

# Compiler Construction

~ Error Recovery ~

# Goal

## Observation

Reporting only one error at a time

- is costly for the user
- is frustrating
- is CPU consuming  
⇒ Think to our planet!

## Problem

How to report all (syntactic) errors  
**simultaneously?**

# Error recovery: different strategies

## Error Recovery

**Error Recovery** is the process of adjusting input stream to handle errors:

- Deletion of token types from input stream
- Insertion of token types
- Substitution of token types

There are two classes of recovery:

- **Local Recovery**: adjust input at point where error was detected.
- **Global Recovery**: adjust input before point where error was detected

## Local Recovery (1/2)

Use an error symbol !  $\Rightarrow$  Try to find a **synchronizing token** and resume parsing!

Let's consider the following grammar:

`exps -> exp`

`exps -> exps ; exp`

`exp -> NUMBER`

`exp -> exp + exp`

`exp -> (exps)`

`exp -> (error)`

`exps -> error ; exp`

## Local Recovery (2/2)

**error is considered as a terminal symbol**

When the (LR) parser reaches an error state, it proceeds as follows:

- 1 Dig in the stack to find a nice place (where **error** is shifted)
- 2 Throw away all unpleasant look-ahead
- 3 Resume normal parsing

## Global Recovery (1/2)

Try to insert/delete token from the input stream at a point before the error was detected.

Let's consider the following example:

```
let type a := intArray [10]
                of 0
in /* ... */
end
```

The parser will try to replace  
**type** with **var**.

# Global Recovery (2/2)

## In practice

The parser finds the smallest set of insertions and deletions that would turn the input stream into a correct stream.

## Burke-Fisher error repair

Try every single token insertion, deletion or replacement at every point that occurs no earlier than  $K$  tokens in the past.

The grammar stays unmodified, only the parsing engine is modified.

# Semantic values for errors

An AST node must be produced for errors!

# Summary

local error  
repair

global  
error  
repair

Burke-  
Fisher

Semantic  
values