

## Matlab notes for Numerical EM

### Array indexing

When plotting in data contained in arrays in Matlab, be aware that Matlab 2-D arrays use (row, column) indexing, that is (y, x) instead of (x,y). So for instance, if you create a 2x2 array:

```
matlab> a = [1 2; 3 4]
matlab> a
     1     2
     3     4
```

To access the '3' at row 2, column 1 you need to index it as:

```
matlab> a(2,1)
ans = 3
```

This can be particularly confusing when plotting, because if you use (x, y) indexing, your plots will appear rotated when using 'image', and the arrows will point in the wrong direction in 'quiver' plots.

You can either use the (y, x) indexing when filling your arrays, or if you are more comfortable using (x,y) indexing you will need to rotate 'image' plots using 'rot90', and swap x and y and rotate quiver plots.

In all cases, the best thing to do is to verify the orientation of your plots by means of a simpler example, for instance, if you are plotting a quiver plot of an E field due to the presence of electric charges, create a simpler example having one positive charge placed towards a corner of your plot. You can verify for rotation by checking the corner is as intended, and you can also see that all the arrows of the plot diverge from the point where the positive charge is placed as expected.