The Double Integral-- Demonstrating Riemann Sums

You may want to consider the cross-sectional format before beginning.

The only differences are
1. We will use a larger step size and not graph the surface
2. We have to animate in both the x and y directions

As an example we'll set up the animation to demonstrate the volume of $f(x,y) := \cos(x) \cdot \cos(y)$

on the unit square.

$$f(x,y) := \cos(x) \cdot \cos(y)$$

$$a := 0 \qquad b := 1 \qquad c := 0 \qquad d := 1 \qquad \Delta x := .1 \qquad \Delta y := .1$$

The next equation holds x fixed for the first 10 frames as y varies and then lets x vary for the next 10 frames

$$t := \begin{cases} \left(0 .. \dfrac{b-a}{\Delta x} \cdot \dfrac{FRAME - 10}{10}\right) & \text{if } 10 \le FRAME \le 20 \\ 1 & \text{otherwise} \end{cases}$$

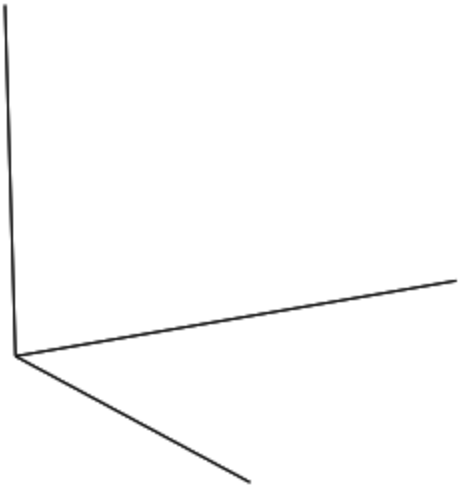
This equation allows y to vary over the first 10 frames and then remains fixed as x varies

$$s := \begin{cases} \left(0 .. \dfrac{d-c}{\Delta y} \cdot \dfrac{FRAME}{10}\right) & \text{if } FRAME \le 10 \\ (0 .. 10) & \text{otherwise} \end{cases}$$

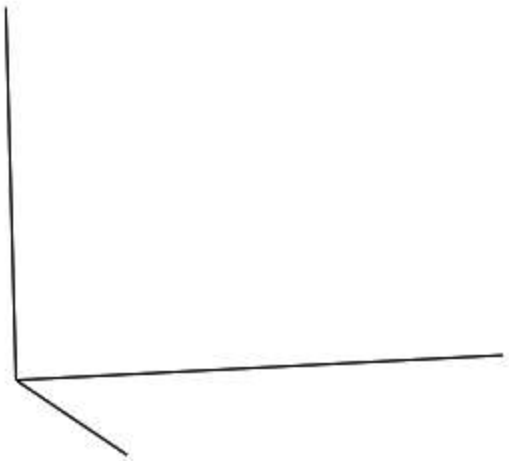
$$X_t := a + t \cdot \Delta x \qquad Y_s := c + s \cdot \Delta y$$

$$N_{t,s} := f\left(X_t, Y_s\right)$$

Again to animate change surface plot to bar plot and use 20 frames



N



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