Derivation

Derivation is a sequence of production rules. It is used to get the input string through these production rules. During parsing, we have to take two decisions. These are as follows:

- We have to decide the non-terminal which is to be replaced.
- We have to decide the production rule by which the non-terminal will be replaced.

We have two options to decide which non-terminal to be placed with production rule.

1. Leftmost Derivation:

In the leftmost derivation, the input is scanned and replaced with the production rule from left to right. So in leftmost derivation, we read the input string from left to right.

Example:

Production rules:

```
E = E + E
E = E - E
E = a | b
```

Input

The leftmost derivation is:

```
E = E + E
E = E - E + E
E = a - E + E
E = a - b + E
E = a - b + a
```

2. Rightmost Derivation:

In rightmost derivation, the input is scanned and replaced with the production rule from right to left. So in rightmost derivation, we read the input string from right to left.

Example

Production rules:

```
E = E + E
E = E - E
E = a | b
```

Input

```
a - b + a
```

The rightmost derivation is:

```
E = E - E
E = E - E + E
E = E - E + a
E = E - b + a
E = a - b + a
```

When we use the leftmost derivation or rightmost derivation, we may get the same string. This type of derivation does not affect on getting of a string.

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