Competitive Programming

Introduction to Competitive Programming

COMPETE SEARCH: MILK2 (INTERVAL) AND TRANSFORMATION

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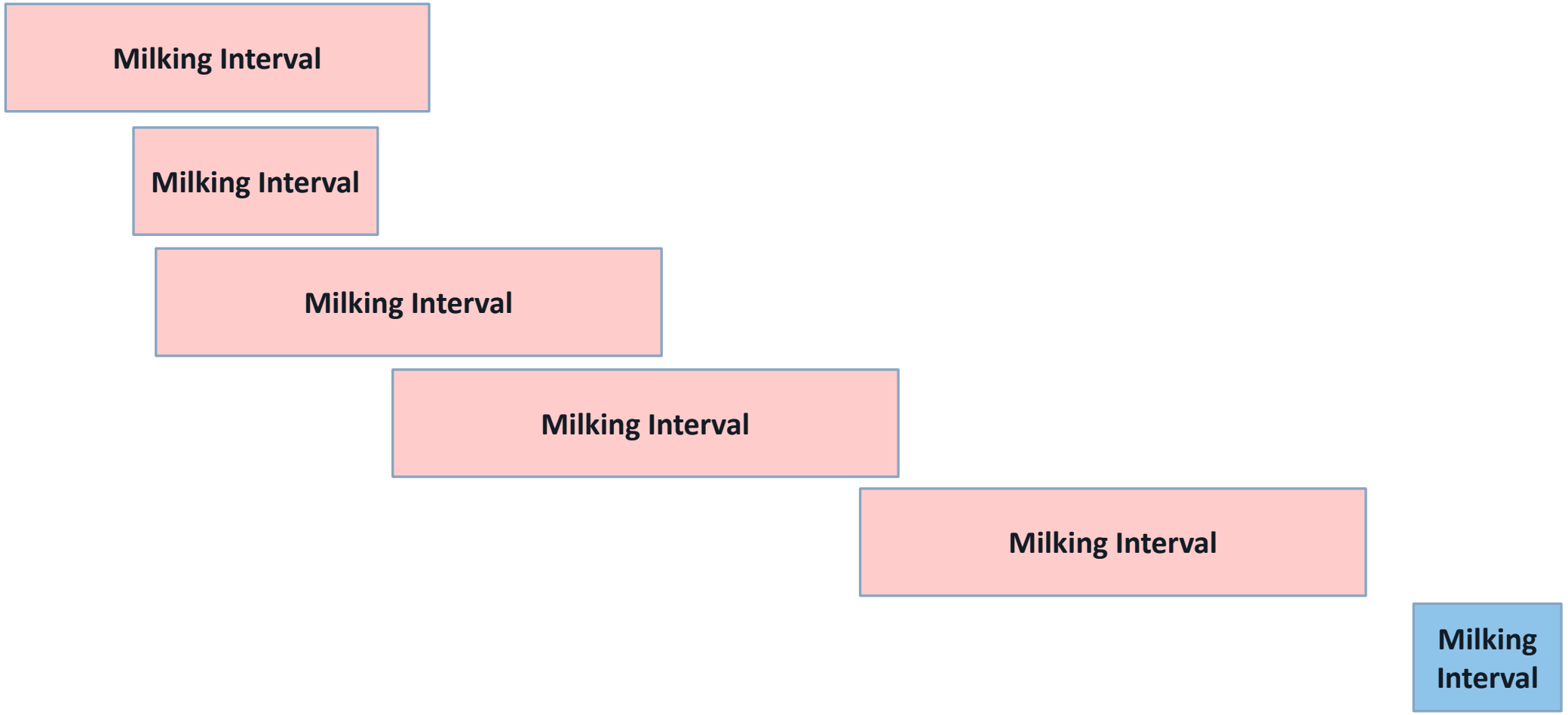
Milk2

LECTURE 1

Nature of the Problem

- Interval Management
- Add a new milking interval
- Convert all milking intervals into Interval objects and add these objects into an interval list one by one.
- Sort all milking intervals by starting time. (***O(log n))***)
- Merging the milking intervals
- Find the longest interval and the longest bye-interval.

Merging Intervals



Bye-Intervals

Bye Interval	Milking Interval	Bye Interval	Milking Interval	Bye Interval	Milking Interval

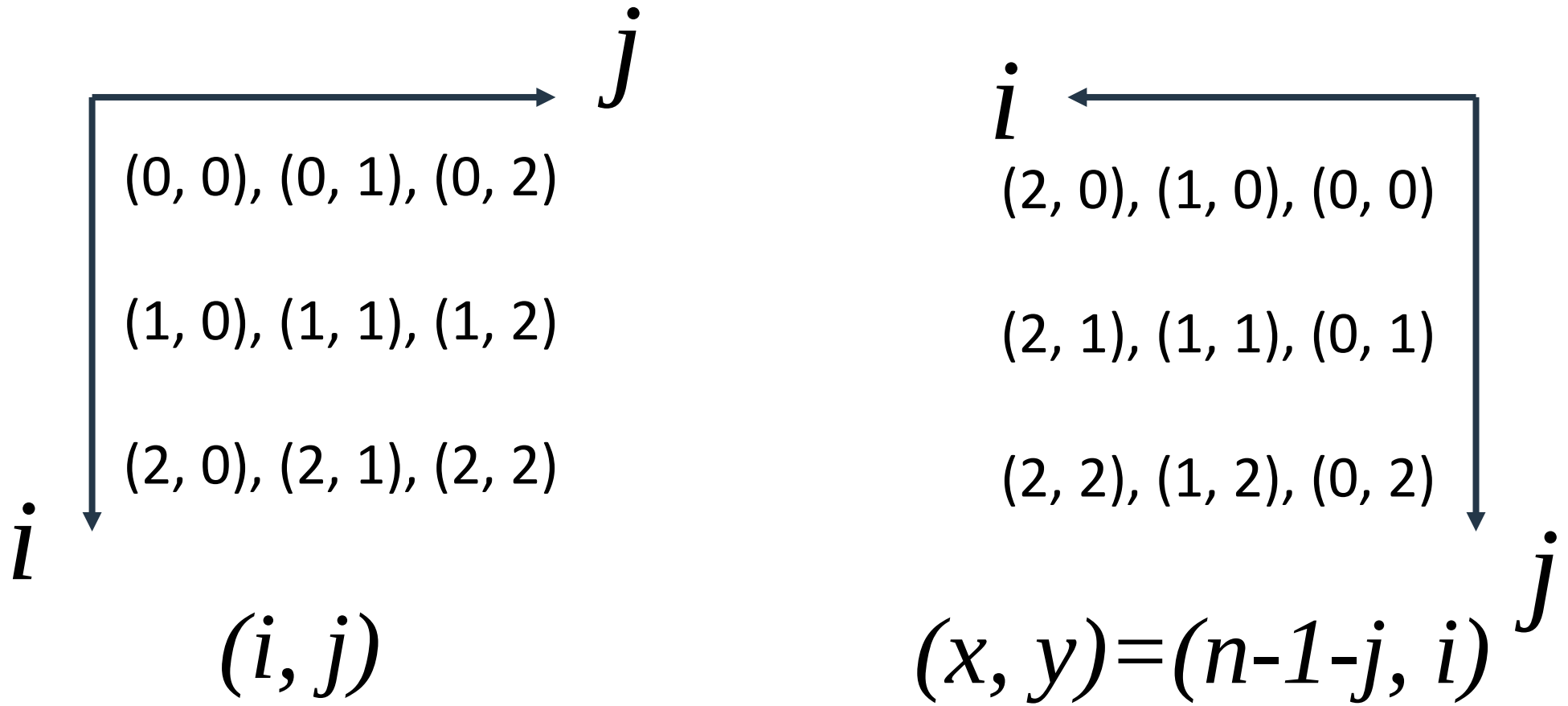
Transformation

LECTURE 2

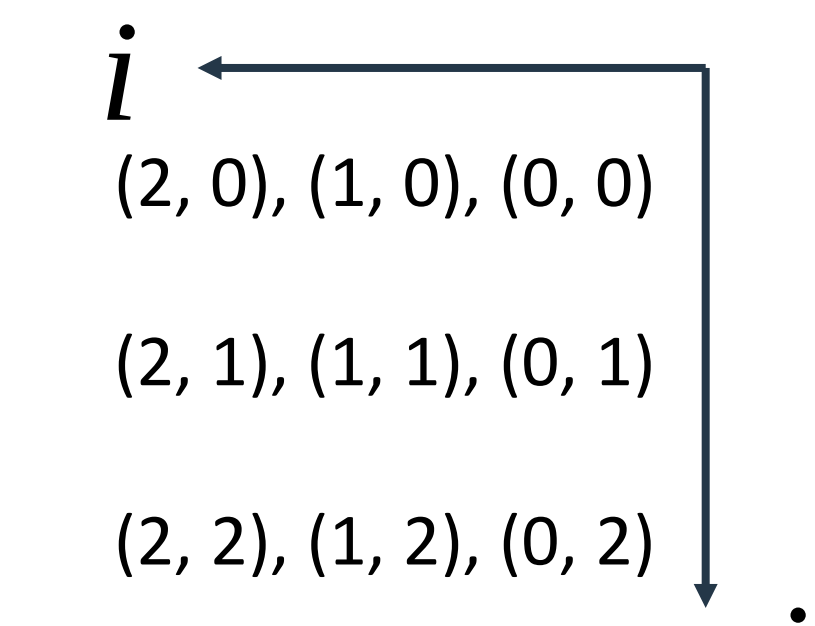
Transformation Rules

- Rule 1: 90 Degree Rotation: The pattern was rotated clockwise 90 degrees.
- Rule 2: 180 Degree Rotation: The pattern was rotated clockwise 180 degrees.
- Rule 3: 270 Degree Rotation: The pattern was rotated clockwise 270 degrees.
- Rule 4: Reflection: The pattern was reflected horizontally (turned into a mirror image of itself by reflecting around a vertical line in the middle of the image).
- Rule 5: Combination: The pattern was reflected horizontally and then subjected to one of the rotations (#1-#3).
- Rule 6: No Change: The original pattern was not changed.
- Rule 7: Invalid Transformation: The new pattern was not obtained by any of the above methods.

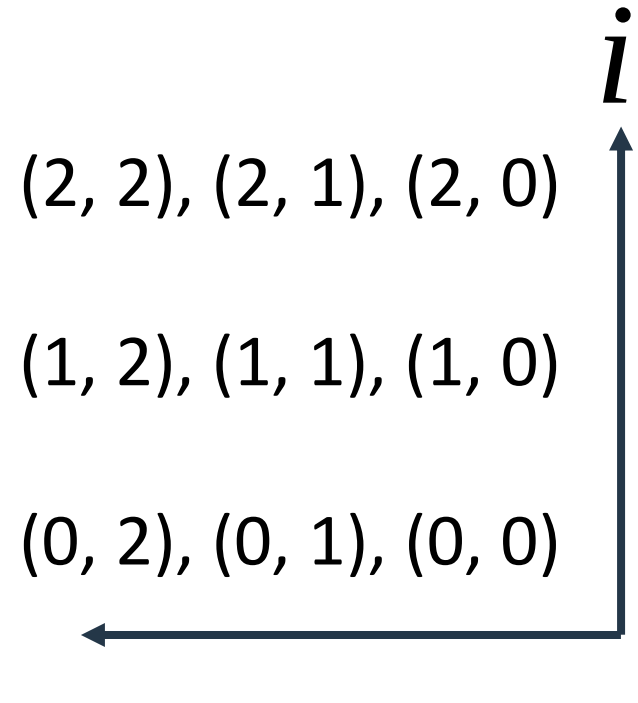
Index Space (90 degree clockwise)



Index Space (180 degree clockwise)

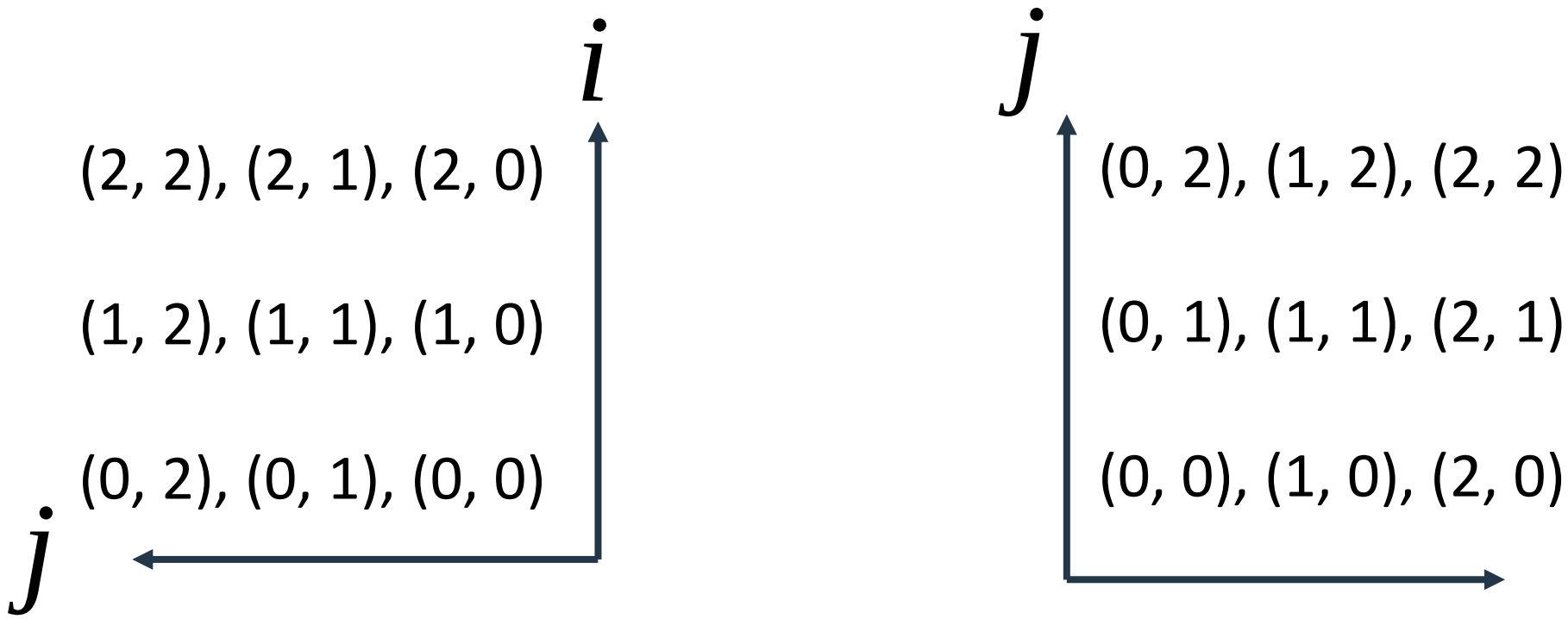


$$(x, y)=(n\text{-}1\text{-}j, i)$$



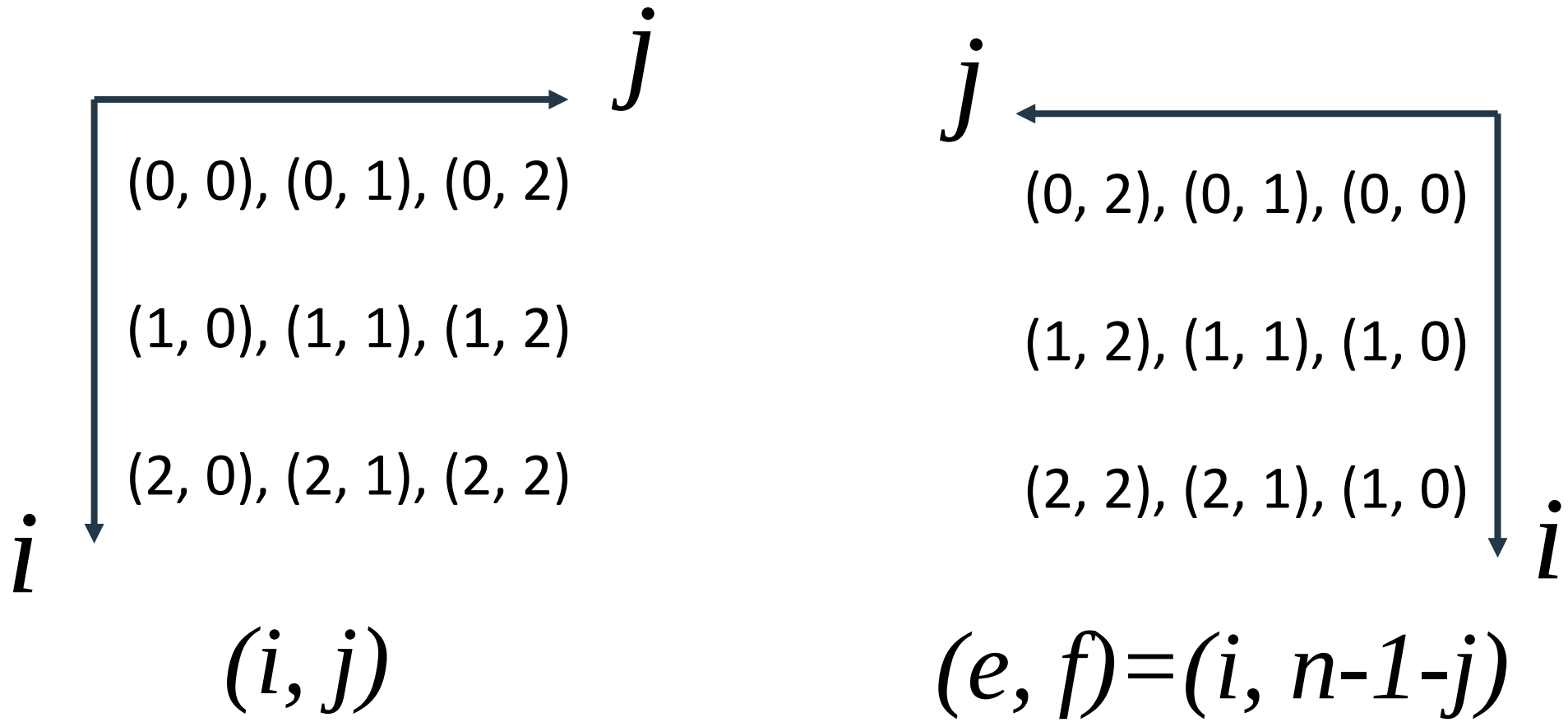
$$(a, b)=(n\text{-}1\text{-}y, x)=((n\text{-}1\text{-}i), (n\text{-}1\text{-}j))$$

Index Space (270 degree clockwise)



$(a, b)=(n\text{-}1\text{-}y, x)=((n\text{-}1\text{-}i), (n\text{-}1\text{-}j))$ $(c, d)=(n\text{-}1\text{-}b, a)=(j, (n\text{-}1\text{-}i))$

Index Space (Reflection Horizontally)

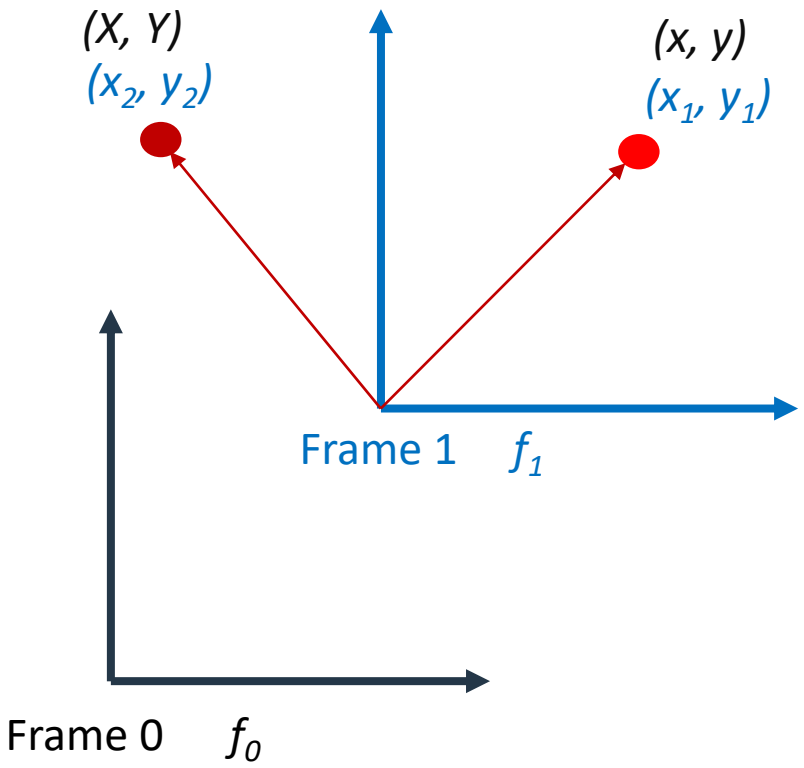


Rule 5

- Apply the horizontal flection and then, apply rotate once to check if valid, then twice, then third times. If there is a match within 3 times. Then return turn. Otherwise return false.

Nature of the Problem

- Use simple index generator for clockwise 90 degree and horizontal reflection.
- Rule checking rules 1, 2, 3, 4, 5, and 6 one by one for isValid() checking. If none of these rules matches, return 7.



The original Point of frame f_1 is located at $(\frac{N-1}{2}, \frac{N-1}{2})$

A data point $p_1(x, y)$ in f_0 *has the coordinates of* p_1 (x_1, y_1) *in* frame f_1
Another data point $p_2(X, Y)$ in f_0 *has the coordinates of* p_2 (x_2, y_2) *in f1*

$(x, y) = (x_1 + \frac{N-1}{2}, y_1 + \frac{N-1}{2})$ due to the translation of the frames.

$(X, Y) = (x_2 + \frac{N-1}{2}, y_2 + \frac{N-1}{2})$ due to the translation of the frames.

$(X, Y) = (x_2 + \frac{N-1}{2}, y_2 + \frac{N-1}{2}) = (-y_1 + \frac{N-1}{2}, x_1 + \frac{N-1}{2})$
$= (-(y + \frac{N-1}{2}) + \frac{N-1}{2}, (x + \frac{N-1}{2}) + \frac{N-1}{2}) = (-y, N-1-x)$

Where $(x_2, y_2) = (-y_1, x_1)$ *due to the rotation of 90 degree*