

# Image Sampling Lattices Tutorial Exercise

## Exercise

Let the basis vectors of two sampling lattices be:

Lattice A:  $v_1 = [\sqrt{3}, 1]^T$  and  $v_2 = [0, 2]^T$ .

Lattice B:  $v_1 = [2\sqrt{2}, 0]^T$  and  $v_2 = [\sqrt{2}, \sqrt{2}]^T$ .

For each of the above sampling lattices:

1. Sketch the basis vectors and the sampling points. Define the Voronoi unit cell. Show that the entire spatial domain is tiled up by shifted versions of the unit cell. Determine sampling density.
2. Determine sampling density of reciprocal lattices.
3. For a signal with circular spectrum (i.e, the support region is circle), which lattice is better?
4. The basis vectors for a given lattice are not unique. Find another set of basis vectors for the above lattices. Sketch the respective basis vectors.