

CPS311: COMPUTER ORGANIZATION

Translation Patterns for Typical Higher Level Language Constructs

In what follows, the "C's" are any boolean condition, the "S's" any executable statement, the "L's" are arbitrary labels, "E" is an ordinal expression, and the "V's" are constants of the same type as E.

Higher Level Language (e.g. C)

Assembly Language

goto L;

Branch to L

if (C)
 S;

Branch if C is false to L1
Code for S

L1:

if (C)
 S1;
else
 S2;

Branch if C is false to L1
Code for S1
Branch to L2

L1:

Code for S2

L2:

if (C1)
 S1;
else if (C2)
 S2;
...
else if (Cn)
 Sn;
else
 Sf;

Branch if C1 is false to L1
Code for S1
Branch to Le

L1:

Branch if C2 is false to L2
Code for S2
Branch to Le

L2:

...
Branch if Cn is false to Ln
Code for Sn
Branch to Le

Ln:

Code for Sf

Le:

while (C)
 S;

Branch to L2

L1:

Code for S

L2:

Branch if C is true to L1

do
 S;
while (C);

L1:

Code for S

Branch if C is true to L1

for (V = L; V <= H; V++)
 S;

Code to set V = L

Branch to L2

L1:

Code for S

Code to increment V

L2:

Branch if V <= H to L1

```

switch(E)
{
    case V1:
        S1;
        break;
    case V2:
        S2;
        break;
    case V3:
        S3;
        break;
    ...
    case Vn:
        Sn;
        break;

    default:
        Sd;
}

```

Two options

If the set of values forms a dense set (i.e. includes all or most of the values in the range V1 .. Vn):

- Translate the statements using the following pattern. (Assume values are sorted in ascending order from V1..Vn)

L1: Code for S1

Branch to Le

L2: Code for S2

Branch to Le

L3: Code for S3

Branch to Le

...

Ln: Code for Sn

Branch to Le

Ld: Code for Sd

Branch to Le

- Create a jump table, structured as follows: (If any value is missing, put Ld address in its slot in the table)

Lc:

L1 address;

L2 address;

L3 address;

...

Ln address

- Translate the switch instruction as follows

Code to evaluate E

Branch if E < V1 or > Vn to Ld

Set temp = (E-V1) * size of address

Branch to address in Lc[temp]

Le:

Alternate

(Always applicable). Translate as if written:

```
temp = E;
```

```
if (temp == V1)
```

```
    S1;
```

```
else if (temp == V2)
```

```
    S2;
```

```
...
```

```
else if (temp == Vn)
```

```
    Sn;
```

```
else
```

```
    Sd;
```