Transformation on Basic Blocks

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Introduction

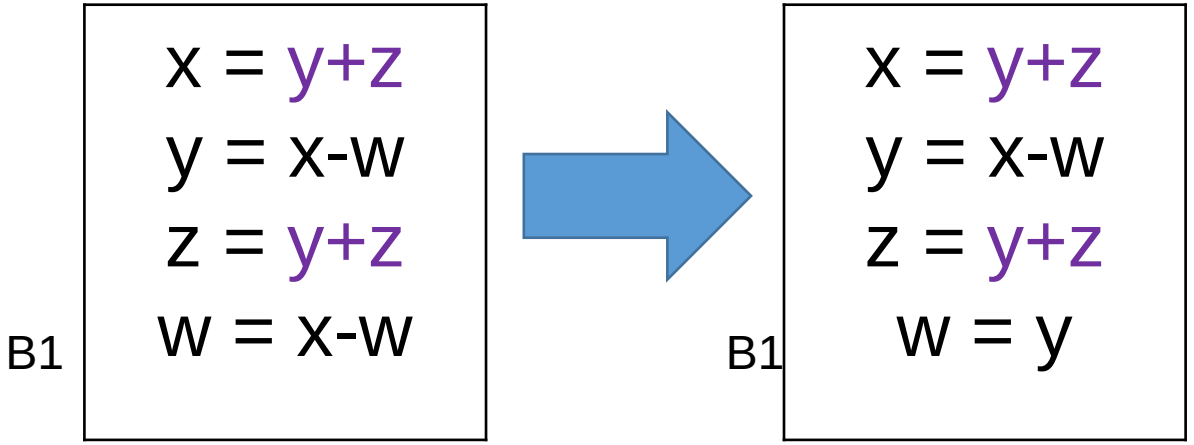
- With the help of transformation, we can improve/ optimize the basic blocks
- There are two types of transformations: Structure Preserving Transformation and Algebraic Transformation

Structure Preserving Transformation

- 4 primary transformations:
    1. Common subexpression elimination
    2. Dead Code Elimination
    3. Renaming of temporary variables
    3. Interchange of 2 independent adjacent statements

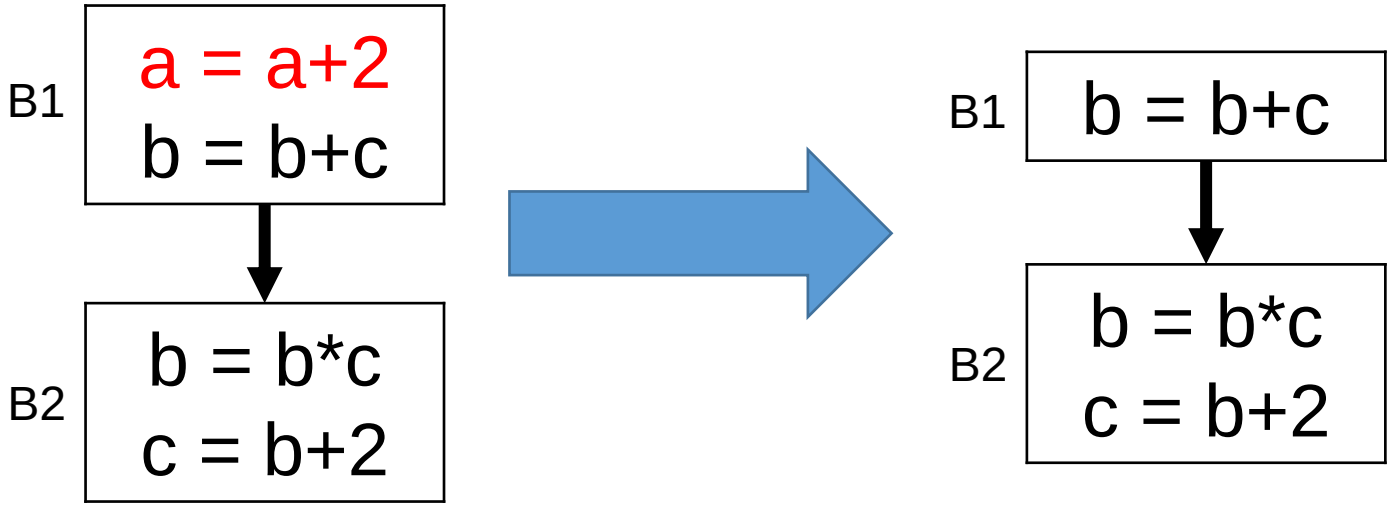
Common subexpression elimination

- If it was previously computed and the value was not changed then they are called common subexpressions



Dead Code Elimination

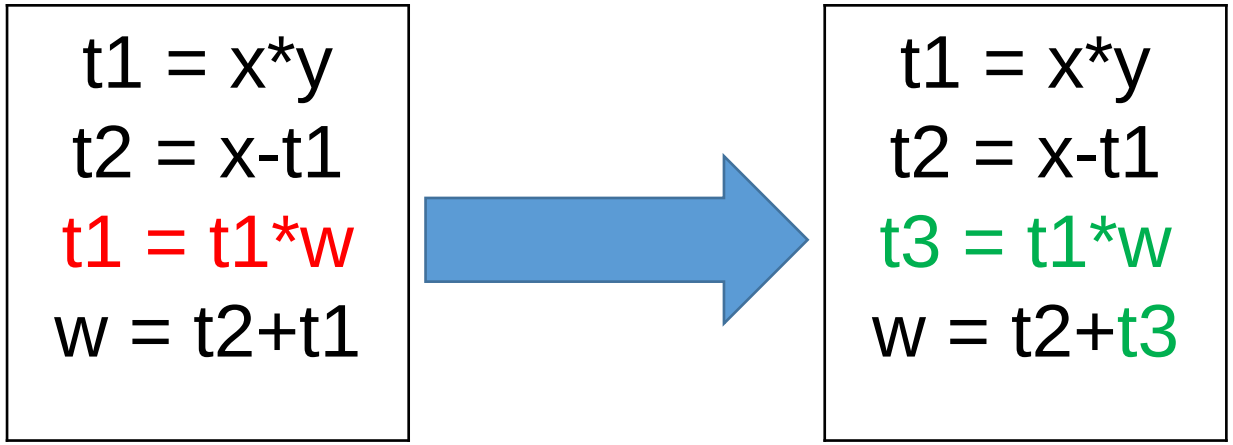
- A variable is considered dead is it not subsequently used in other basic blocks or it is not used further



- We can observe that the variable '**a**' is not used is block B2 or further
- So, a becomes dead

Renaming of temporary variables

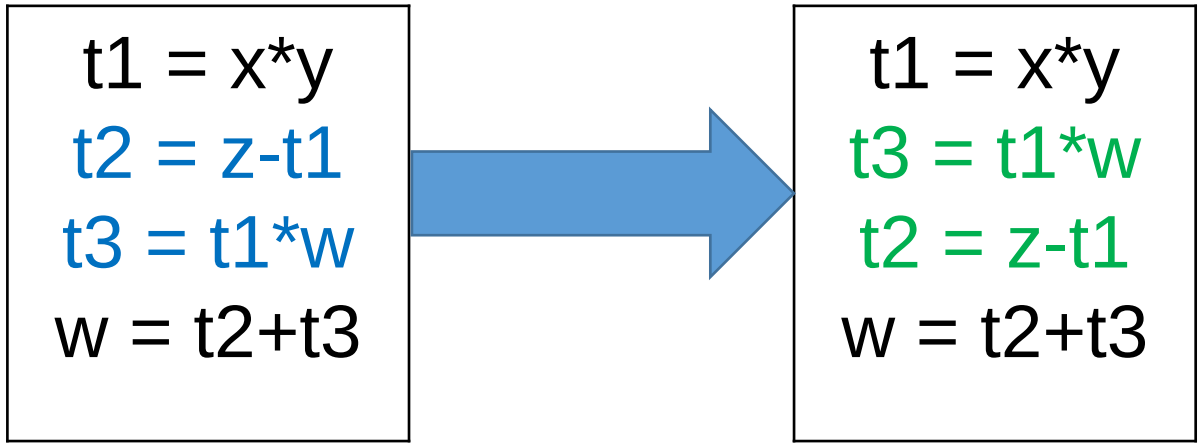
- A temporary variable can be renamed with another temporary variable



At first t1 = t1*w
The, it becomes t1= x*y*w
What if the first t1 is needed by some other block?

Interchange of 2 independent adjacent statements

- If two statements are not dependent upon each other they are called independent statements



- t2 is dependent on t1 and t3 is dependent on t1 also.
- But, they are not dependent on each other!
- So, both t2 and t3 are the dependent statements
- We can interchange these two independent statement without changing the value

Algebraic Transformation

- Several algebraic transformations can be performed into basic blocks. Some of them are:

x = x+0
x=x-0

- The value of x remains unchanged for both cases
- So these two statements can be completely removed from the basic block

Algebraic Transformation

- Several algebraic transformations can be performed into basic blocks. Some of them are:

```
a = a*1
b=b/1
```

- The value of a and b remains unchanged
- So these two statements can be completely removed from the basic block

Algebraic Transformation

- The exponent operation:

```
c = d**2
```

- We need to call the pow function for this.
- Instead using pow(d,2) we can use multiplication

```
c = d*d
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