Orion Kostival

CSCI 400 A

2/28/2013

Homework #5

Problem 1

**Original Grammar:**  
 <program> 🡪 main { <stmts> }

<stmts> 🡪 <stmt>;

🡪 <stmt>; <stmts>

<stmt> 🡪 <var> = <expr>

<expr> 🡪 <term> + <term>

🡪 <term> - <term>

🡪 <term>

<term> 🡪 <var> | const

<var> 🡪 a | b | c | d

1. **Augmented Grammar:**

<while> 🡪 while (<stmt>) { <stmts> }

<for> 🡪 for (<stmt>; <stmt>; <stmt>) { <stmts> }

<stmts> 🡪 <for>

🡪 <for> <stmts>

🡪 <while>

🡪 <while> <stmts>

<stmt> 🡪 <var> < <expr>

1. **Program 1:**

main

{

a = const;

b = const;

while (a < const)

{

b = b + a;

a = a – const;

}

}

**Leftmost Derivation:**

<program> 🡪 main { <stmts> }

🡪 main { <stmt>; <stmts> }

🡪 main { <var> = <expr>; <stmts> }

🡪 main { a = <expr>; <stmts> }

🡪 main { a = <term>; <stmts> }

🡪 main { a = const; <stmts> }

🡪 main { a = const; <stmt>; <stmts> }

🡪 main { a = const; <var> = <expr>; <stmts> }

🡪 main { a = const; b = <expr>; <stmts> }

🡪 main { a = const; b = <term>; <stmts> }

🡪 main { a = const; b = const; <stmts> }

🡪 main { a = const; b = const; <while> }

🡪 main { a = const; b = const; while (<stmt>) { <stmts> }}

🡪 main { a = const; b = const; while (<var> < <expr>) { <stmts> }}

🡪 main { a = const; b = const; while (a < <expr>) { <stmts> }}

🡪 main { a = const; b = const; while (a < <term>) { <stmts> }}

🡪 main { a = const; b = const; while (a < const) { <stmts> }}

🡪 main { a = const; b = const; while (a < const) { <stmt>; <stmts> }}

🡪 main { a = const; b = const; while (a < const) { <var> = <expr>; <stmts> }}

🡪 main { a = const; b = const; while (a < const) { b = <expr>; <stmts> }}

🡪 main { a = const; b = const; while (a < const) { b = <term> + <term>; <stmts> }}

🡪 main { a = const; b = const; while (a < const) { b = <var> + <term>; <stmts> }}

🡪 main { a = const; b = const; while (a < const) { b = b + <term>; <stmts> }}

🡪 main { a = const; b = const; while (a < const) { b = b + <var>; <stmts> }}

🡪 main { a = const; b = const; while (a < const) { b = b + a; <stmts> }}

🡪 main { a = const; b = const; while (a < const) { b = b + a; <stmt>; }}

🡪 main { a = const; b = const; while (a < const) { b = b + a; <var> = <expr>; }}

🡪 main { a = const; b = const; while (a < const) { b = b + a; a = <expr>; }}

🡪 main { a = const; b = const; while (a < const) { b = b + a; a = <term> + <term>; }}

🡪 main { a = const; b = const; while (a < const) { b = b + a; a = <term> - <term>; }}

🡪 main { a = const; b = const; while (a < const) { b = b + a; a = <var> - <term>; }}

🡪 main { a = const; b = const; while (a < const) { b = b + a; a = a - <term>; }}

🡪 **main**

**{**

**a = const;**

**b = const;**

**while (a < const)**

**{**

**b = b + a;**

**a = a - const;**

**}**

**}**

**Parse Tree:**

<program>

main { <stmts> }

<stmt>; <stmts>

<var> = <expr>; <stmt>; <stmts>

a <term>; <var> = <expr>; <while>

const; b <term>; while ( <stmt> ) { <stmts> }

const; <var> < <expr> <stmt>; <stmts>

a <term> <var> = <expr>; <stmt>;

const b <term> + <term>; <var> = <expr>;

<var> <var>; a

b a; <term> - <term>;

<var> const;

a

**Program 2:**

main

{

a = const;

b = const;

for (a = const; a < const; a = a - const)

{

b = b + a;

}

}

**Leftmost Derivation:**

<program> 🡪 main { <stmts> }

🡪 main { <stmt>; <stmts> }

🡪 main { <var> = <expr>; <stmts> }

🡪 main { a = <expr>; <stmts> }

🡪 main { a = <term>; <stmts> }

🡪 main { a = const; <stmts> }

🡪 main { a = const; <stmt>; <stmts> }

🡪 main { a = const; <var> = <expr>; <stmts> }

🡪 main { a = const; b = <expr>; <stmts> }

🡪 main { a = const; b = <term>; <stmts> }

🡪 main { a = const; b = const; <stmts> }

🡪 main { a = const; b = const; <for> }

🡪 main { a = const; b = const; for (<stmt>; <stmt>; <stmt>) { <stmts> } }

🡪 main { a = const; b = const; for (<var> = <expr>; <stmt>; <stmt>) { <stmts> } }

🡪 main { a = const; b = const; for (a = <expr>; <stmt>; <stmt>) { <stmts> } }

🡪 main { a = const; b = const; for (a = <term>; <stmt>; <stmt>) { <stmts> } }

🡪 main { a = const; b = const; for (a = const; <stmt>; <stmt>) { <stmts> } }

🡪 main { a = const; b = const; for (a = const; <var> < <expr>; <stmt>) { <stmts> } }

🡪 main { a = const; b = const; for (a = const; a < <expr>; <stmt>) { <stmts> } }

🡪 main { a = const; b = const; for (a = const; a < <term>; <stmt>) { <stmts> } }

🡪 main { a = const; b = const; for (a = const; a < const; <stmt>) { <stmts> } }

🡪 main { a = const; b = const; for (a = const; a < const; <var> = <expr>) { <stmts> } }

🡪 main { a = const; b = const; for (a = const; a < const; a = <expr>) { <stmts> } }

🡪 main {

a = const; b = const;

for (a = const; a < const; a = <term> - <term>) { <stmts> }

}

🡪 main {

a = const; b = const;

for (a = const; a < const; a = <var> - <term>) { <stmts> }

}

🡪 main {

a = const; b = const;

for (a = const; a < const; a = a - <term>) { <stmts> }

}

🡪 main {

a = const; b = const;

for (a = const; a < const; a = a - const) { <stmts> }

}

🡪 main {

a = const; b = const;

for (a = const; a < const; a = a - const) { <stmt>; }

}

🡪 main {

a = const; b = const;

for (a = const; a < const; a = a - const) { <var> = <expr>; }

}

🡪 main {

a = const; b = const;

for (a = const; a < const; a = a - const) { b = <expr>; }

}

🡪 main {

a = const; b = const;

for (a = const; a < const; a = a - const) { b = <term> + <term>; }

}

🡪 main {

a = const; b = const;

for (a = const; a < const; a = a - const) { b = <var> + <term>; }

}

🡪 main {

a = const; b = const;

for (a = const; a < const; a = a - const) { b = b + <term>; }

}

🡪 main {

a = const; b = const;

for (a = const; a < const; a = a - const) { b = b + <var>; }

}

🡪 **main**

**{**

**a = const;**

**b = const;**

**for (a = const; a < const; a = a - const)**

**{**

**b = b + a;**

**}**

**}**

**Parse Tree:**

<program>

main { <stmts> }

<stmt>; <stmts>

<var> = <expr>; <stmt>; <stmts>

a <term>; <var> = <expr>; <for>

const; b <term>; for ( <stmt>; <stmt>; <stmt> ) { <stmts> }

const; <stmt>;

<var> = <expr>; <var> < <expr>; <var> = <expr>; <var> = <expr>;

a <term>; a <term>; a <term> - <term> b

const; const; <var> const <term> + <term>;

a <var> <var>;

b a;