Semantic Analysis

- Semantic analysis includes
  - Dynamic Checking (Those checks for which to perform, compiler doesn't have sufficient information)
  - Static Checking (Semantic Checks that can be performed in compile time)

- Dynamic checking:
  - A piece of object code is added to the compiled program to perform the checking in the execution time
  - Example:

    var a[10] int; …; read (I); a(I) := 0;
  - Generated code is as such the last statement would have been:
  - If I <= 10 then a(I) := 0 else print ("subscript out of range error")

Semantic Analysis

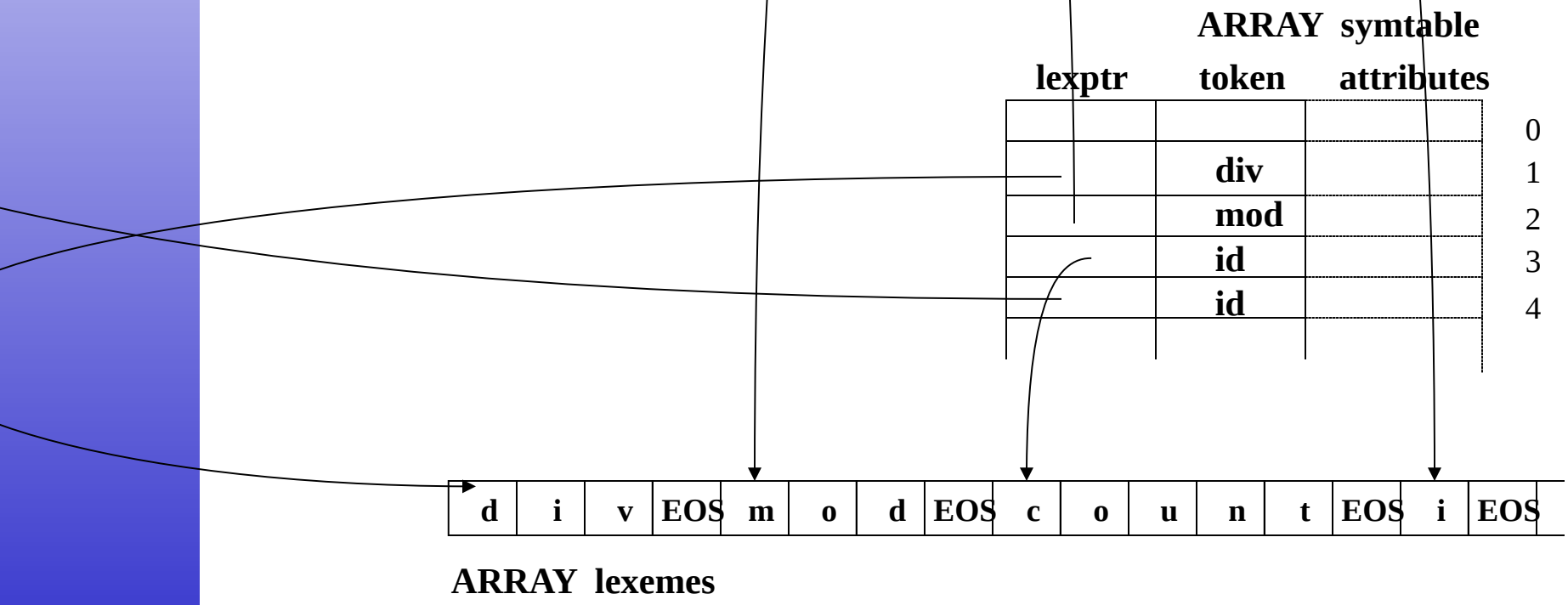
- Static checking examples:
  - Type checks: *in A := B + C, all operands should have the same type*
  - Flow-of-control checks: *check whether a e.g. break statement has somewhere to return control.*
  - Uniqueness checks: *In some languages names must be unique*
  - Nested-related checks: *In ADA for loops can have name, and it must appear twice (before the for keyword and before the end statement.*

Symbol Table Considerations

OPERATIONS: **Insert (string, token_ID)**
Lookup (string)

NOTICE: **Reserved words are placed into symbol table for easy lookup**

Attributes may be associated with each entry, i.e., typing info, size info, memory address, etc.

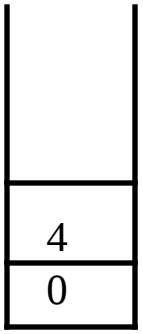


Symbol Table Management

```
program sort(input, output);
    var a : array [0 .. 10] of integer; x : integer;

    procedure readarray;
        var i : integer;
        begin … a … end;

    procedure exchange( i, j, : integer);
        begin
                x := a[i]; a[i] := a[j]; a[j] := x
        end

    procedure quicksort(m, n: integer);
        var k, v : integer;

        function partition(y, z: integer) : integer;
        var i, j : integer;
        begin   … a …
                … v …
                … exchange(i, j); …
        end { partition };
        begin … end { quicksort }
    begin … end { sort }.
```

Symbol Table Management

When entering readarray



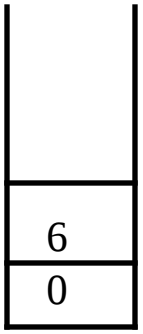
Scope Stack

symbol table

	lexeme	**type**	**attributes**
0	sort	-	
1	a	int	
2	x	int	
3	readarray	-	
4	i	int	

Symbol Table Management

After entering quicksort



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5	quicksort	-	
6	k	int	
7	v	int	