SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore – 641 107

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Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A' Grade

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

COURSE NAME : -AUTOMATE THEORY AND COMPLIER DESIGN

III YEAR / V SEMESTER

Topic : Type Checking and Type Conversion

Type Checking

- Type checking is the process of verifying and enforcing constraints of types in values.
- A compiler must check that the source program should follow the syntactic and semantic conventions of the source language and it should also check the type rules of the language.
- It allows the programmer to limit what types may be used in certain circumstances and assigns types to values.

Type Checking

Types of Type Checking:

There are two kinds of type checking:

- Static Type Checking.
- Dynamic Type Checking.

Type Checking

Examples of Static checks

- Static Type Checking is defined as type checking performed at compile time.
- It checks the type variables at compile-time, which means the type of the variable is known at the compile time.
- It generally examines the program text during the translation of the program.

Type Checking

Examples of Static checks

Type-checks: A compiler should report an error if an operator is applied to an incompatible operand. For example, if an array variable and function variable are added together.

The flow of control checks: Statements that cause the flow of control to leave a construct must have someplace to which to transfer the flow of control. For example, a break statement in C causes control to leave the smallest enclosing while, for, or switch statement, an error occurs if such an enclosing statement does not exist.

Type Checking

Uniqueness checks: There are situations in which an object must be defined only once. For example, in Pascal an identifier must be declared uniquely, labels in a case statement must be distinct, and else a statement in a scaler type may not be represented.

Name-related checks: Sometimes the same name may appear two or more times. For example in Ada, a loop may have a name that appears at the beginning and end of the construct. The compiler must check that the same name is used at both places.

Type Checking

Benefits of Static Type Checking:

- Runtime Error Protection.
- It catches syntactic errors like spurious words or extra punctuation.
- It catches wrong names like Math and Predefined Naming.
- Detects incorrect argument types.
- It catches the wrong number of arguments.

Type Checking

Dynamic Type Checking:

- Dynamic Type Checking is defined as the type checking being done at run time.
- In Dynamic Type Checking, types are associated with values, not variables.
- Implementations of dynamically type-checked languages runtime objects are generally associated with each other through a type tag, which is a reference to a type containing its type information.

Type Checking

The design of the type-checker depends on:

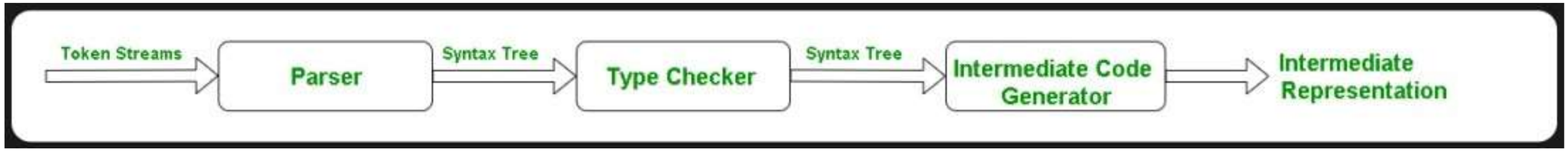
1.Syntactic Structure of language constructs.

2.The Expressions of languages.

3.The rules for assigning types to constructs (semantic rules).

Type Checking

The Position of the Type checker:



Type Conversion

The type conversion is an operation that takes a data object of one type and creates the equivalent data objects of multiple types.

The signature of a type conversion operation is given as

conversion_op :type1→type2

Type Conversion

There are two types of type conversions which are as follows −

Implicit type conversion (Coercions) − The programming languages that enable mixed-mode expressions should describe conventions for implicit operand type conversions.

Type Conversion

Explicit type conversion − Some languages support few efficiencies for doing explicit conversions, both widening and narrowing.

In some cases, warning messages are created when an explicit narrowing conversion results in a meaningful change to the value of the object being modified.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