A
Seminar
on

Extensions To Cycle Shrinking With Variable Distance

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- The technique of extension to cycle shrinking with variable distance is quit difficult as considered to the technique of constant distance
  Consider a example of constant distance

```
DO I=1 to N
    s1: A[I+5]= B[I]
    s2: B[I+4\= A[I]+C[I]
 ENDO
```

Here summarization process declears s2-s1 reference pair as dependence distance.

- Consider the example of variable distance as shown below

```
DO I=1 TO N
  s1: A[3I+5]=B[I+1]
  s2: B[4I+2]=A[I+2]
ENDO
```

In this example the for I = 1, the reference pair s2-s1 is declared as the dependence distance. But for the values greater than 3 this relation changes.For I=3 the reference pair s1-s2 declared as dependence distance.

- So the releation of reference pair does not remains the same for all values of I in variable distance. This is quit unlike to the constant distance method.

  So there is different method for partitioning. Some terminalogies below.

Apex

Cone of the apex

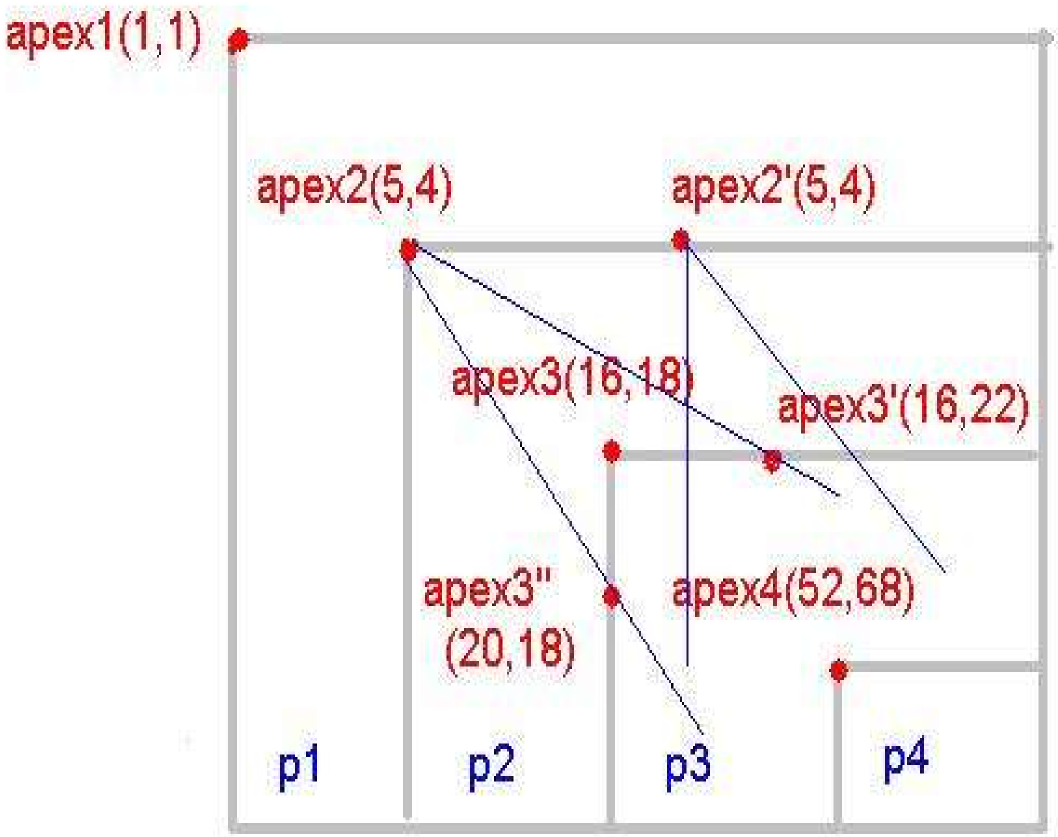
Bonding cone of the apex

Let us solve on example by variable distance method.

```
DO I=1 TO 70
DO I=1 TO 70

   s1: A[2I+J+3,I+4J+2]=B[I+3,J+3]
   s2: B[3I+J+4,2I+2J+3]=A[I+1,J+1]

ENDO
ENDO
```


apex1(1,1)
apex2(5,4)
apex2'(5,4)
apex3(16,18)
apex3'(16,22)
apex3''
(20,18)
apex4(52,68)
p1
p2
p3
p4

- The upper and lower slopes of the cone of apex’ are bounded by 1/0 and 0/1.
- The sink for (i1,i2) with respect to R’ lies within the cone of the apex’.
- Method correctly generates a bounding cone

Algorithm

- Input: 2-D loop bounds N1,N2,body B and DDVs<E1,E2>. Both E1 and E2 are functions of loop indicies I1 and I2

  Output: a parallelized loop.

```
apex=(1,1)
WHILE apex<(N1,N2) DO
nextapex=([min{E1(apex1,apex2)}],[min{E2(apex1,apex2)}])
PARBEGIN
    DOALL I1=apex to min{nextapex1-1,N1}
    DOALL I2 =apex2 to N2       B
    ENDDOALL
    ENDDOALL;
    DOALL I1=nextapex1 to N1
    DOALL I2=apex2 to min{nextapex2-1,N2}
    B
    ENDOALL  ENDOALL PAREND
    apex=nextapex
    ENDWHILE
```

Reference

Extension to Cycle shrinking
A. Sethi, S.Biswas, A. Sanyal