$$\textbf{\textit{Handshake Time complexity}}$$

$$\textbf{\textit{using Recursion Tree Method}}$$

$$T(n) = \begin{cases} 1 & ,for\ (n = 0) \\ 1 & ,for\ (n = 1) \\ T(n-1) + T(1) & ,for\ (n > 1) \end{cases}$$

$Or\ for$

$$T(n) = \begin{cases} 1 & ,for\ (n = 0) \\ 1 & ,for\ (n = 1) \\ T(n-1) + 1 & ,for\ (n > 1) \end{cases}$$

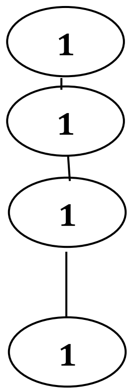
$We\ know:$

$$t_n = \begin{cases} 1 & for\ n = 1 \\ t_{n-1} + a & for\ n > 1 \end{cases}$$

When a is 1, problem size becomes 1 i.e. constant.

Therefore, the recurrence tree for this recurrence equation would be shown below:

Level	***No. of problems***	***Problem Size***	***Work done = Problem Size × No. of Problems***
$\mathbf{0}$	$\mathbf{1}$	$\mathbf{1}$	$\mathbf{1 \times 1 = 1}$
$\mathbf{1}$	$\mathbf{1}$	$\mathbf{1}$	$\mathbf{1 \times 1 = 1}$
$\mathbf{2}$	$\mathbf{1}$	$\mathbf{1}$	$\mathbf{1 \times 1 = 1}$
. .	. .	. .	. .
$\boldsymbol{n-1}$	$\mathbf{1}$	$\mathbf{1}$	$\mathbf{1 \times 1 = 1}$



One can observe that the work done at every level is 1 and the size of the problem is reduced by a factor of 1 at every level.

Therefore, at the level $n-1$, the problem size and work done would be 1. The total number of levels is n (as the level of the root is 0). Therefore, the final cost can be estimated as follows:

$$\boldsymbol{Total\ Cost = \sum_{i=1}^{n} 1 = 1 + 1 + 1 + \cdots n\ times = 1 \times n = n.}$$

$$\boldsymbol{Therefore, the\ asymptotic\ complexity\ would\ be\ \mathrm{O}(n).}$$

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