$B.B.14.A.$ Domain Transformation

Domain transformation is a technique of converting a recurrence equation into a form that can be solved using the regular methods . One can view domain transformation as a technique of converting a pseudo − nonlinear recurrence into a familiar form.

The procedure for domain transformation(or change of variable) includes the following steps:

1. Convert the unfamiliar recurrence form of $T(n)$ using algebraic manipulations.

2. Solve the recurrence equation.

3. Reconvert this solution back into the solution of the original equation by reverse transformation.

For example , consider the following recurrence equation:

$$T(n) = aT\left(\left\lfloor\frac{n}{2}\right\rfloor\right) + f(n)$$

***It can be observed that the complexity functions has a floor function . As the regular methods cannot be used to solve these kinds of recurrence relations, domain transformation can be applied as follows*:**

***Substituting $n = b^k$ in this equation we obtain the following*:**

$$Tb^k = aT\left(\left\lfloor\frac{b^k}{b}\right\rfloor\right) + f(n) = aT\left(b^{k-1}\right) + f(n)$$

***Now, transform this to a regular recurrence equation as follows*:**

$$T(k) = aT(k-1) + f(k)$$

The next step is to solve this equation. By substituting $k = \log_b n$ in this solution the solution for the original given function can be obtained.

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