Arithmetic Encoding

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Input : Message Output : A range or fractional value assigned for entire message as encoding

Defaults

```
clc;
clear all;
close all;
```

Inputs, Variables, Constants

```
alphabets = ["A", "B", "C"];
probabs   = [0.2 0.5 0.3];
MESSAGE   = 'ABBAC';
```

Interactive Inputs (Optional)

alphabets = input("Enter alphabets array in ascending order: "); probabs = input("Enter respectively probability array: "); MESSAGE = input("Enter message: ");

Algorithm

```
cumProbs = [0 cumsum(probabs)];

low  = 0;
high = 1;

fprintf('Initial range: [%.6f , %.6f)\n\n', low, high);

for k = 1:length(MESSAGE)

    % Find index of current symbol
    idx = find(alphabets == MESSAGE(k));

    % Current range width
    range = high - low;

    % Calculate new boundaries
    low_new  = low  + range * cumProbs(idx);
```

```
    high_new = low  + range * (cumProbs(idx) + probabs(idx));

    % Update range
    low  = low_new;
    high = high_new;

    fprintf('After %c : [%.6f , %.6f)\n', MESSAGE(k), low, high);
end
```

```
Initial range: [0.000000 , 1.000000)

After A : [0.000000 , 0.200000)
After B : [0.040000 , 0.140000)
After B : [0.060000 , 0.110000)
After A : [0.060000 , 0.070000)
After C : [0.067000 , 0.070000)
```

Results

```
fprintf('\nEncoded range for the message "%s" is: [%.6f , %.6f)\n', MESSAGE,
low, high);

res = (low + high) / 2;
fprintf('Assigned average value for the message is: %.6f\n', res);
```

```
Encoded range for the message "ABBAC" is: [0.067000 , 0.070000)
Assigned average value for the message is: 0.068500
```

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