We will encode the word ‘cba’ using arithmetic coding.

|  |  |  |
| --- | --- | --- |
| **Source Symbol** | **Probability** | **Initial Subinterval** |
| a | 0.5 |  |
| b | 0.2 |  |
| c | 0.15 |  |
| d | 0.1 |  |
| e | 0.05 |  |

The first subinterval would correspond to ‘c’, and so it would be .  
After renormalizing, the table will look like so-

|  |  |  |
| --- | --- | --- |
| **Source Symbol** | **Probability** | **Initial Subinterval** |
| a | 0.5 |  |
| b | 0.2 |  |
| c | 0.15 |  |
| d | 0.1 |  |
| e | 0.05 |  |

The second subinterval would correspond to ‘b’ and so it would be .

Instead of calculating the final table, we’ll just calculate the expected probability-  
The last character is ‘a’, meaning in the first half of the interval .  
The interval is of size 0.03 and so half of it is of size 0.015.  
And so, the final subinterval for ‘a’ would be .

Finally, we will choose a number within that range(which represents cba), like 0.78.

Projective transformations do not necessarily preserve parallelism. Projective transformations change the perspective of an object. So, for example, when viewing a rectangle from its side we can get the following change in perspective-

As we can see, the before-transformation parallel lines(top and bottom) are no longer parallel.

Let us choose the two parallel lines in Euclidian space and , and consider the projective transformation represented by this matrix-

Which transforms the coordinates of a point [ like so-

The line y=1

Let us pick two points on the line :   
The homogeneous coordinates of these points are and , respectively.  
Calculating their transformations results in-

, which corresponds to .

, which corresponds to (by dividing by the z component).

These two points are represented by the line

The line y=2

Let us pick two points on the line : ,   
Their corresponding homogenous coordinates are and .

, which corresponds to .

, which corresponds to (by dividing by the z component).

These two points are represented by the line

Since the coefficients of aren’t the same, the resulting two lines are not parallel- contradicting the initial statement.