Lecture delivered during the Teachers Enrichment Workshop held at IMSC between 26th November to 1st December 2018.

Good noon friends

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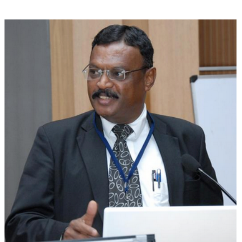

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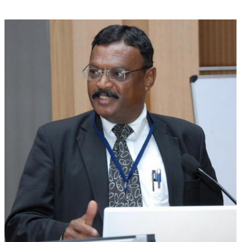

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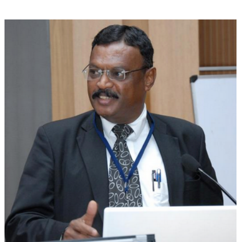

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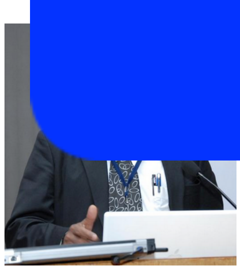
Godfrey Harold Hardy

Born: 7 February 1877 in Cranleigh, Surrey, England
Died: 1 December 1947 in Cambridge, England



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Discrete Fourier Transforms

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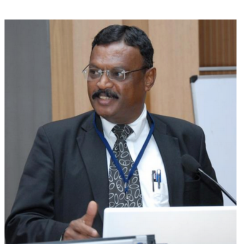
Discrete Fourier Transforms

- Continuous signals are digitised using digital computers
- When we sample, we calculate the value of the continuous signal at discrete points
  - How fast do we sample
  - What is the value of each point
- Quantization determines the value of each samples value



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Finite Fourier Sine and Cosine Transforms

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Finite Fourier Sine and Cosine Transforms

Suppose we have a function $f(x)$ defined in an interval $(-c, c)$ which is Fourier expandable

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Finite Fourier Sine and Cosine Transforms

Suppose we have a function f(x) defined in an interval (-c, c)

which is Fourier expandable

$$Then,\ f(x) = \frac{a_0}{2} + \sum_{1}^{\infty} a_n \cos\left(\frac{n\pi x}{c}\right) + \sum_{1}^{\infty} b_n \sin\left(\frac{n\pi x}{c}\right)$$

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$$F_c(n) = \sqrt{\frac{2}{c}} \int_0^c f(t) \cos\left(\frac{n\pi t}{c}\right) dt$$

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Inverse Finite Fourier Sine and Cosine Transforms

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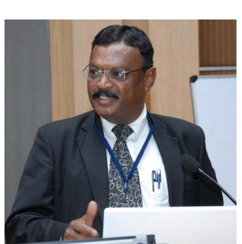

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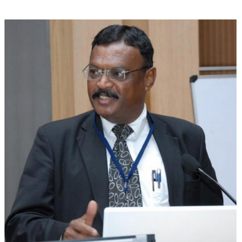
The Inverse Finite Fourier cosine Transform of f(x) is

$$f(x)=\sqrt{\frac{1}{c}}F_c(0)+\sqrt{\frac{2}{c}}\left\{\sum_{1}^{\infty}F_c(n)\cos\left(\frac{n\pi x}{c}\right)\right\}$$



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Find the Inverse Finite Fourier Sine and Cosine Transforms of the function

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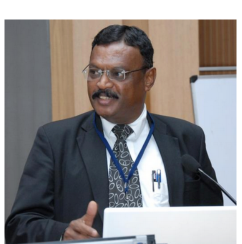
1) $f(t) = 1 \, , 0 < t < 1$

2) $f(t) = t(\pi - t) \, , 0 < t < \pi$



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These are also called the Discrete Fourier transforms of the function

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Fast Fourier Transformation

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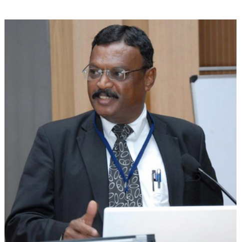
Fast Fourier Transformation

- A fast Fourier transform (FFT) is an algorithm that calculates the discrete Fourier transform (DFT) of some sequence – the discrete Fourier transform is a tool to convert specific types of sequences of functions into other types of representations.



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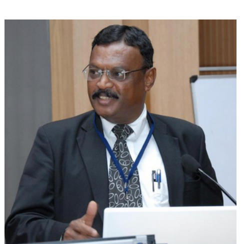
- Cooley - Tukey FFT algorithm



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- **Fast Fourier transformation and the Caller ID in a Mobile phone**

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- # Fast Fourier transformation and the Caller ID in a Mobile phone

1	2	3
4	5	6
7	8	9
	0	

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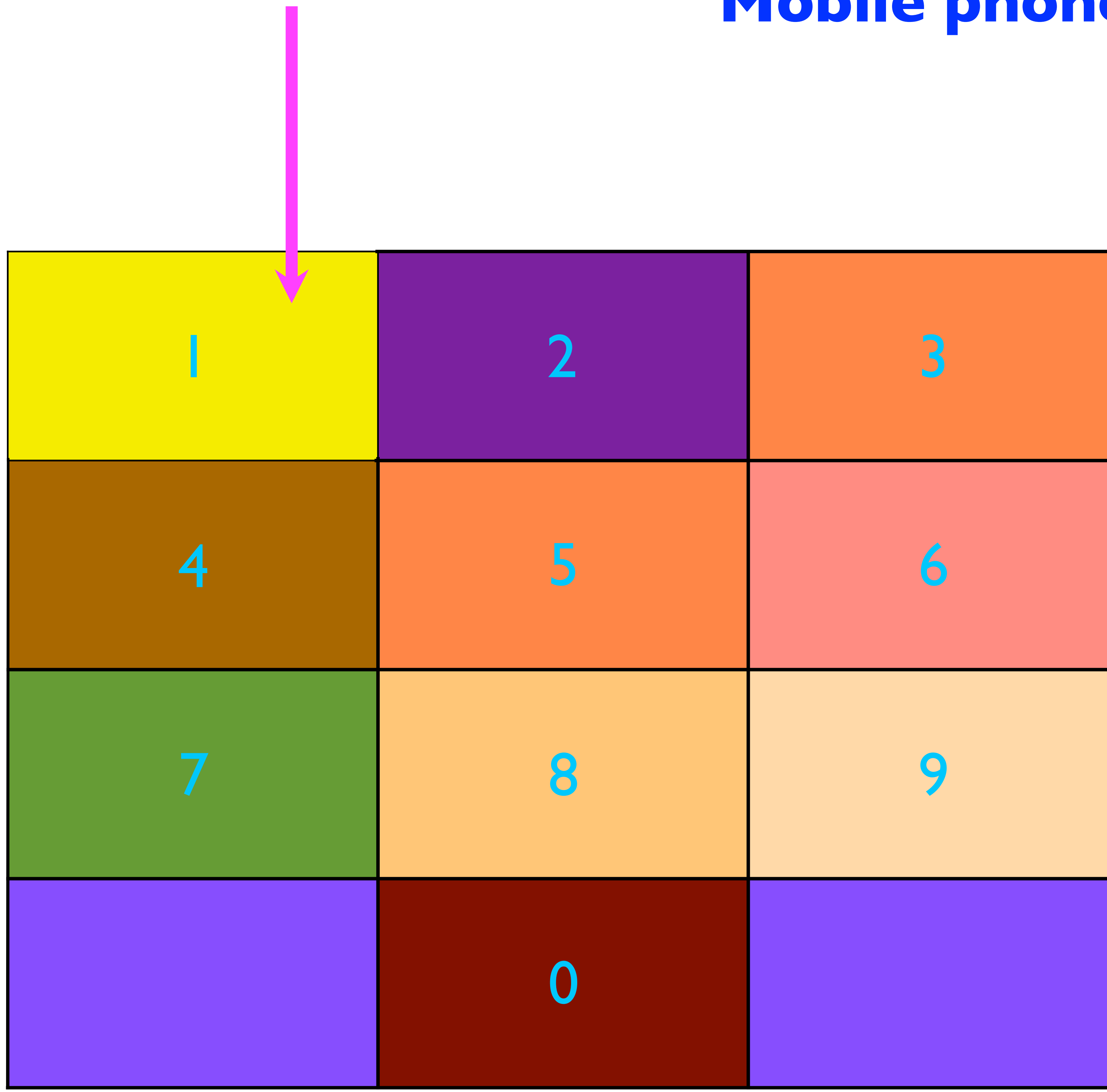

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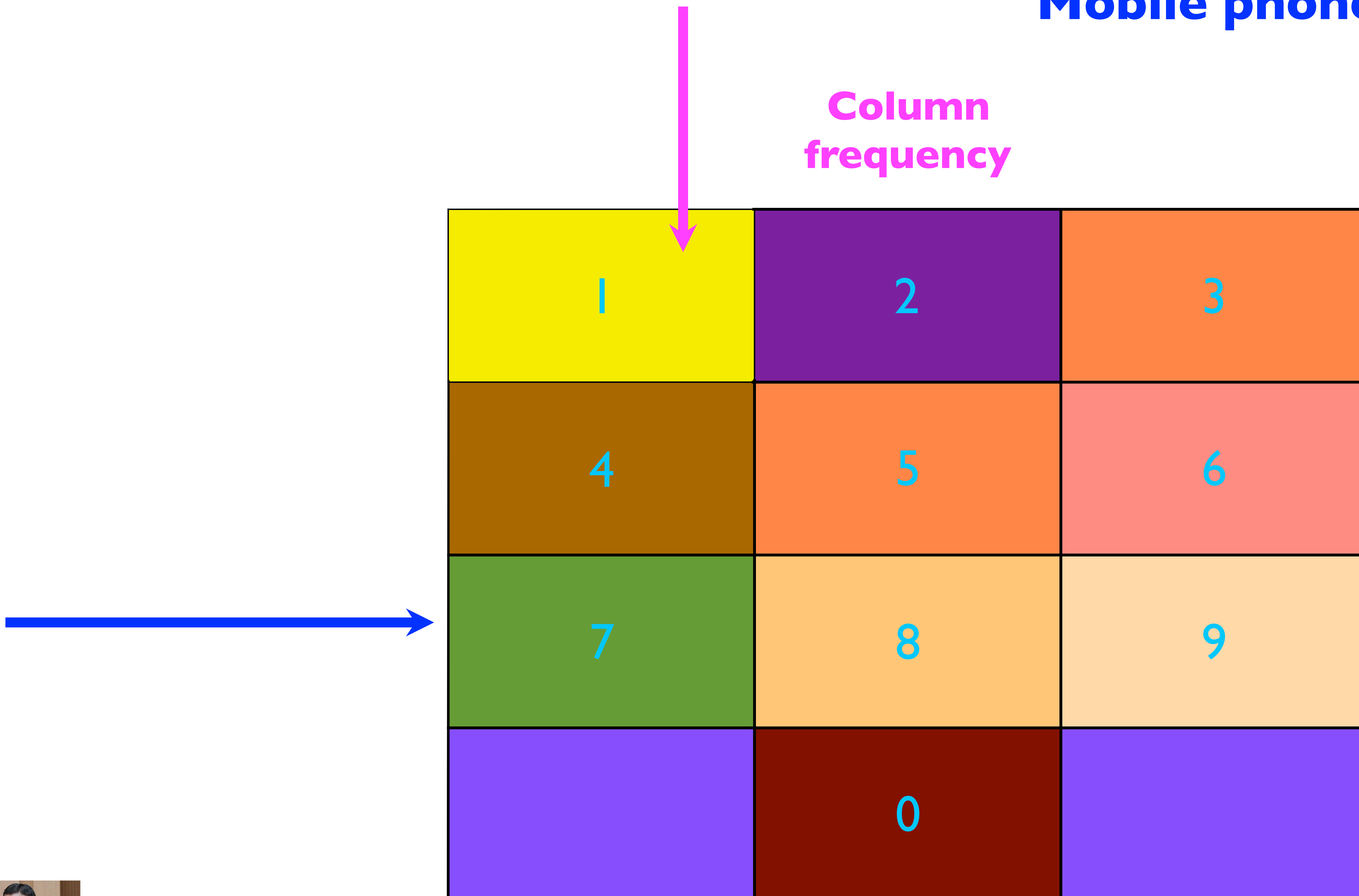

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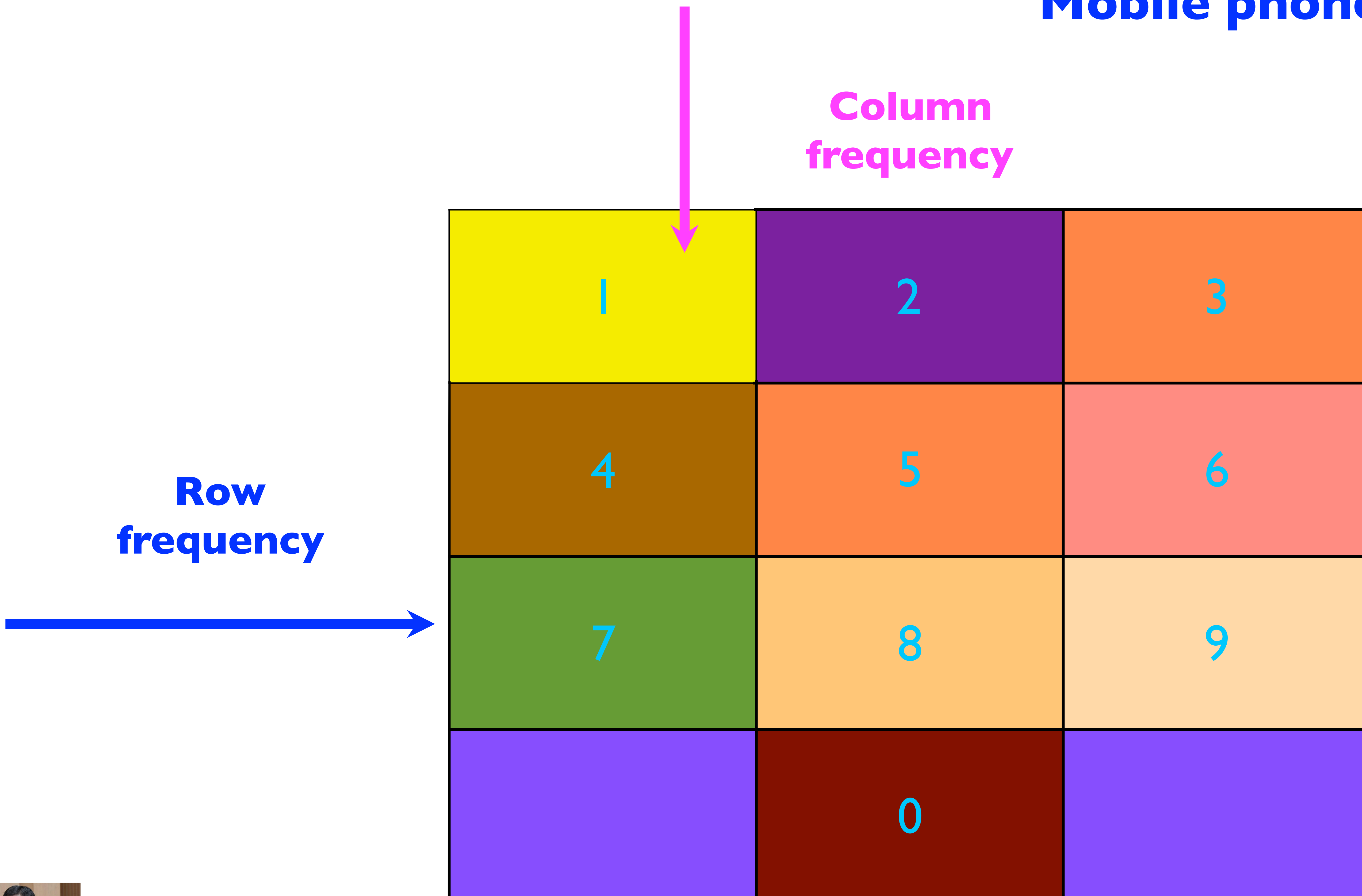

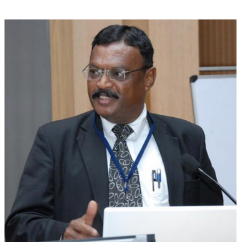

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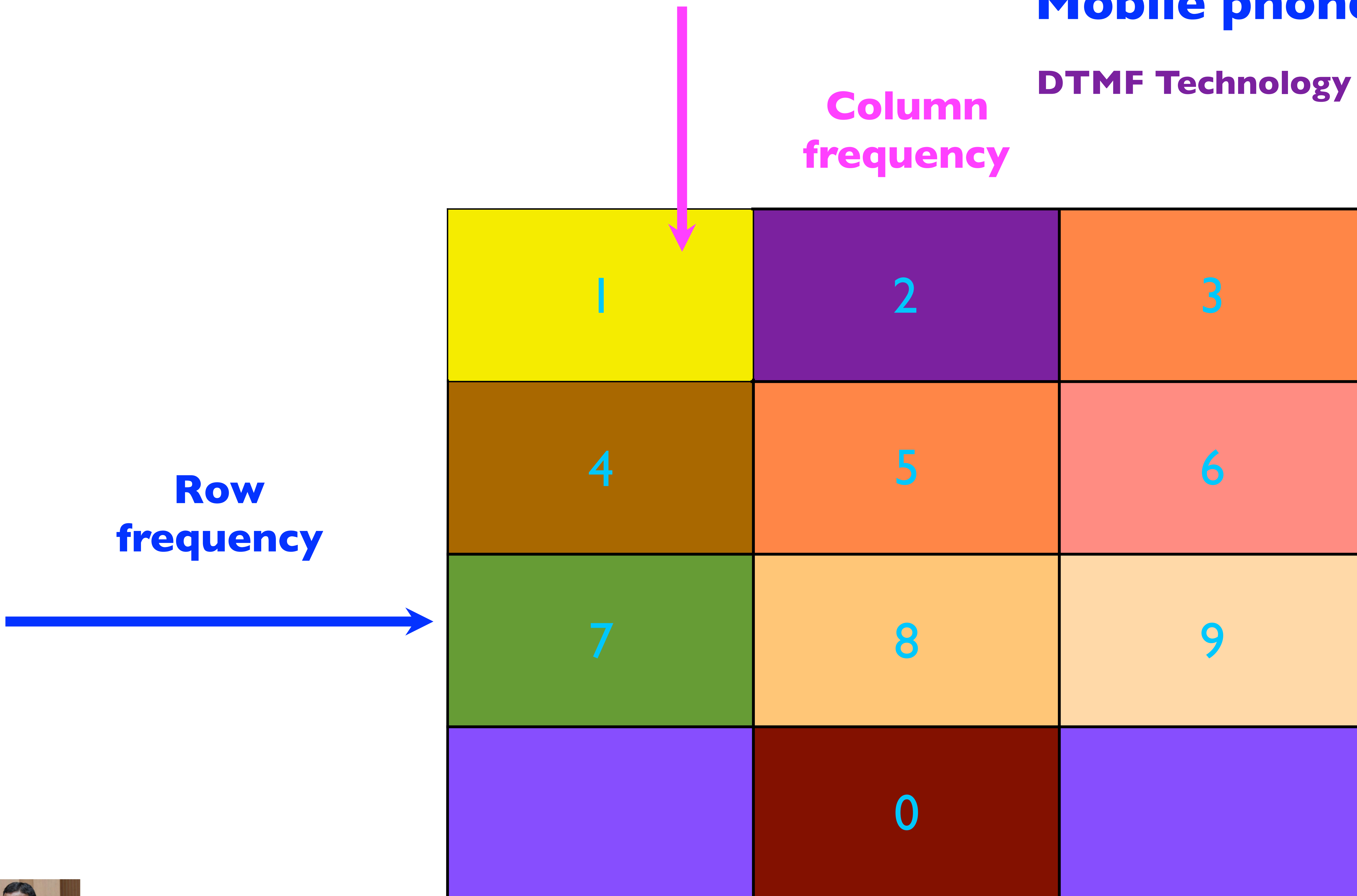
DTMF Technology



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3. **A Fourier transformation ,actually FFT , of that curve is taken. This curve may be of the form**

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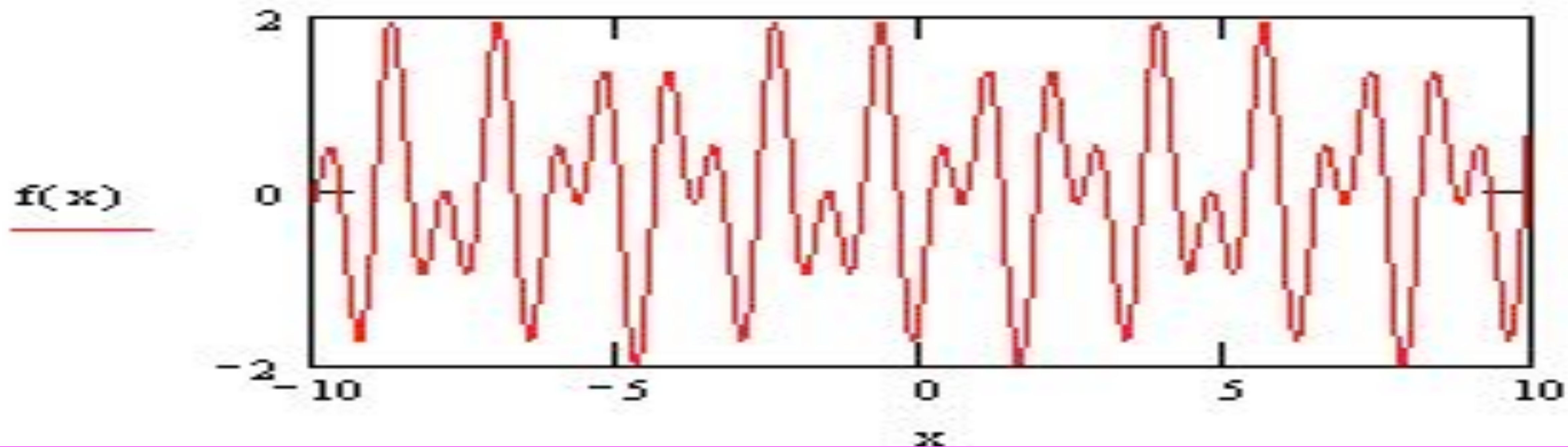

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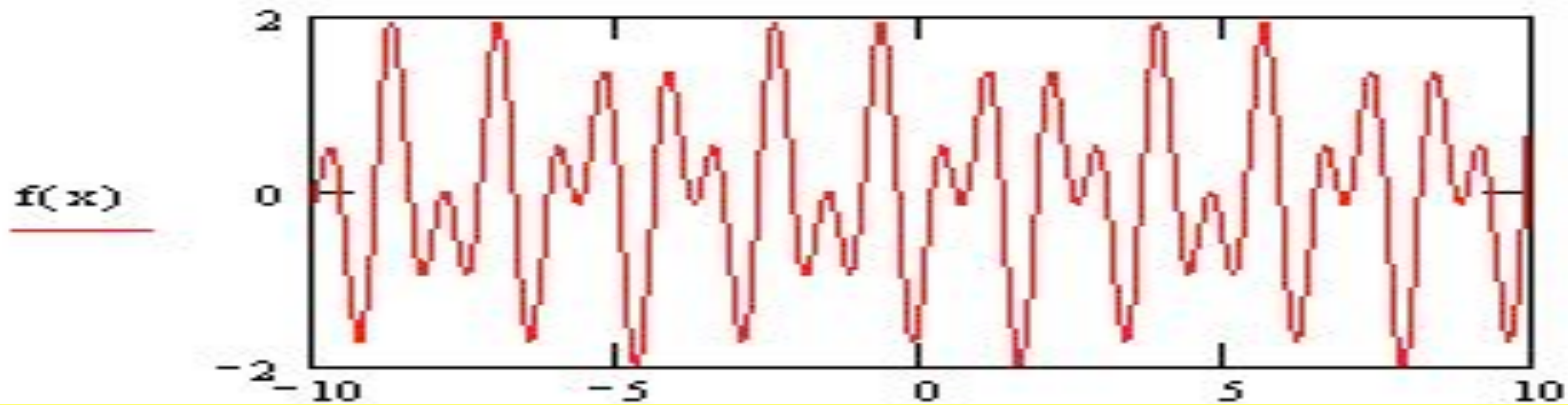

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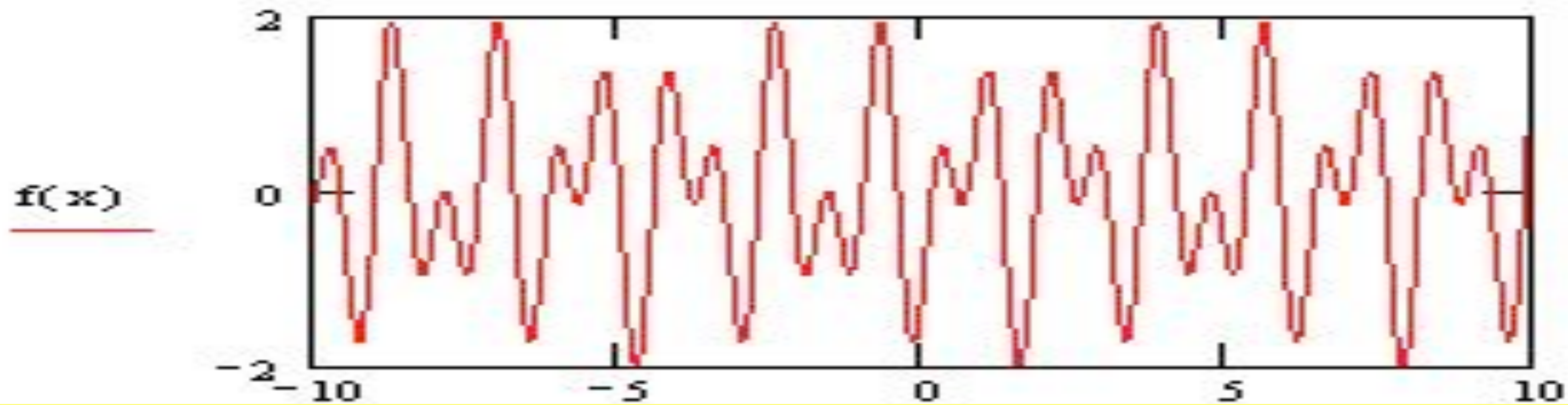

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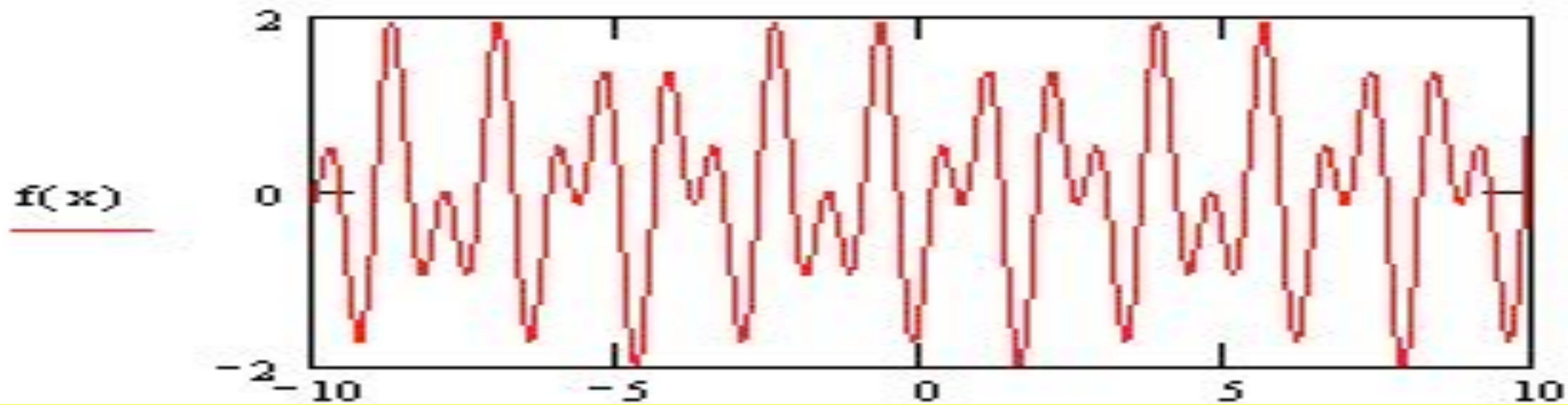

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6. A mechanism will catch the number and display them.

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Steganography

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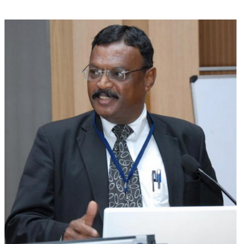
Steganography

By removing all but the last 2 bits of each colour component, an almost completely black image results. Making the resulting image 85 times brighter which results a cat comes from the tree



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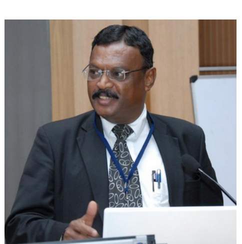

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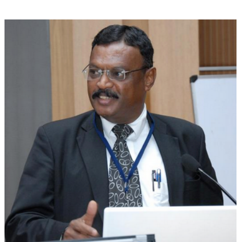

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