Image origin
and
CTF Astigmatism Angle (ASTIG)

Anchi Cheng (acheng@scripps.edu)

National Resource for Automated Molecular Microscopy

The Scripps Research Institute

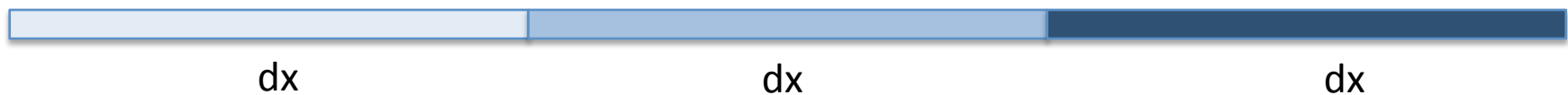10550 N. Torrey Pines Rd, La Jolla, CA 92037, USA

data in file is a long string

- header includes information on how to parse it and which corresponds to which axis when a program access it

For example: header says: x axis is the fast axis, y axis the slow.
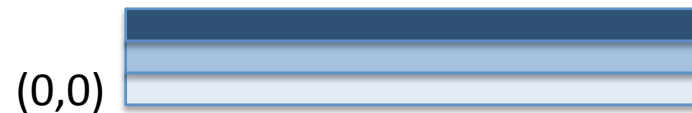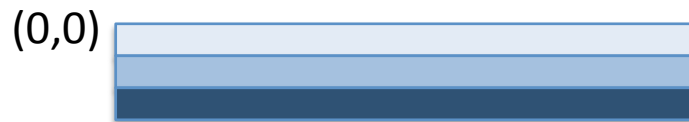Length in x dimension is dx, Length in y dimension is 3

(0,0)

dx   dx   dx

- Therefore, from a program that accesses the value at any coordinate, this data file becomes a 2-d image of dimension (dx, 3) where (0,0) is at the first piece that parsed out (the lightest block shown here)
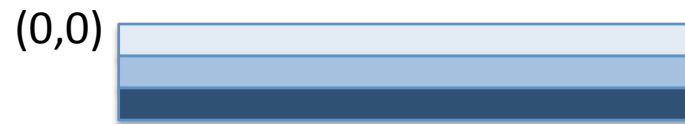
Display programs

- Need to do two things:
  - Read the data
  - Show it in some coordinate system to the viewer.
- The same (dx,3) image data can therefore be presented in two common ways.

(0,0)
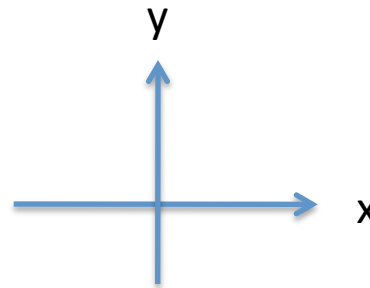
(0,0)

Computer Scientists

- Prefer

(0,0)

- because it is consistent with ray-scan on TV and monitor (top to bottom)

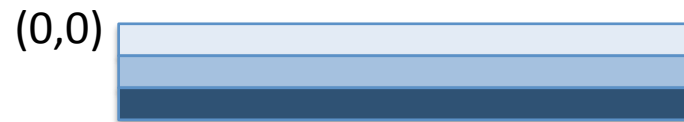# Physicists

- Prefer

(0,0)

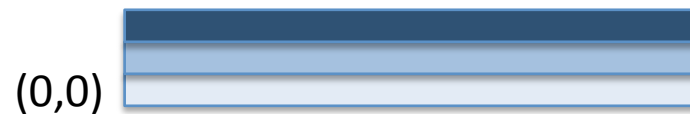- because that is how we learned Cartesian in middle school.

y

x

Problem with displaying MRC

- Leginon/Appion was developed by computer scientists. So it displays MRC as

  (0,0)

- FEI softwares do the same.

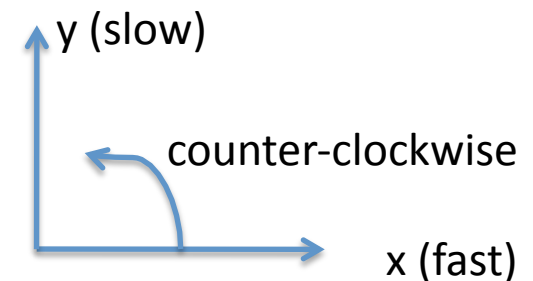- While the native MRC display (XIMDISP) and many others show the same data as
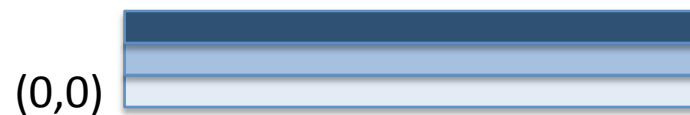
  (0,0)

On the same stream of data with the same header

Who is wrong? No one

- It all depends on how the data was acquired in the first place.

- Leginon/FEI collect data with the origin at top-left

- At MRC-LMB, the film are scanned with the origin at bottom-left

Counter-clockwise?

- When paper like the one for ctffind stated that its ASTIG was counter-clockwise from x-axis, it probably assumed that we always view it in the physicist orientation. It therefore probably really meant that from data point of view, the rotation that brings the fast-axis to the slow-axis is defined as positive

- 3DEM did not clarify the definition but repeated the same wording.

(0,0)

y (slow)

counter-clockwise

x (fast)

Importance of checking image origin

For the same given image file with ASTIG > 0, it APPEARS "counter-clockwise" when displayed with origin at bottom left, but "clockwise" when displayed with origin at top left