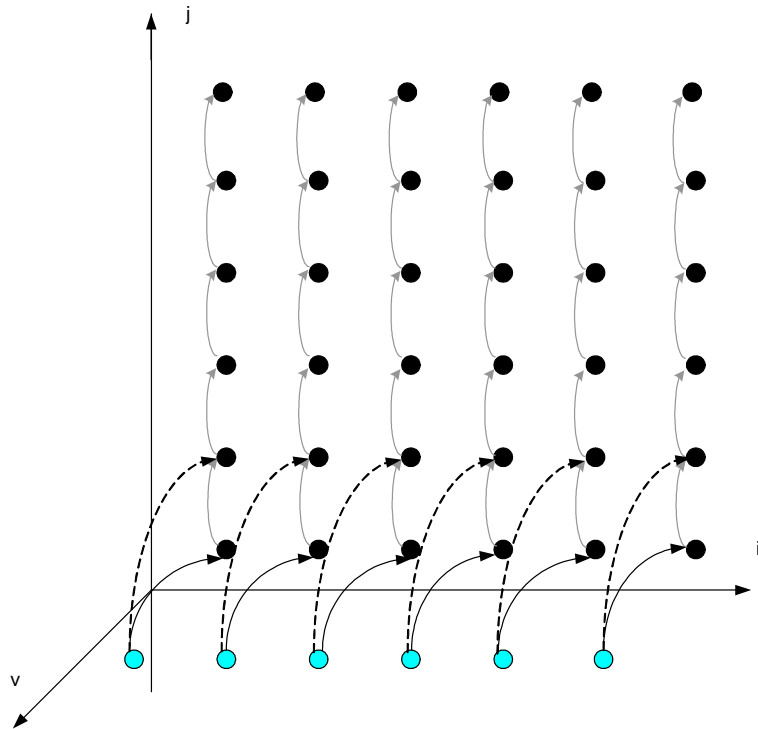


Example 1: Imperfectly nested and parameterized loop

```

for i=1 to n do
  a(i,1)=1
  for j=1 to n do
    a(i,j)=a(i,j-1)
  endfor
endfor

```



Dependence relations

1. $\{ \text{Sym}=[n] [i,i',v] \rightarrow [i',j',v'] \mid i' = i \ \&\& \ j' = 2 \ \&\& \ 1+i' = 0 \ \&\& \ v = 7 \ \&\& \ v' = 9 \ \&\& \ 1 \leq i \leq n \ \&\& \ 2 \leq j' \leq n \}$
2. $\{ \text{Sym}=[n] [i,i',v] \rightarrow [i',j',v'] \mid i' = i \ \&\& \ j' = 1 \ \&\& \ 1+i' = 0 \ \&\& \ v = 7 \ \&\& \ v' = 9 \ \&\& \ 1 \leq i \leq n \}$
3. $\{ \text{Sym}=[n] [i,i',v] \rightarrow [i',j',v'] \mid i' = i \ \&\& \ j' = 1+i' \ \&\& \ v = 9 \ \&\& \ v' = 9 \ \&\& \ 1 \leq i' < n \ \&\& \ 1 \leq i \leq n \}$

Relation 1 is transitively described by other relations so it can be removed.

R_UCS

$\{ \text{Sym}=[n] [i,i',v] \rightarrow [i'',i''',v'] \mid \text{FALSE} \}$

Sources of Slices: 1

$\{ \text{Sym}=[n] [i,i',v] \mid 1+i' = 0 \ \&\& \ v = 7 \ \&\& \ 1 \leq i \leq n \}$

Loop of sources:

```

for(t1 = 1; t1 <= n; t1++) {
  s1(t1,-1,7);
}

```

Parallel loop for affine dependences :

```
par for(t1 = 1; t1 <= n; t1++) {  
  s1(t1,-1,7);  
  if (n >= t1 && t1 >= 1) {  
    for(t2 = 1; t2 <= n; t2++) {  
      s1(t1,t2,9);  
    }  
  }  
}
```

where

```
s1(i,j,v)  
{  
  if(v==7)  
    a(i,1) = 1;  
  else  
    a(i,j) = a(i,j-1);  
}
```

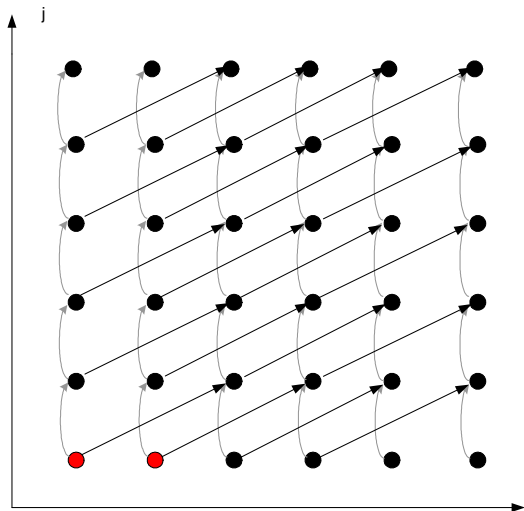
Variable v decides which statement should be executed.

Example 2: Perfectly nested and parameterized loop with not empty range(R_UCS)

```

for i=1 to n do
for j=1 to n do
  a(i,j)=a(i,j-1)+a(i-2,j-1)
endfor
endfor

```



Dependence relations:

1. $\{ \text{Sym}=[n] [i,j,v] \rightarrow [i',j',v'] \mid i' = i \ \&\& \ j' = 1+j \ \&\& \ v = 7 \ \&\& \ v' = 7 \ \&\& \ 1 \leq j < n \ \&\& \ 1 \leq i \leq n \}$
2. $\{ \text{Sym}=[n] [i,j,v] \rightarrow [i',j',v'] \mid i' = 2+i \ \&\& \ j' = 1+j \ \&\& \ v = 7 \ \&\& \ v' = 7 \ \&\& \ 1 \leq j < n \ \&\& \ 1 \leq i \leq n-2 \}$

Additional variable v is unnecessary when a loop consists only of one statement.

R_UCS:

$\{ \text{Sym}=[n] [i,j,v] \rightarrow [i',j',v'] \mid \text{Exists } (\alpha : 0 = i+i'+2\alpha \ \&\& \ j' = 1 \ \&\& \ j = 7 \ \&\& \ 1 \leq i \leq i'-2 \ \&\& \ i' \leq n \ \&\& \ 4+i' \leq i+2n) \text{ OR } \text{Exists } (\alpha : 0 = i+i'+2\alpha = 1 \ \&\& \ v = 7 \ \&\& \ v' = 7 \ \&\& \ 1 \leq i \leq i'-2 \ \&\& \ i' \leq n \ \&\& \ 2+i' \leq i+2n \ \&\& \ 3 \leq n) \}$

Sources of Slices: 1

$\{ \text{Sym}=[n] [i,j,v] \mid j = 1 \ \&\& \ v = 7 \ \&\& \ 1 \leq i \leq 2 \ \&\& \ 2 \leq n \}$

Loop of sources:

```

if (n >= 2) {
  for(t1 = 1; t1 <= 2; t1++) {
    s1(t1,1,7);
  }
}

```

Parallel loop for affine dependences :

```
if (n >= 2) {  
  par for(t1 = 1; t1 <= 2; t1++) {  
    s1(t1,1,7);  
    if (n >= t1 && t1 >= 1) {  
      for(t2 = 2; t2 <= n; t2++) {  
        s1(t1,t2,7);  
      }  
    }  
    if (t1 >= 1) {  
      for(t1' = t1+2; t1' <= n; t1' += 2) {  
        s1(t1',1,7);  
        for(t2 = 2; t2 <= n; t2++) {  
          s1(t1',t2,7);  
        }  
      }  
    }  
  }  
}
```

where

```
s1(i,j,v)  
{  
  a(i,j)=a(i,j-1)+a(i-2,j-1);  
}
```