Error Recovery Strategies in Compiler Design

The error may occur at various levels of compilation, so error handling is important for the correct execution of code. There are mainly four error recovery strategies, which are as follows:

1. Panic mode
2. Phrase level recovery
3. Error production
4. Global correction

Panic Mode:

This strategy is used by most parsing methods. In this method, when an incorrect structure is found, it is corrected by deleting characters one by one until the given structure is corrected. When an incorrect structure is found, the 1st character is deleted and the structure is checked for correctness. If the structure is not corrected, the next character is deleted. This continues until the structure is corrected.

Example 1.

int x, y?z;

in the above statement, y?z is incorrect as ? is not allowed in variable names. 1st y is deleted and ?z is checked that it is correct or not. As not correct, so ? is deleted. Now the remaining i.e. z is checked. As it is correct, so the process is complete.

Example 2.

int ab#cde;

In the example 2, ab#cde is incorrect, as #is not allowed. Now after applying the Panic Mode method, 1st a is deleted, then b, then #. At this point the given structure becomes cde that is a correct structure.

Advantage:

1. It's easy to use.
2. It is simple to implement and program never falls into the infinite loop.

Disadvantage:

1. This technique may lead to further errors in latter stages.
2. If the problematic character is in the last of the structure i.e. abc?, it will lead to a semantic error.

Phrase Level Recovery:

It is also known as local correction. In this strategy, the errors in punctuation marks (; , . etc) are corrected if there is any issue. For example inserting a missing punctuation mark or deleting an extra punctuation mark.

Examples:

int a,,b;
Will become
int a,b; after removing extra ,.

Int x,y
Will become
Int x,y; after inserting

Advantages: This method is used in many errors repairing compilers.

Disadvantages: While doing the replacement the program may fall into infinite loop if semi colon is inserted after while loop.

Error Production:

In this technique, it is assumed that we have a complete knowledge of errors. Using that knowledge, a complete CFG is constructed. When an error is found, the CFG will be used to solve or correct the error. This technique is theoretical and can't be applied, as it is not possible to have a complete knowledge of all possible errors.

Global Correction:

It is also known as least cost correction. This technique is an improved version of panic mode technique. In this technique, when an incorrect structure is found, it is corrected by deleting characters one by one. But if a character dose not correct the given structure, the deleted character is restored and the next character is deleted. The process is continued until the given structure is corrected.
Examples.

int ab?cde;

1st a is deleted but as no correction so a is restored.
2nd b is deleted but as no correction so b is restored.

3rd ? is deleted that results in **abcde** that is a correct structure.

Advantages: It makes very few changes in processing an incorrect input string.
Disadvantages: It is not applicable if there are more then one incorrect symbols in a given structure.