CSL302: Compiler Design

Intermediate Code Generation

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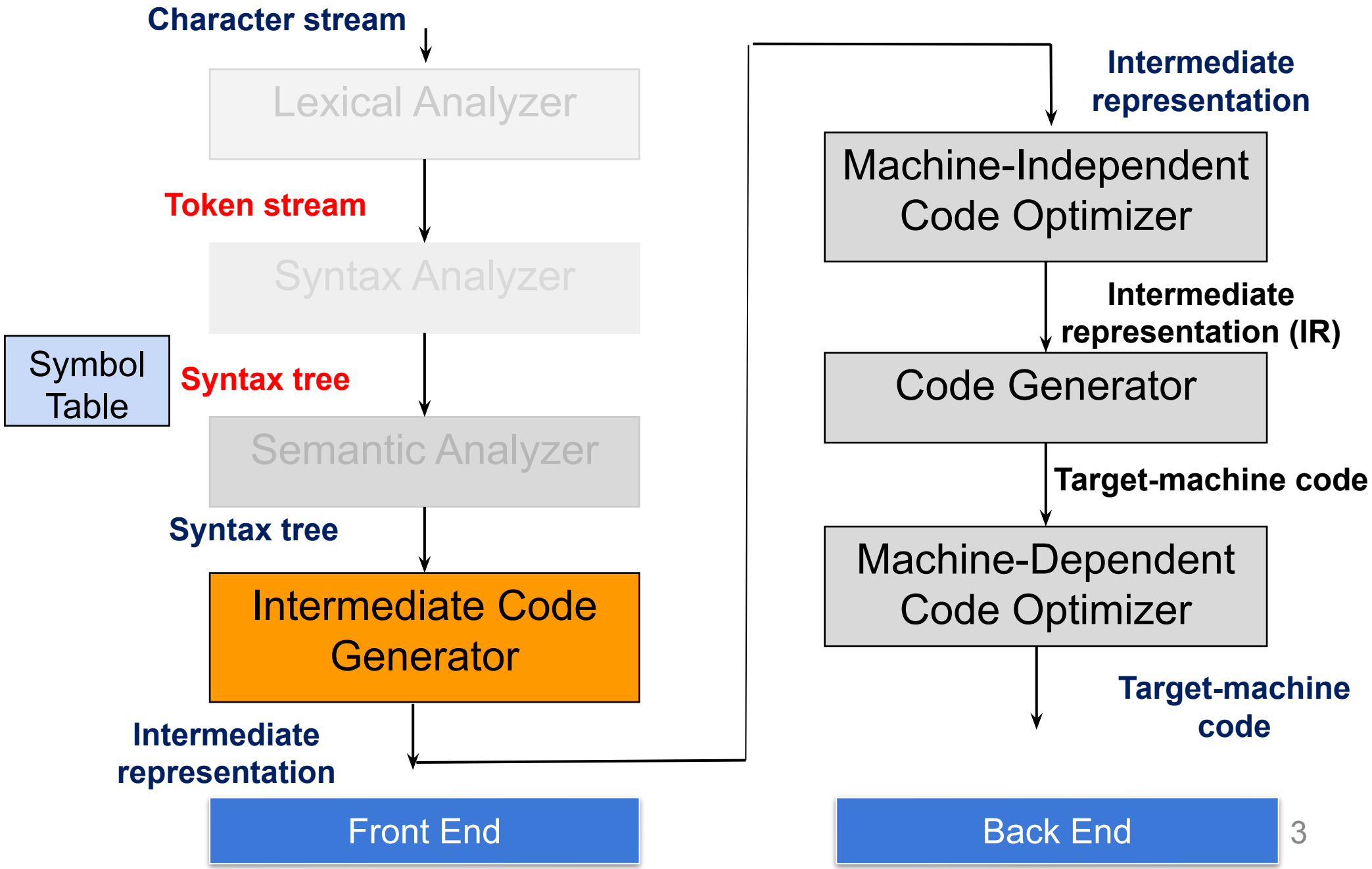
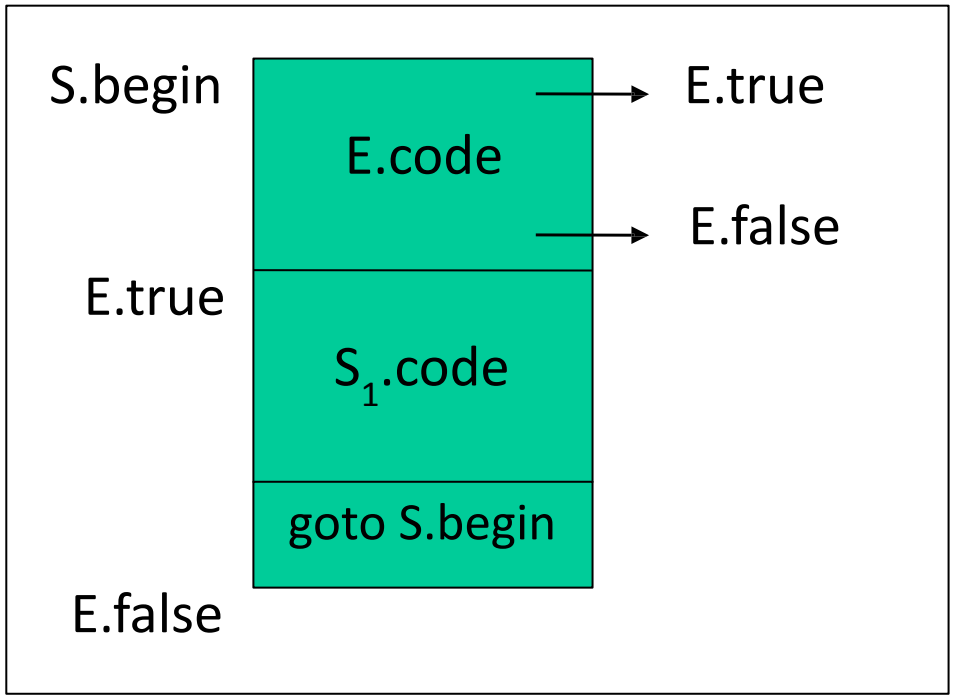
Acknowledgement

- References for today's slides
  - *Lecture notes of Prof. Amey Karkare (IIT Kanpur) and Late Prof. Sanjeev K Aggarwal (IIT Kanpur)*
  - *IIT Madras (Prof. Rupesh Nasre)*
    - *http://www.cse.iitm.ac.in/~rupesh/teaching/compiler/aug15/schedule/4-sdt.pdf*
  - *Course textbook*
  - *Stanford University:*
    - *https://web.stanford.edu/class/archive/cs/cs143/cs143.1128/*

Next…


Character stream
Lexical Analyzer
Token stream
Syntax Analyzer
Symbol Table
Syntax tree
Semantic Analyzer
Syntax tree
Intermediate Code Generator
Intermediate representation
Front End
Intermediate representation
Machine-Independent Code Optimizer
Intermediate representation (IR)
Code Generator
Target-machine code
Machine-Dependent Code Optimizer
Target-machine code
Back End

While Loop



$S \rightarrow$ while E do S_1

S.begin = newlabel

E.true = newlabel

E.false = S.next

S_1.next = S.begin

S.code = gen(S.begin ':') ||
E.code ||
gen(E.true ':') ||
S_1.code ||
gen(goto S.begin)

Example …

Code for `while a < b do`
`if c<d then x=y+z`
`else x=y-z`

```
L1:     if a < b goto L2
        goto Lnext
L2:     if c < d goto L3
        goto L4
L3:     t1 = Y + Z
        X= t1
        goto L1
L4:     t1 = Y - Z
        X= t1
        goto L1
Lnext:
```

Example …

Code for

```
while a < b do
        if c<d then x=y+z
          else    x=y-z
```

Exercise

Generate the three-address code representation for the following snippet of the program with short circuit evaluation

```
c=(a+b)*a-b;
e=c+d;
x=0;
while ((a==b) || (c != d) && (e==f)) {
    a=a+2;
    x=x+1;
}
f=x+a;
```

Exercise

Write semantic rules for the FOR statement

$S \rightarrow \text{for}(E_1; E_2; E_3)\ S_1$