Semantic error recovery

Prof. Vaibhavi Patel

Assistant Professor
Computer Science & Engineering

Parul® University
Vadodara, Gujarat

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Semantic error

- During the **semantic analysis** phase, the compiler checks whether the program follows the **meaning rules** of the language.

- Even if a program is syntactically correct, it may still contain **semantic errors** such as:

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Typical Semantic Errors

- Incompatible type of operands

        int a[10], b;
        ...
        a = b;

- Undeclared variables

        x = y + 1;   // if y is not declared → error

- Mismatch between actual and formal parameters in function calls

        sum(a, b, c);   // but sum() expects only 2 arguments → error

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Semantic Error Recovery

- The purpose of recovery is to report the error and continue compilation without stopping. This prevents multiple cascading errors.

- Recovery from Undeclared Identifier
    - If the compiler encounters a variable that has not been declared:

        x = y + z;   // y undeclared

    Recovery Action:
    The compiler **creates a new symbol table entry** for y, usually assigning it a **default type (int)**.
    This allows compilation to continue.

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Semantic Error Recovery Techniques

- Recovery from Incompatible Data Types
    - If operands of an expression are of different types, e.g.,

        int x;
        float y;
        x = x + y;

    Recovery Action:
    The compiler performs **automatic type conversion (type coercion)** where possible:
    - Convert int to float → ensures meaningful evaluation.
    If conversion is not possible:
    - Skip expression and issue an error message.

Semantic Error Recovery Techniques

- Recovery in Function Call Errors
    - If the number or type of actual parameters does not match the function definition:

        int sum(int, int);
        sum(a, b, c);   // too many arguments

    Recovery Action:
- Ignore extra arguments *or*
- Insert placeholder values to match expected parameters.

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