Παραδείγματα Ενδιάμεσου Κώδικα

Διαλέξεις στο μάθημα: Μεταφραστές
Γεώργιος Μανής

Παράδειγμα 1

```
program ex1()
{   var b,c,g;
    function P1(in X,inout Y)
    { Y:=Y-1;
      if (X=1)
        return(X);
      else
        return(P1(in X-1,inout Y));
    }
    c:=10;
    b:=5;
    g:=P1(in c, inout b);
}
```

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Παράδειγμα 1

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Παράδειγμα 1

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    c:=10;
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    g:=P1(in c, inout b);
}
```

```
1: begin_block P1 _ _
2: - Y 1 T_0
3: := T_0 _ Y
```

Παράδειγμα 1

```
program ex1()
{   var b,c,g;
    function P1(in X,inout Y)
    { Y:=Y-1;
      if (X=1)
        return(X);
      else
        return(P1(in X-1,inout Y));
    }
    c:=10;
    b:=5;
    g:=P1(in c, inout b);
}
```

```
1: begin_block P1 _ _
2: - Y 1 T_0
3: := T_0 _ Y
4: = X 1 _
5: jump _ _ _
```

Παράδειγμα 1

```
program ex1()
{   var b,c,g;
    function P1(in X,inout Y)
    { Y:=Y-1;
      if (X=1)
        return(X);
      else
        return(P1(in X-1,inout Y));
    }
    c:=10;
    b:=5;
    g:=P1(in c, inout b);
}
```

```
1: begin_block P1 _ _
2: - Y 1 T_0
3: := T_0 _ Y
4: = X 1 6
5: jump _ _ _
6: retv X _ _
```

Παράδειγμα 1

```
program ex1()
{   var b,c,g;
    function P1(in X,inout Y)
    { Y:=Y-1;
      if (X=1)
        return(X);
      else
        return(P1(in X-1,inout Y));
    }
    c:=10;
    b:=5;
    g:=P1(in c, inout b);
}
```

```
1: begin_block P1 _ _
2: - Y 1 T_0
3: := T_0 _ Y
4: = X 1 6
5: jump _ _ _
6: retv X _ _
7: jump _ _ _
```

Παράδειγμα 1

```
program ex1()
{   var b,c,g;
    function P1(in X,inout Y)
    { Y:=Y-1;
      if (X=1)
        return(X);
      else
        return(P1(in X-1,inout Y));
    }
    c:=10;
    b:=5;
    g:=P1(in c, inout b);
}
```

```
1: begin_block P1 _ _
2: - Y 1 T_0
3: := T_0 _ Y
4: = X 1 6
5: jump _ _ 8
6: retv X _ _
7: jump _ _ _
8: - X 1 T_1
9: par T_1 CV _
10: par Y REF _
11: par T_2 RET _
12: call _ _ P1
13: retv T_2 _ _
```

Παράδειγμα 1

```
program ex1()
{   var b,c,g;
    function P1(in X,inout Y)
    { Y:=Y-1;
      if (X=1)
        return(X);
      else
        return(P1(in X-1,inout Y));
    }
    c:=10;
    b:=5;
    g:=P1(in c, inout b);
}
```

```
1: begin_block P1 _ _
2: - Y 1 T_0
3: := T_0 _ Y
4: = X 1 6
5: jump _ _ 8
6: retv X _ _
7: jump _ _ 14
8: - X 1 T_1
9: par T_1 CV _
10: par Y REF _
11: par T_2 RET _
12: call _ _ P1
13: retv T_2 _ _
14: end_block P1 _ _
```

Παράδειγμα 1

```
program ex1()
{   var b,c,g;
    function P1(in X,inout Y)
    { Y:=Y-1;
      if (X=1)
        return(X);
      else
        return(P1(in X-1,inout Y));
    }
    c:=10;
    b:=5;
    g:=P1(in c, inout b);
}
```

```
15: begin_block ex1 _ _
16: := 10 _ c
```

Παράδειγμα 1

```
program ex1()
{   var b,c,g;
    function P1(in X,inout Y)
    { Y:=Y-1;
      if (X=1)
        return(X);
      else
        return(P1(in X-1,inout Y));
    }
    c:=10;
    b:=5;
    g:=P1(in c, inout b);
}
```

```
15: begin_block ex1 _ _
16: := 10 _ c
17: := 5 _ b
```

Παράδειγμα 1

```
program ex1()
{   var b,c,g;
    function P1(in X,inout Y)
    { Y:=Y-1;
      if (X=1)
        return(X);
      else
        return(P1(in X-1,inout Y));
    }
    c:=10;
    b:=5;
    g:=P1(in c, inout b);
}
```

```
15: begin_block ex1 _ _
16: := 10 _ c
17: := 5 _ b
18: par c CV _
19: par b REF _
20: par T_3 RET _
21: call _ _ P1
22: := T_3 _ g
```

Παράδειγμα 1

```
program ex1()
{   var b,c,g;
    function P1(in X,inout Y)
    { Y:=Y-1;
      if (X=1)
        return(X);
      else
        return(P1(in X-1,inout Y));
    }
    c:=10;
    b:=5;
    g:=P1(in c, inout b);
}
```

```
15: begin_block ex1 _ _
16: := 10 _ c
17: := 5 _ b
18: par c CV _
19: par b REF _
20: par T_3 RET _
21: call _ _ P1
22: := T_3 _ g
23: halt _ _ _
24: end_block ex1 _ _
```

Παράδειγμα 2

```
program exams
{   declareint c,a,b,t enddeclare
    a:=1;
    while (a+b<1 and b<5)
    {  if (t=1) c:=2;
      else if (t=2) c:=4;
           else c:=0;
      while (a<1)
        if (a=2)
          while(b=1)
            c:=2;
    }
 }
```

Παράδειγμα 2

```
program exams
{   declareint c,a,b,t enddeclare
    a:=1;
    while (a+b<1 and b<5)
    {  if (t=1) c:=2;
      else if (t=2) c:=4;
           else c:=0;
      while (a<1)
        if (a=2)
          while(b=1)
            c:=2;
    }
 }
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Παράδειγμα 2

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program exams
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    a:=1;
    while (a+b<1 and b<5)
    {  if (t=1) c:=2;
      else if (t=2) c:=4;
           else c:=0;
      while (a<1)
        if (a=2)
          while(b=1)
            c:=2;
    }
 }
```

Παράδειγμα 2

```
program exams                          1: begin_block exams _ _
{   declareint c,a,b,t enddeclare      2: := 1 _ a
    a:=1;
    while (a+b<1 and b<5)
    {  if (t=1) c:=2;
      else if (t=2) c:=4;
           else c:=0;
      while (a<1)
        if (a=2)
          while(b=1)
            c:=2;
    }
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    a:=1;
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    {  if (t=1) c:=2;
       else if (t=2) c:=4;
            else c:=0;
       while (a<1)
         if (a=2)
           while(b=1)
             c:=2;
    }
 }
```

```
1: begin_block exams _ _
2: := 1 _ a
3: + a b T_1
4: < T_1 1 _
5: jump _ _ _
```

Παράδειγμα 2

```
program exams
{   declareint c,a,b,t enddeclare
    a:=1;
    while (a+b<1 and b<5)
    {  if (t=1) c:=2;
       else if (t=2) c:=4;
            else c:=0;
       while (a<1)
         if (a=2)
           while(b=1)
             c:=2;
    }
 }
```

```
1: begin_block exams _ _
2: := 1 _ a
3: + a b T_1
4: < T_1 1 6
5: jump _ _ _
6: < b 5 _
7: jump _ _ _
```

Παράδειγμα 2

```
program exams
{   declareint c,a,b,t enddeclare
    a:=1;
    while (a+b<1 and b<5)
    {  if (t=1) c:=2;
      else if (t=2) c:=4;
           else c:=0;
      while (a<1)
        if (a=2)
          while(b=1)
            c:=2;
    }
 }
```

```
1: begin_block exams _ _
2: := 1 _ a
3: + a b T_1
4: < T_1 1 6
5: jump _ _ _
6: < b 5 8
7: jump _ _ _
8: = t 1 _
9: jump _ _ _
```

Παράδειγμα 2

```
program exams
{   declareint c,a,b,t enddeclare
    a:=1;
    while (a+b<1 and b<5)
    {  if (t=1) c:=2;
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            else c:=0;
       while (a<1)
         if (a=2)
           while(b=1)
             c:=2;
    }
 }
```

```
1: begin_block exams _ _
2: := 1 _ a
3: + a b T_1
4: < T_1 1 6
5: jump _ _ _
6: < b 5 8
7: jump _ _ _
8: = t 1 10
9: jump _ _ _
10: := 2 _ c
```

Παράδειγμα 2

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program exams
{   declareint c,a,b,t enddeclare
    a:=1;
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       while (a<1)
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           while(b=1)
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    }
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```
1: begin_block exams _ _
2: := 1 _ a
3: + a b T_1
4: < T_1 1 6
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8: = t 1 10
9: jump _ _ _
10: := 2 _ c
11: jump _ _ _
```

Παράδειγμα 2

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```
1: begin_block exams _ _
2: := 1 _ a
3: + a b T_1
4: < T_1 1 6
5: jump _ _ _
6: < b 5 8
7: jump _ _ _
8: = t 1 10
9: jump _ _ 12
10: := 2 _ c
11: jump _ _ _
12: = t 2 _
13: jump _ _ _
```

Παράδειγμα 2

```
program exams
{   declareint c,a,b,t enddeclare
    a:=1;
    while (a+b<1 and b<5)
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       else if (t=2) c:=4;
            else c:=0;
       while (a<1)
         if (a=2)
           while(b=1)
             c:=2;
    }
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```

```
1: begin_block exams _ _
2: := 1 _ a
3: + a b T_1
4: < T_1 1 6
5: jump _ _ _
6: < b 5 8
7: jump _ _ _
8: = t 1 10
9: jump _ _ 12
10: := 2 _ c
11: jump _ _ _
12: = t 2 14
13: jump _ _ _
14: := 4 _ c
```

Παράδειγμα 2

```
program exams
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           while(b=1)
             c:=2;
    }
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```

```
1: begin_block exams _ _
2: := 1 _ a
3: + a b T_1
4: < T_1 1 6
5: jump _ _ _
6: < b 5 8
7: jump _ _ _
8: = t 1 10
9: jump _ _ 12
10: := 2 _ c
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12: = t 2 14
13: jump _ _ _
14: := 4 _ c
15 jump _ _ _
```

Παράδειγμα 2

```
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            c:=2;
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```

```
1: begin_block exams _ _
2: := 1 _ a
3: + a b T_1
4: < T_1 1 6
5: jump _ _ _
6: < b 5 8
7: jump _ _ _
8: = t 1 10
9: jump _ _ 12
10: := 2 _ c
11: jump _ _ _
12: = t 2 14
13: jump _ _ 16
14: := 4 _ c
15 jump _ _ _
16 := 0 _ c
```

Παράδειγμα 2

```
program exams
{   declareint c,a,b,t enddeclare
    a:=1;
    while (a+b<1 and b<5)
    {  if (t=1) c:=2;
      else if (t=2) c:=4;
           else c:=0;
      while (a<1)
        if (a=2)
          while(b=1)
            c:=2;
    }
 }
```

```
1: begin_block exams _ _
2: := 1 _ a
3: + a b T_1
4: < T_1 1 6
5: jump _ _ _
6: < b 5 8
7: jump _ _ _
8: = t 1 10
9: jump _ _ 12
10: := 2 _ c
11: jump _ _ 17
12: = t 2 14
13: jump _ _ 16
14: := 4 _ c
15 jump _ _ 17
16 := 0 _ c
```

```
17: < a 1 _
18: jump _ _ _
```

Παράδειγμα 2

```
program exams
{   declareint c,a,b,t enddeclare
    a:=1;
    while (a+b<1 and b<5)
    {  if (t=1) c:=2;
       else if (t=2) c:=4;
            else c:=0;
       while (a<1)
         if (a=2)
           while(b=1)
             c:=2;
    }
 }
```

```
1: begin_block exams _ _
2: := 1 _ a
3: + a b T_1
4: < T_1 1 6
5: jump _ _ _
6: < b 5 8
7: jump _ _ _
8: = t 1 10
9: jump _ _ 12
10: := 2 _ c
11: jump _ _ 17
12: = t 2 14
13: jump _ _ 16
14: := 4 _ c
15 jump _ _ 17
16 := 0 _ c
17: < a 1 19
18: jump _ _ _
19: = a 2 _
20: jump _ _ _
```

Παράδειγμα 2

```
program exams
{   declareint c,a,b,t enddeclare
    a:=1;
    while (a+b<1 and b<5)
    {  if (t=1) c:=2;
      else if (t=2) c:=4;
           else c:=0;
      while (a<1)
        if (a=2)
          while(b=1)
            c:=2;
    }
 }
```

```
1: begin_block exams _ _
2: := 1 _ a
3: + a b T_1
4: < T_1 1 6
5: jump _ _ _
6: < b 5 8
7: jump _ _ _
8: = t 1 10
9: jump _ _ 12
10: := 2 _ c
11: jump _ _ 17
12: = t 2 14
13: jump _ _ 16
14: := 4 _ c
15 jump _ _ 17
16 := 0 _ c
```

```
17: < a 1 19
18: jump _ _ _
19: = a 2 21
20: jump _ _ _
21: = b 1 _
22: jump _ _ _
```

Παράδειγμα 2

```
program exams
{   declareint c,a,b,t enddeclare
    a:=1;
    while (a+b<1 and b<5)
    {  if (t=1) c:=2;
      else if (t=2) c:=4;
           else c:=0;
      while (a<1)
        if (a=2)
          while(b=1)
            c:=2;
    }
 }
```

```
1: begin_block exams _ _
2: := 1 _ a
3: + a b T_1
4: < T_1 1 6
5: jump _ _ _
6: < b 5 8
7: jump _ _ _
8: = t 1 10
9: jump _ _ 12
10: := 2 _ c
11: jump _ _ 17
12: = t 2 14
13: jump _ _ 16
14: := 4 _ c
15 jump _ _ 17
16 := 0 _ c
```

```
17: < a 1 19
18: jump _ _ _
19: = a 2 21
20: jump _ _ _
21: = b 1 23
22: jump _ _ _
23: := 2 _ c
```

Παράδειγμα 2

```
program exams
{   declareint c,a,b,t enddeclare
    a:=1;
    while (a+b<1 and b<5)
    {  if (t=1) c:=2;
      else if (t=2) c:=4;
           else c:=0;
      while (a<1)
        if (a=2)
          while(b=1)
            c:=2;
    }
 }
```

```
1: begin_block exams _ _
2: := 1 _ a
3: + a b T_1
4: < T_1 1 6
5: jump _ _ 28
6: < b 5 8
7: jump _ _ 28
8: = t 1 10
9: jump _ _ 12
10: := 2 _ c
11: jump _ _ 17
12: = t 2 14
13: jump _ _ 16
14: := 4 _ c
15 jump _ _ 17
16 := 0 _ c
```

```
17: < a 1 19
18: jump _ _ 27
19: = a 2 21
20: jump _ _ 26
21: = b 1 23
22: jump _ _ 25
23: := 2 _ c
24: jump _ _ 21
25: jump _ _ 26
26: jump _ _ 17
27: jump _ _ 3
28: halt _ _ _
29: end_block exams _ _
```

Παράδειγμα 2
Ισοδύναμο σε C

```
int main()
{
  int a,b,T_1,t,c;
  L_1:
  L_2: a=1; //(:=, 1,  , a)
  L_3: T_1=a+b; //(+, a, b, T_1)
  L_4: if (T_1<1) goto L_6; //(<, T_1, 1, 6)
  L_5: goto L_28; //(jump,  ,  , 28)
  L_6: if (b<5) goto L_8; //(<, b, 5, 8)
  L_7: goto L_28; //(jump,  ,  , 28)
  L_8: if (t==1) goto L_10; //(=, t, 1, 10)
  L_9: goto L_12; //(jump,  ,  , 12)
  L_10: c=2; //(:=, 2,  , c)
  L_11: goto L_17; //(jump,  ,  , 17)
  L_12: if (t==2) goto L_13; //(=, t, 2, 14)
  L_13: goto L_16; //(jump,  ,  , 16)
  L_14: c=4; //(:=, 4,  , c)
  L_15: goto L_17; //(jump,  ,  , 17)
  L_16: c=0; //(:=, 0,  , c)
  L_17: goto L_19; //(jump,  ,  , 19)
  L_18: goto L_27; //(jump,  ,  , 27)
  L_19: if (a==2) goto L_21; //(=, a, 2, 21)
  L_20: goto L_25; //(jump,  ,  , 26)
  L_21: if (b==1) goto L_23; //(=, b, 1, 23)
  L_22: goto L_25; //(jump,  ,  , 25)
  L_23: c=2; // (:=, 2,  , c)
  L_24: goto L_21; //(jump,  ,  , 21)
  L_25: goto L_26; //(jump,  ,  , 26)
  L_26: goto L_17; //(jump,  ,  , 17)
  L_27: goto L_3; //(jump,  ,  , 3)
  L_28: {}
}
```

Παράδειγμα 3

```
program max()
{   var a,b,c,d,e;
    function max(in x, in y)
    {   if (x>y)
           return(x);
        else
           return(y);
    }

    e:=max(in max(in a, in b),
           in max(in c, in d));
}
```

Παράδειγμα 3

```
program max()
{   var a,b,c,d,e;
    function max(in x, in y)
    {   if (x>y)
            return(x);
        else
            return(y);
    }

    e:=max(in max(in a, in b),
           in max(in c, in d));
}
```

```
0: begin_block MAX _ _
1: > x y 3
2: jump _ _ 5
3: retv x _ _
4: jump _ _ 6
5: retv y _ _
6: end_block MAX _ _
```

Παράδειγμα 3

```
program max()
{   var a,b,c,d,e;
    function max(in x, in y)
    {   if (x>y)
            return(x);
        else
            return(y);
    }

    e:=max(in max(in a, in b),
           in max(in c, in d));
}
```

```
8: begin_block max _ _
9: par a CV _
10: par b CV
11: par T_1 RET _
12: call _ _ max
```

Παράδειγμα 3

```
program max()
{   var a,b,c,d,e;
    function max(in x, in y)
    {   if (x>y)
            return(x);
        else
            return(y);
    }

    e:=max(in max(in a, in b),
           in max(in c, in d));
}
```

```
8: begin_block max _ _
9: par a CV _
10: par b CV
11: par T_1 RET _
12: call _ _ max
13: par c CV _
14: par d CV _
15: par T_2 RET _
16: call _ _ max
```

Παράδειγμα 3

```
program max()
{   var a,b,c,d,e;
    function max(in x, in y)
    {   if (x>y)
           return(x);
        else
           return(y);
    }

    e:=max(in max(in a, in b),
           in max(in c, in d));
}
```

```
8: begin_block max _ _
9: par a CV _
10: par b CV
11: par T_1 RET _
12: call _ _ max
13: par c CV _
14: par d CV _
15: par T_2 RET _
16: call _ _ max
17: par T_1 CV _
18: par T_2 CV _
19: par T_3 RET _
20: call _ _ max
```

Παράδειγμα 3

```
program max()
{   var a,b,c,d,e;
    function max(in x, in y)
    {   if (x>y)
            return(x);
        else
            return(y);
    }

    e:=max(in max(in a, in b),
           in max(in c, in d));
}
```

```
8: begin_block max _ _
9: par a CV _
10: par b CV
11: par T_1 RET _
12: call _ _ max
13: par c CV _
14: par d CV _
15: par T_2 RET _
16: call _ _ max
17: par T_1 CV _
18: par T_2 CV _
19: par T_3 RET _
20: call _ _ max
21: := T_3 _ e
22: halt _ _ _
23: end_block max _ _
```

Ευχαριστώ