Discrete Assignment
EE1205 Signals and Systems

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February 2, 2024

Question 11.9.1.2: Write the first five terms of the sequence whose n^{th} terms $x(n) = \frac{n}{n+1}$
Solution: Given the terms of the sequence are $x(n) = \frac{n}{n+1}$ where $n = 0, 1, 2, 3, 4...$
In terms of $u(n)$, $x(n)$ is

$$x(n) = u(n) - \frac{u(n)}{n+1} \tag{1}$$

$$x(n) = \begin{cases} 0 & \text{if } n = 0 \\ u(n) - \frac{u(n)}{n+1} & \text{if } n > 0 \\ \text{not defined} & \text{if } n < 0 \end{cases}$$

Z-transform is defined as,

$$x(n) \overset{z}{\leftrightarrow} X(z)$$

$$X(z) = \sum_{i=-\infty}^{\infty} x(n).z^{-n} \tag{2}$$

Here, Z-transform

$$X(z) = \sum_{i=1}^{\infty} x(n).z^{-n} \tag{3}$$

$$= \sum_{i=1}^{\infty} \frac{n}{n+1}.z^{-n} \tag{4}$$

On solving,

$$X(z) = \frac{1}{1-z^{-1}} + z\log\left(1-z^{-1}\right) \tag{5}$$

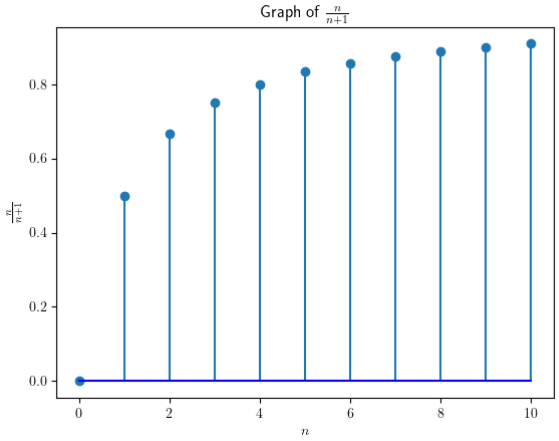

Figure 1: Sequence plot generated from Python script