

G52MAL

Machines and Their Languages

Lecture 10

The Language of a CFG

Henrik Nilsson

University of Nottingham

Recap: Definition of CFG

A CFG $G = (N, T, P, S)$ where

- N is a finite set of **nonterminals** (or **variables** or **syntactic categories**)
- T is a finite set of **terminals**
- $N \cap T = \emptyset$ (disjoint)
- P is a finite set of **productions** of the form $A \rightarrow \alpha$ where $A \in N$ and $\alpha \in (N \cup T)^*$
- $S \in N$ is the **start symbol**

Simple Arithmetic Expressions

$SAE = (N = \{E, I, D\}, T = \{+, *, (,), 0, 1, \dots, 9\}, P, E)$
where P is given by:

$$E \rightarrow E + E$$

$$| E * E$$

$$| (E)$$

$$| I$$

$$I \rightarrow DI | D$$

$$D \rightarrow 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9$$

Note: $A \rightarrow \alpha | \beta$ shorthand for $A \rightarrow \alpha, A \rightarrow \beta$.

Another Example: Java

The syntax of programming languages is invariably specified by CFGs.

Example: The Java Language Specification, Third Edition. Section 14.5, page 368 gives a CFG for Java statements.