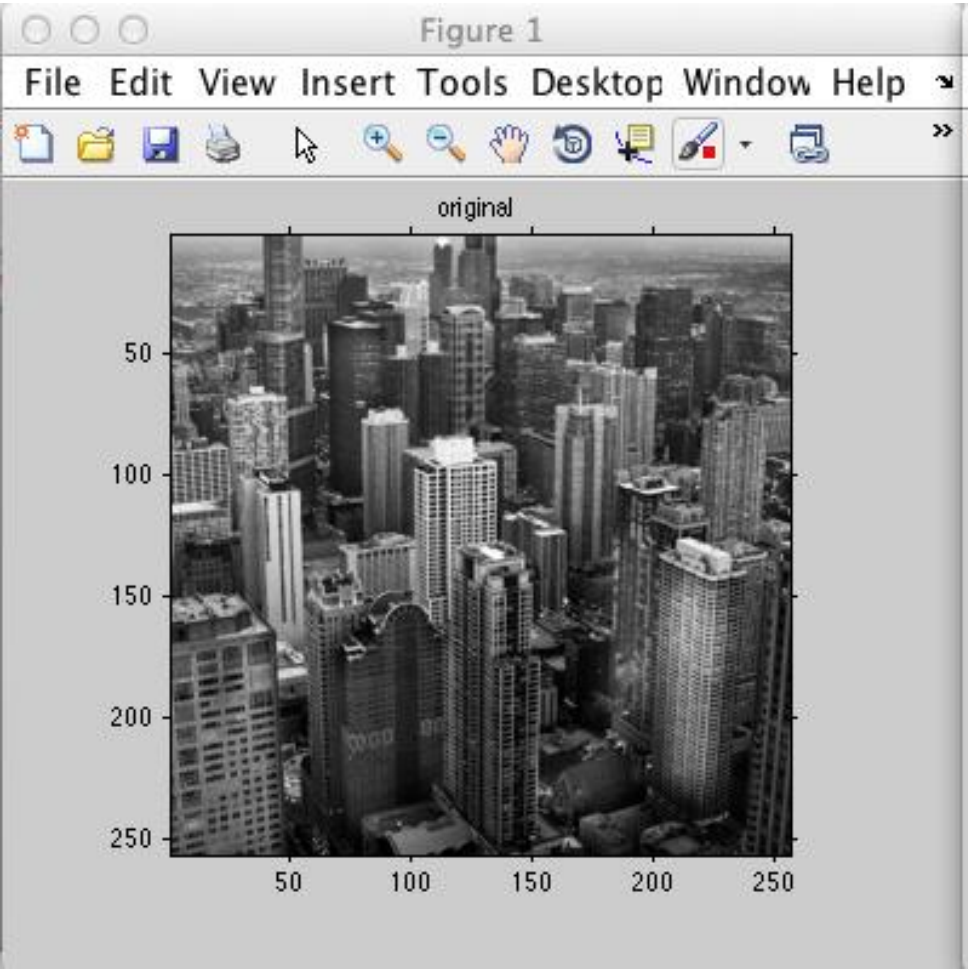


Figure 1
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original
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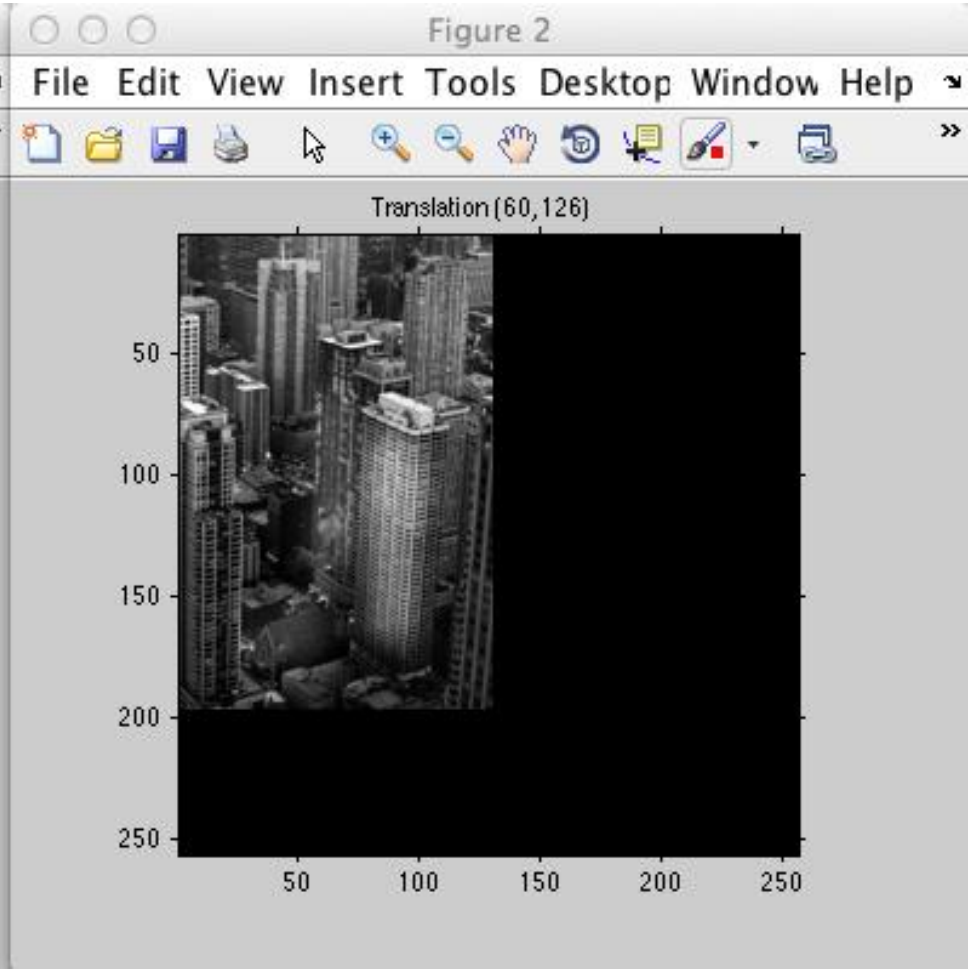
Figure 2
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Translation (60,126)
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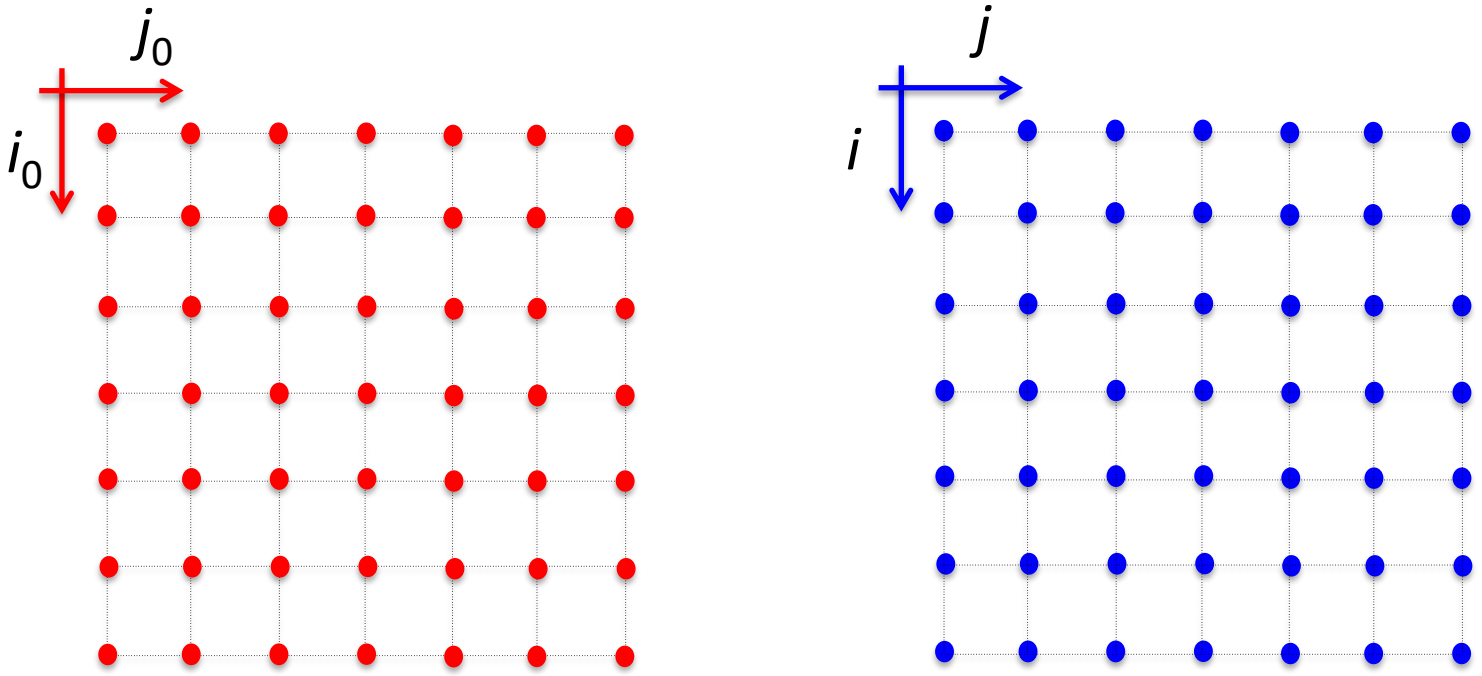
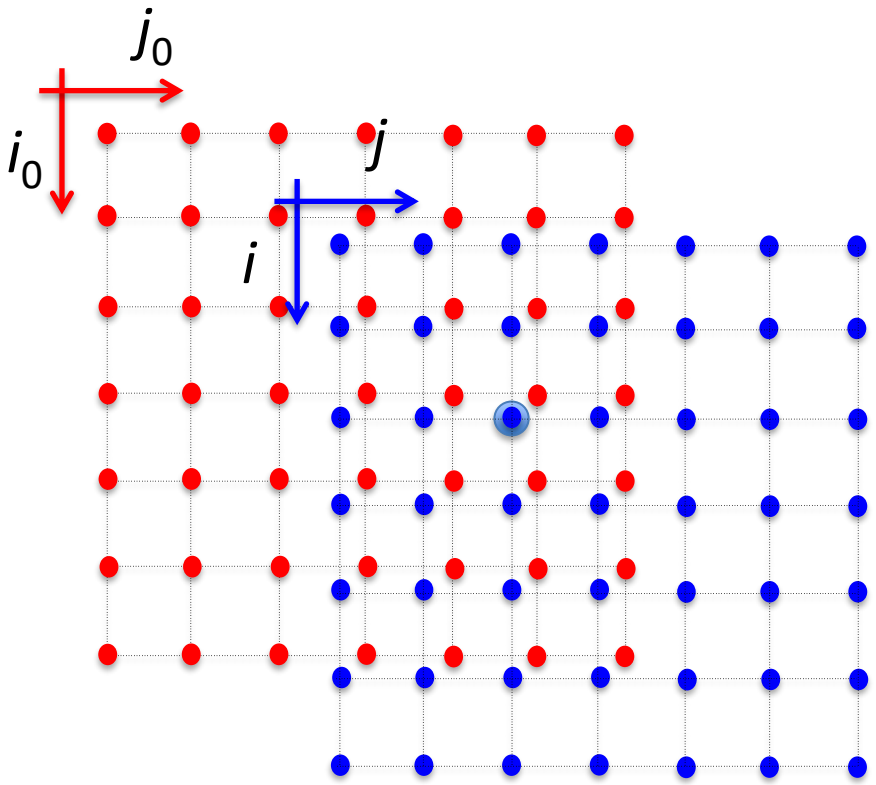


Coordinate Transformation: $i_0 = i + 1.25$
(Example: Translation)

$$j_0 = j + 2.75$$

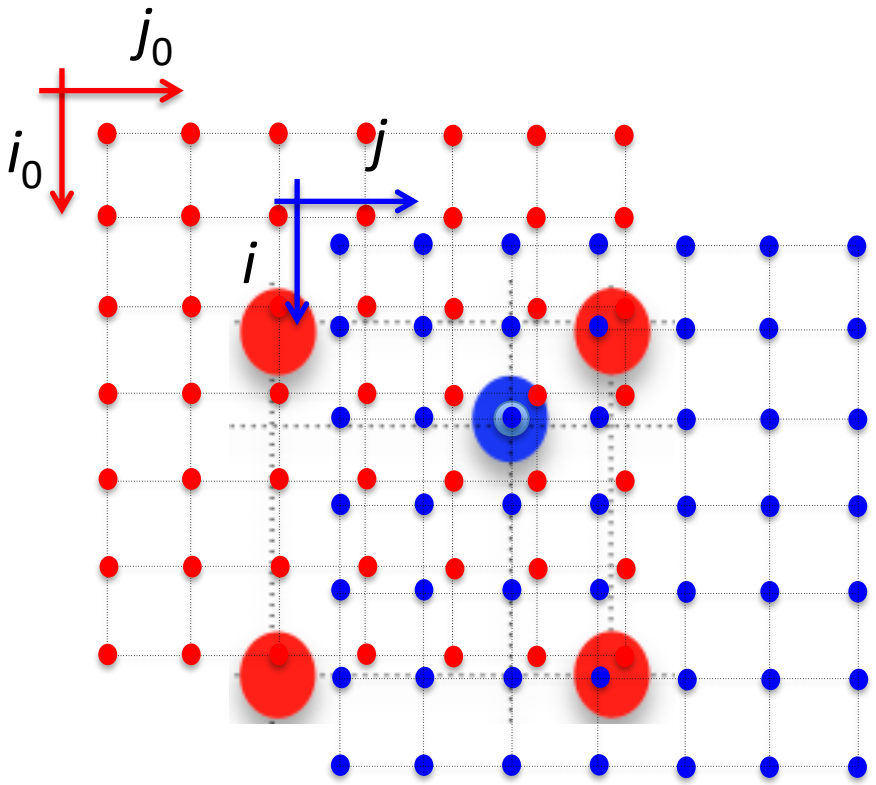


Algorithm:

1) For each (i,j) of J compute (i_0,j_0).
2) J(i,j) = interpolation {I(i_0,j_0)}

Coordinate Transformation: $i_0 = i + 1.25$
(Example: Translation)

$$j_0 = j + 2.75$$



Algorithm:

1) For each (i,j) of J compute (i_0,j_0).
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(Example: Translation)

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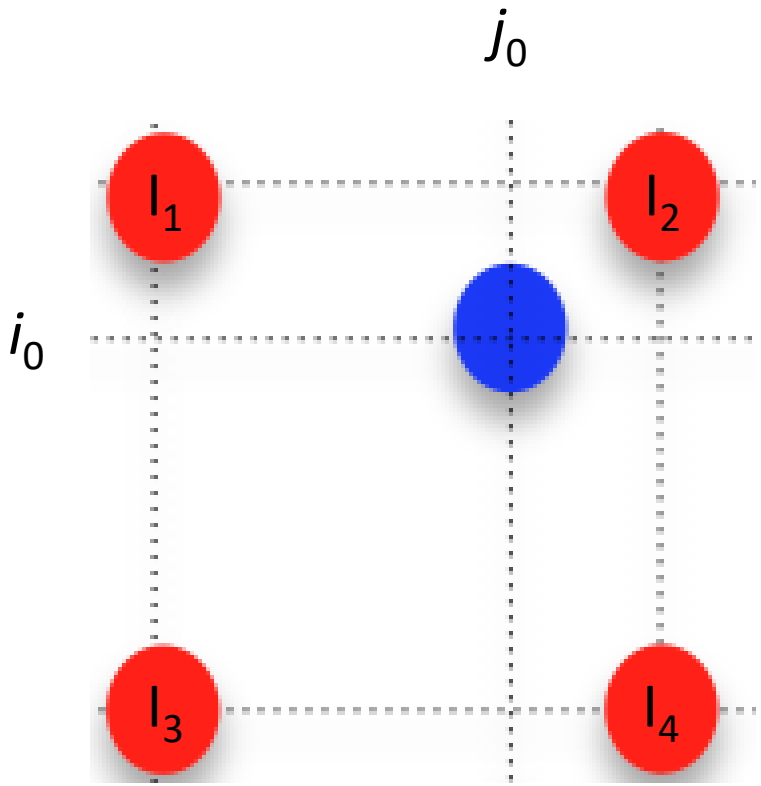
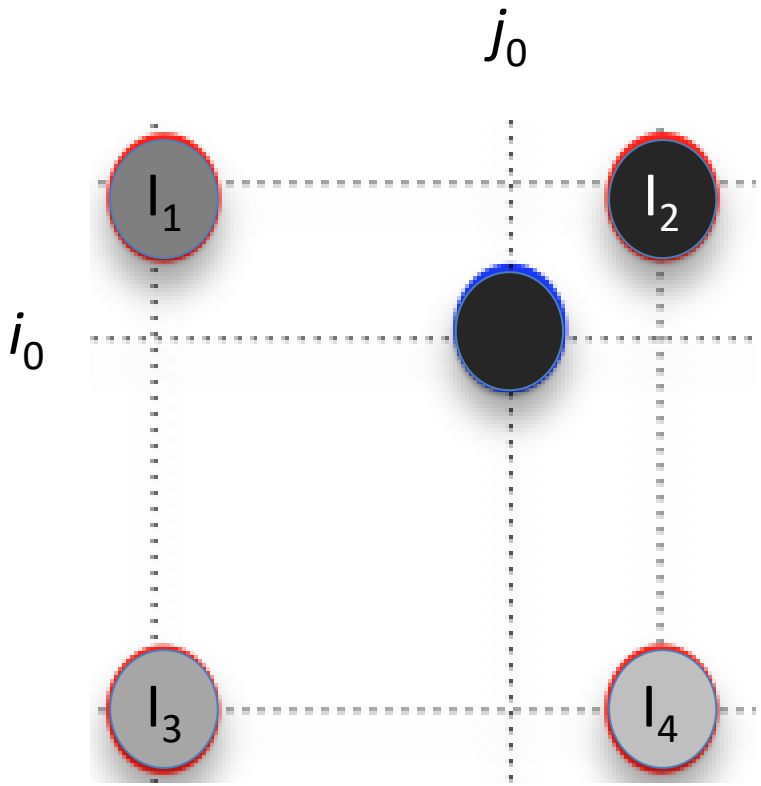


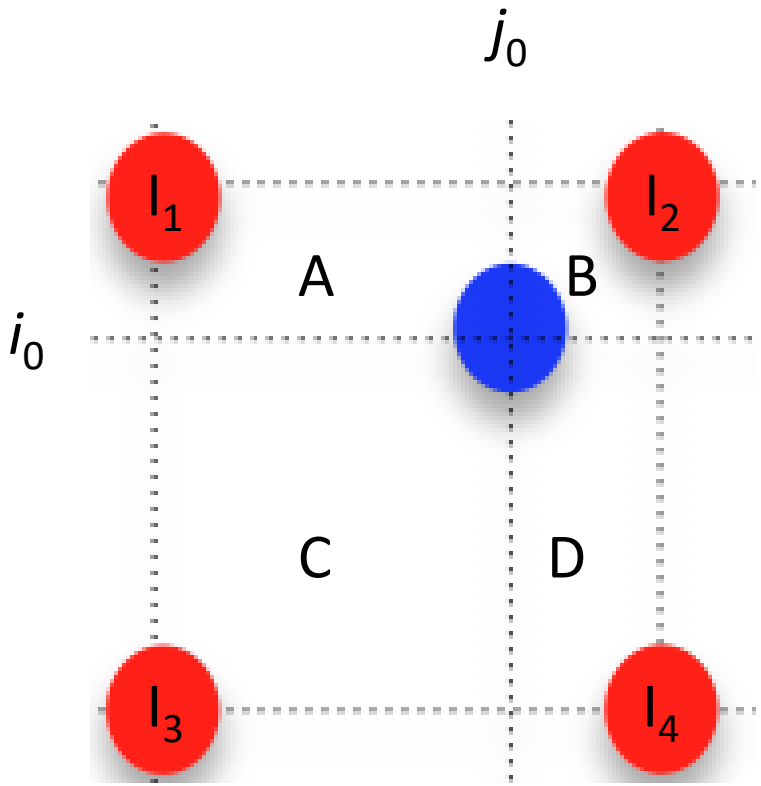
Nearest pixel

$J(i,j)$ = interpolation $\{I(i_0,j_0)\} = I_2$



Nearest pixel

$J(i,j)$ = interpolation $\{I(i_0,j_0)\} = I_2$

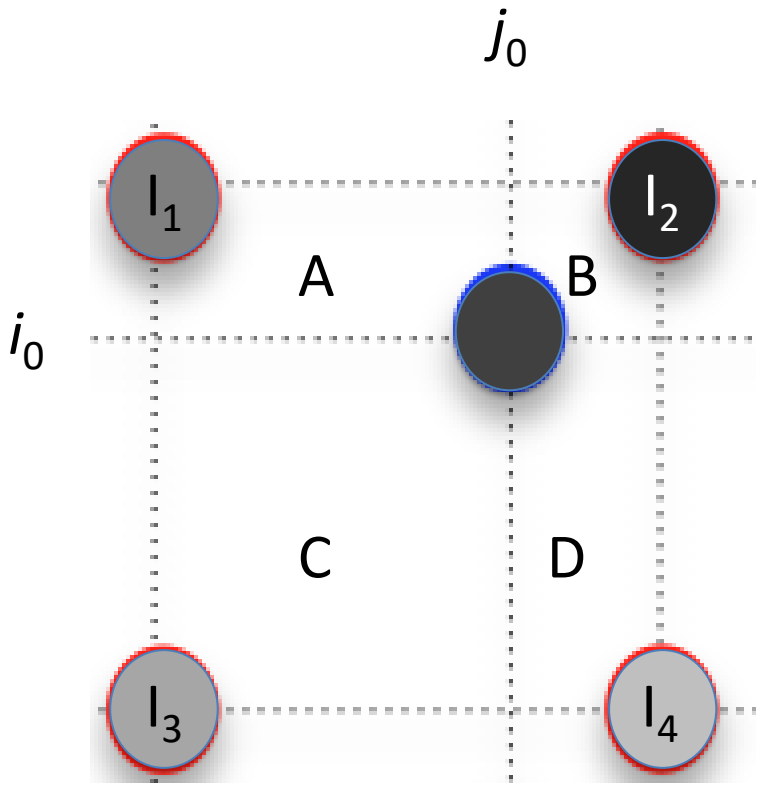


Bilinear interpolation

$J(i,j)$ = interpolation $\{I(i_0,j_0)\}$ =

$$AI_4+BI_3+CI_2+DI_1$$

$A+B+C+D = 1$



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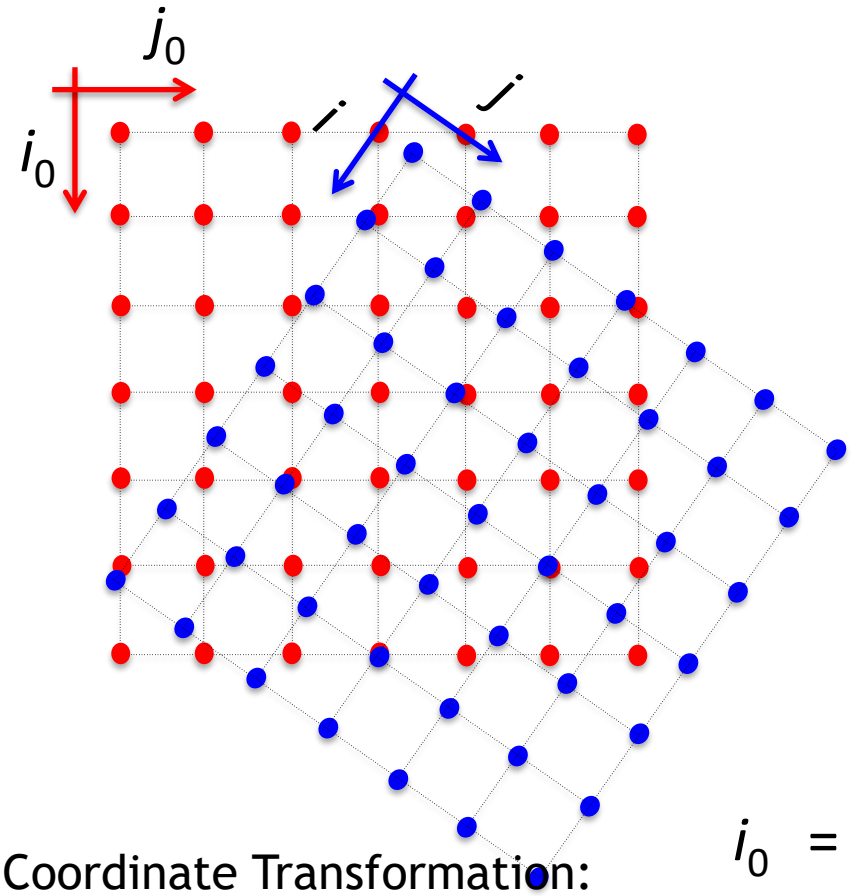

Algorithm:

1) For each (i,j) of J compute (i_0,j_0).
2) J(i,j) = interpolation {I(i_0,j_0)}

Coordinate Transformation:
(Example: Rotation &Translation)

$$i_0 = i\cos\Theta + j\sin\Theta + a$$

$$j_0 = -i\sin\Theta + j\cos\Theta + b$$

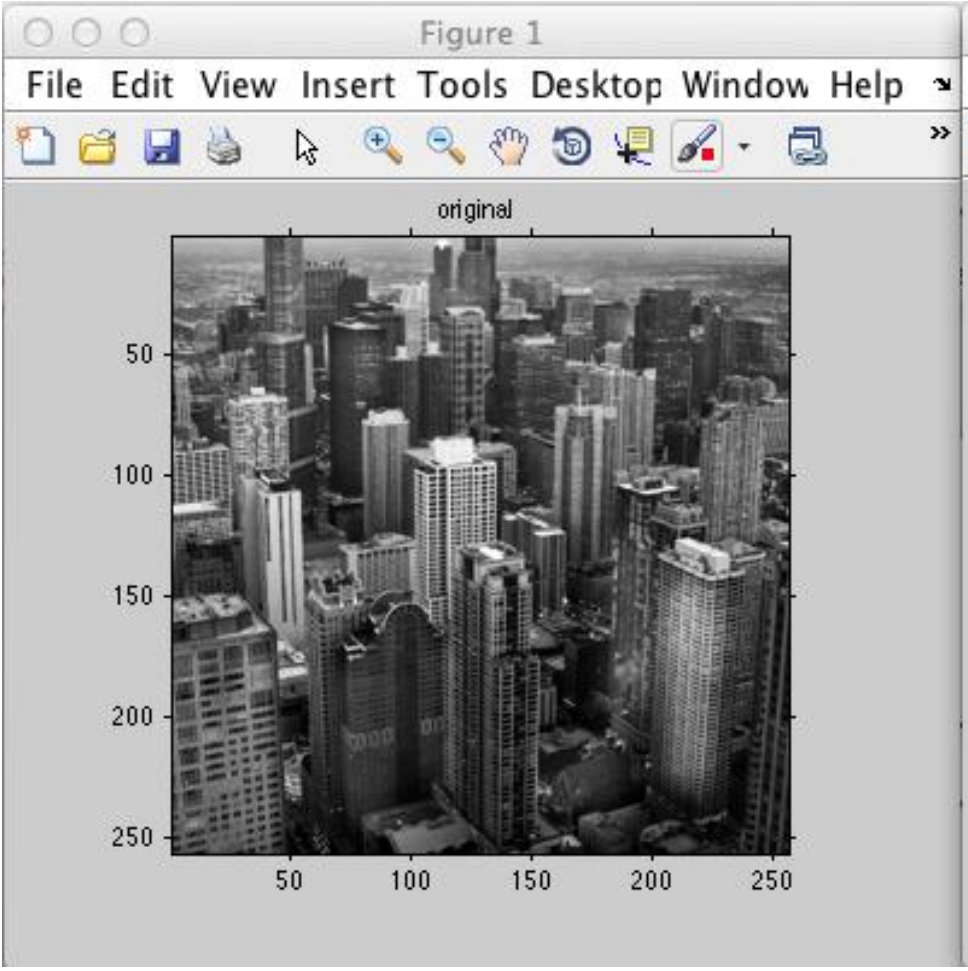
Figure 1
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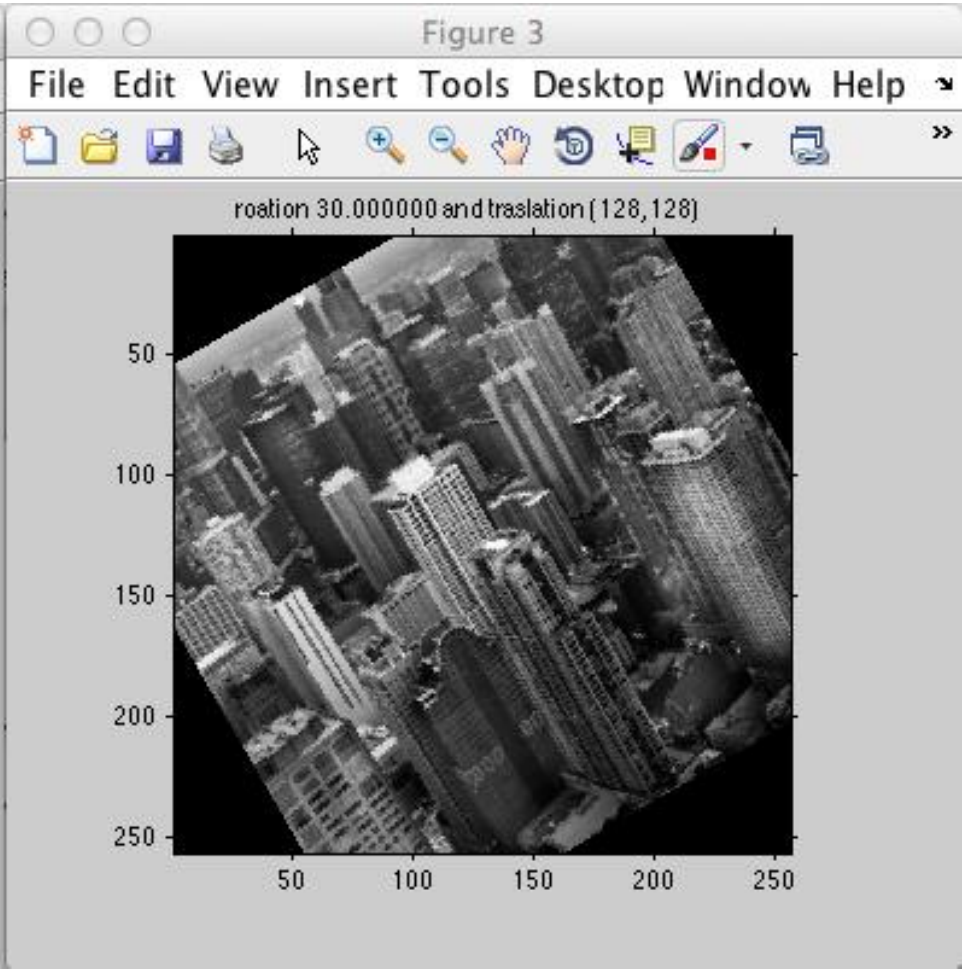
Figure 3
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roation 30.000000 and traslation (128,128)
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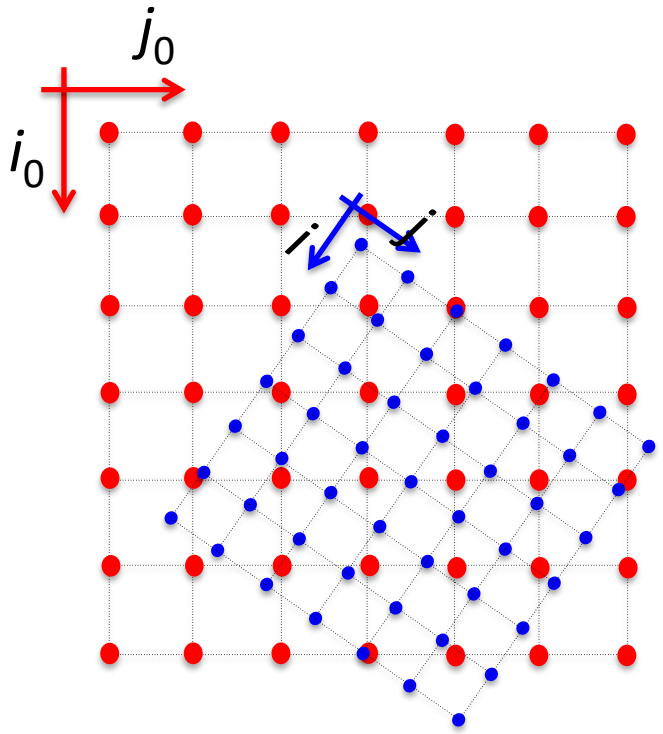

Algorithm:

1) For each (i,j) of J compute (i_0,j_0).
2) J(i,j) = interpolation {I(i_0,j_0)}

Coordinate Transformation:
(Example: Rotation & Translation & Scale)

$$i_0 = s\, i \cos\Theta + s\, j \sin\Theta + a$$

$$j_0 = -\, s\, i \sin\Theta + s\, j \cos\Theta + b$$