gpu_magic

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In [1]:
```
def a_j(j, N):
    return 2**(8*(N-j-1)) * (2**8 - 1)

def alpha(xmin, xmax):
    return 1 / (xmax - xmin)

def beta(xmin, xmax):
    return -xmin * alpha(xmin, xmax)

def z0_j(d, N, alpha):
    return x0_j(-d/alpha, N)

def x0_j(X, N):
    x = []
    for i in range(N-1):
        x0 = X % 2**8 / (2**8 - 1)
        X = X // 2**8
        x.append(x0)
    x.append(X / (2**8 - 1))
    x = x[::-1]
    return x
```

In [3]:
```
xmin = 7567
xmax = 753404
N = 4
d = beta(xmin, xmax) + alpha(xmin, xmax) * 2.0**31
z0 = z0_j(d, N, alpha(xmin, xmax))
print('z0:', z0)
print('compare d:', sum(- z * alpha(xmin, xmax) * a_j(j,N) for j,z in enumerate(z0)), d

x = 2**31 + 120000
x0j = x0_j(x, N)
x0j[0] = x0j[0] - 256/255 * int(x0j[0] > 0.5)
for j in range(N):
    print(f'x0_{j}:', x0j[j])
print('compare x0:', sum(x0j[j] * a_j(j, N) for j in range(N)), -2**31 + 120000)
```

```
        for i in range(N):
            print(f'x2_{j}:', a_j(j,N) * alpha(xmin, xmax) * (x0j[j] - z0[j]))
        print('x2', sum(a_j(j,N) * alpha(xmin, xmax) * (x0j[j] - z0[j]) for j in range(N)))
```

```
z0: [-0.5019607843137255, 0.0, 0.11372549019607843, 0.5607843127905153]
compare d: 2879.2833836347627 2879.2833836347622
x0_0: -0.5019607843137255
x0_1: 0.00392156862745098
x0_2: 0.8313725490196079
x0_3: 0.7529411764705882
compare x0: -2147363648.0 -2147363648
x2_3: 6.569800135742607e-05
x2_3: 6.569800135742607e-05
x2_3: 6.569800135742607e-05
x2_3: 6.569800135742607e-05
x2 0.150747415320289
```

```
In [6]: xmin = 512
        xmax = 514
        N = 2
        d = beta(xmin, xmax)
        z0 = z0_j(d, N, alpha(xmin, xmax))
        print('z0:', z0)
        print('compare d:', sum(- z * alpha(xmin, xmax) * a_j(j,N) for j,z in enumerate(z0)), d

        x = 513.5
        x0j = x0_j(x, N)
        for j in range(N):
            print(f'x0_{j}:', x0j[j])
        print('compare x0:', sum(x0j[j] * a_j(j, N) for j in range(N)), x)

        a_j(1,N) * alpha(xmin, xmax) * (x0j[1] - z0[1]), a_j(0,N) * alpha(xmin, xmax) * (x0j[0]
```

```
z0: [0.00784313725490196, 0.0]
compare d: -256.0 -256.0
x0_0: 0.00784313725490196
x0_1: 0.0058823529411764705
compare x0: 513.5 513.5
```

```
Out[6]: (0.75, 0.0)
```