#### Script generated by TTT

Title: Petter: Compiler Construction (18.06.2020)

- 38: Example for Strong Acyclicity

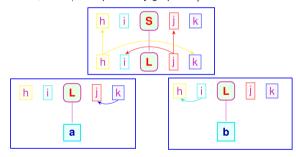
Date: Thu Jun 18 11:26:15 CEST 2020

Duration: 13:01 min

Pages: 13

**Example: Strong Acyclic Test** 

Given grammar  $S \rightarrow L$ ,  $L \rightarrow a \mid b$ . Dependency graphs  $D_p$ :



### Subclass: Strongly Acyclic Attribute Dependencies

# Strongly Acyclic Grammars If all $D(p) \cup \mathcal{R}^*(X_1)[1] \cup \ldots \cup \mathcal{R}^*(X_k)[k]$ are acyclic for all $p \in G$ , G is strongly acyclic.

Idea: we compute the least solution  $\mathcal{R}^*(X)$  of  $\mathcal{R}(X)$  by a fixpoint computation, starting from  $\mathcal{R}(X) = \emptyset$ .

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# **Example: Strong Acyclic Test**

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Start with computing  $\mathcal{R}(L) = [\![L \rightarrow a]\!]^{\sharp}() \sqcup [\![L \rightarrow b]\!]^{\sharp}()$ :

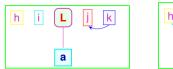


terminal symbols do not contribute dependencies

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## **Example: Strong Acyclic Test**

Start with computing  $\mathbb{R}(L) = [\![L \rightarrow a]\!]^{\sharp}() \sqcup [\![L \rightarrow b]\!]^{\sharp}()$ :



- h i L j k
- terminal symbols do not contribute dependencies check for cycles!
- transitive closure of all relations in  $(D(L \rightarrow a))^+$  and  $(D(L \rightarrow b))^+$

# **Example: Strong Acyclic Test**

Start with computing  $\mathcal{R}(L) = [\![L \rightarrow a]\!]^{\sharp}() \sqcup [\![L \rightarrow b]\!]^{\sharp}()$ :



- terminal symbols do not contribute dependencies
- 2 transitive closure of all relations in  $(D(L \rightarrow a))^+$  and  $(D(L \rightarrow b))^+$
- $\odot$  apply  $\pi_0$

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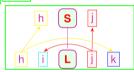
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## **Example: Strong Acyclic Test**

Continue with  $\mathbb{R}(S) = [S \to L]^{\sharp} (\mathbb{R}(L))$ :



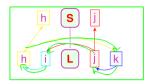


• re-decorate and embed  $\mathcal{R}(L)[1]$ 

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### **Example: Strong Acyclic Test**

Continue with  $\mathcal{R}(S) = [S \to L]^{\sharp}(\mathcal{R}(L))$ :

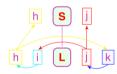


- re-decorate and embed  $\mathcal{R}(L)[1]$

- $\bullet$  transitive closure of all relations  $D(S \rightarrow L) \cup \{(k[1], j[1])\} \cup \{(i[1], h[1])\}$

#### **Example: Strong Acyclic Test**

Continue with  $\mathcal{R}(S) = [S \to L]^{\sharp}(\mathcal{R}(L))$ :



- check for cycles! • re-decorate and embed  $\mathcal{R}(L)$ [1]
- lacktriangledown transitive closure of all relations  $(D(S 
  ightarrow L) \cup \{(k[1],j[1])\} \cup \{(i[1],h[1])\})^+$

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- **3** apply  $\pi_0$

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- $\bigcirc$  transitive closure of all relations  $(D(S \rightarrow L) \cup \{(k[1], j[1])\} \cup \{(i[1], h[1])\})^+$
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- lefta apply  $\pi_0$

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**3**  $\mathcal{R}(L) = \{(k, j), (i, h)\}$ 

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