Shri Ramdeobaba College of Engineering and Management, Nagpur

Department of CSE – Cyber Security
Session: 2023-2024

Compiler Design Lab CCP308

PRACTICAL No. 6

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Topic: Code Optimization
Platform: Windows or Linux

Aim: Write a code to implement Local optimization techniques until no further optimization is possible for the given three address code.

Input: Three Address Code (non- optimized)

Implementation: Identify and apply local optimization techniques to optimize the TAC

- Constant propagation
- Constant Folding

Constant propagation:

```
#include<stdio.h>
#include<stdlib.h>
void main(){
   char s1[3]={'a','=','1','\0'};

   printf(" Constant propagation:\n");
   int i=0,a,b;
   if((s1[i]>='a' && s1[i]<='z') && s1[i+1]=='=' && (s1[i+2]>='0' && s1[i+2]<='9') &&
s1[i+3]=='\0')
   {
      printf(" %s\n",s1);
      a=atoi(&s1[i+2]);
   }

   char s2[3]={'b','=','2','\0'};
   if((s2[i]>='a' && s2[i]<='z') && s2[i+1]=='=' && (s2[i+2]>='0' && s2[i+2]<='9') &&
s2[i+3]=='\0')
   {
      printf(" %s\n",s2);
      b=atoi(&s2[i+2]);
   }
   char s3[5]={'c','=','a','+','b','\0'};
   if((s3[i]>='a' && s3[i]<='z') && s3[i+1]=='=' && (s3[i+2]>='a' && s3[i+2]<='z') &&
s3[i+3]=='+' && (s3[i+4]>='a' && s3[i+4]<='z')){
      printf(" %c%c",s3[i],s3[i+1]);
      if(s3[i+2]=='a')
      printf("%d",a);
      printf("%c",s3[i+3]);
      if(s3[i+4]=='b')
      printf("%d\n",b);
```

```
    }
    char s4[5]={'d','=','3','+','b','\0'};
    if((s4[i]>='a' && s4[i]<='z') && s4[i+1]=='=' && (s4[i+2]>='0' && s4[i+2]<='9') &&
s4[i+3]=='+' && (s4[i+4]>='a' && s4[i+4]<='z')){
        printf(" %c%c%c",s4[i],s4[i+1],s4[i+2]);
        printf("%c",s3[i+3]);
        if(s4[i+4]=='b')
        printf("%d",b);
    }

}
```

Constant folding:

```
#include<stdio.h>
#include<stdlib.h>
void main(){
    char s1[3]={'a','=','1','\0'};

    printf(" Constant folding:\n");
    int i=0,a,b;
    if((s1[i]>='a' && s1[i]<='z') && s1[i+1]=='=' && (s1[i+2]>='0' && s1[i+2]<='9') &&
s1[i+3]=='\0')
    {
        printf(" %s\n",s1);
        a=atoi(&s1[i+2]);
    }

    char s2[3]={'b','=','2','\0'};
    if((s2[i]>='a' && s2[i]<='z') && s2[i+1]=='=' && (s2[i+2]>='0' && s2[i+2]<='9') &&
s2[i+3]=='\0')
    {
        printf(" %s\n",s2);
        b=atoi(&s2[i+2]);
    }
    char s3[5]={'c','=','1','+','2','\0'};
    if((s3[i]>='a' && s3[i]<='z') && s3[i+1]=='=' && (s3[i+2]>='a' && s3[i+2]<='z') &&
s3[i+3]=='+' && (s3[i+4]>='a' && s3[i+4]<='z')){
        printf(" %c%c",s3[i],s3[i+1]);
        if(s3[i+2]=='1' && s3[i+3]=='+' && s3[i+4]=='2')
        printf("%d",a+b);
    }
    char s4[5]={'d','=','3','+','2','\0'};
    if((s4[i]>='a' && s4[i]<='z') && s4[i+1]=='=' && (s4[i+2]>='0' && s4[i+2]<='9') &&
s4[i+3]=='+' && (s4[i+4]>='a' && s4[i+4]<='z')){
        printf(" %c%c",s4[i],s4[i+1]);
        if(s3[i+2]=='3' && s3[i+3]=='+' && s3[i+4]=='2')
        printf("%d",3+b);
    }
}
```

Output: Optimized TAC.

```
Constant propagation:
a=1
b=2
c=1+2
d=3+2

...Program finished with exit code 0
Press ENTER to exit console.
```

```
Constant Folding
a=1
b=2
c=3
d=5

Process returned 0 (0x0)   execution time : 0.031 s
Press any key to continue.
```