Section 1

Introduction

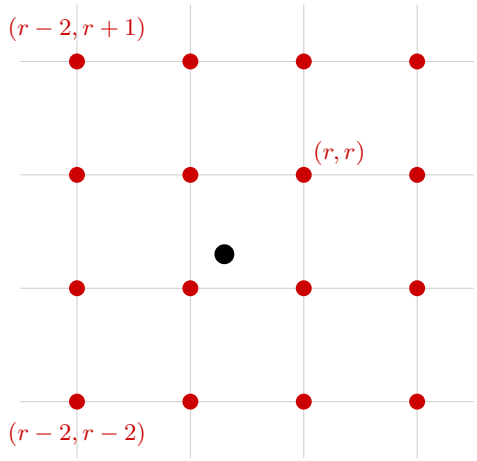
Subsection 1.1

The Interpolation Function

Given the material position X we want to obtian the velocity of fluid at that point. [1] This process is directly interpreted by

$$\mathbf{u}(\mathbf{X}(r,s,t),t) = \int \mathbf{u}(\mathbf{x},t)\delta(\mathbf{x}-\mathbf{X}(r,s,t))d\mathbf{x} \tag{1.1}$$

[1] *Note that X usually doesn't lies on the grid point.*



However in the discrete case we would need the discrete Delta Function.

In the figure on the left, black point is the material point and red points are the grid points. The δ function average all the velocity at the red points.

Something to pay attention is that in MATLAB, the convention for a matrix to represent a grid of point is to have lay points with same x coordinat in the **same row** This may be different from our intuition. However, This is reasonable since we normally define the matrix for storing points to have size

$$N_x \times N_y$$

So it has N_x rows.