

Assignment

# Compiler Design

Code Generation

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## Problem Statement

Consider the following three-address code:

$p = q + r$

$s = p + q$

$u = s * v$

if (  $u > 100$  )

$v = r + u$

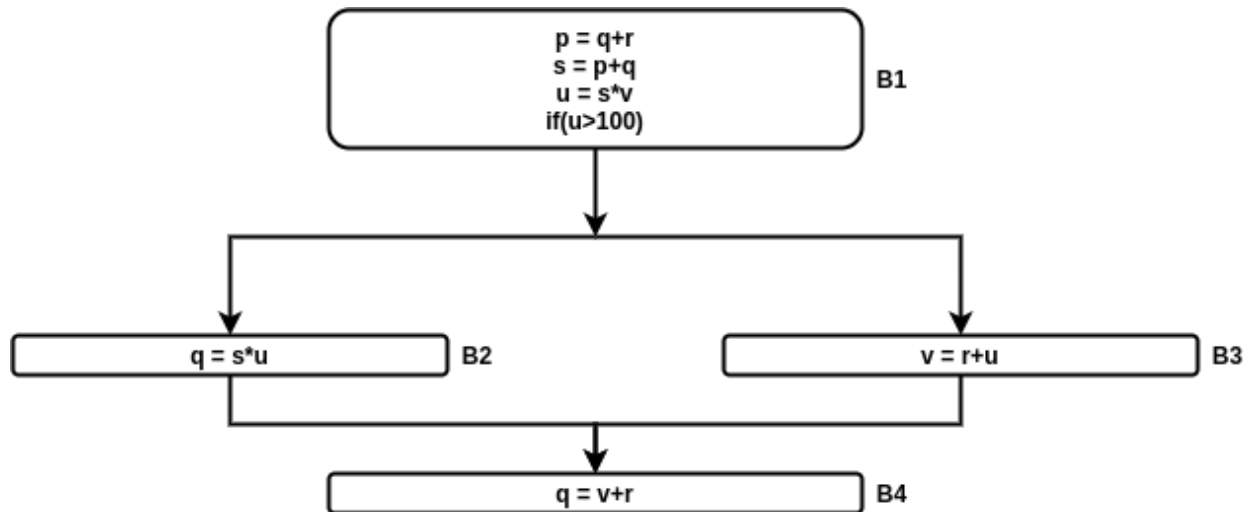
else

$q = s * u$

$q = v + r$

- Construct the flow graph of the above piece of code.
- Find the liveness and next use for each variable at each statement and at the entry of each basic block.
- Construct the Register Interference Graph.
- Write a target code for the above code. Ensure maximum reuse of the register. Justify your answer.

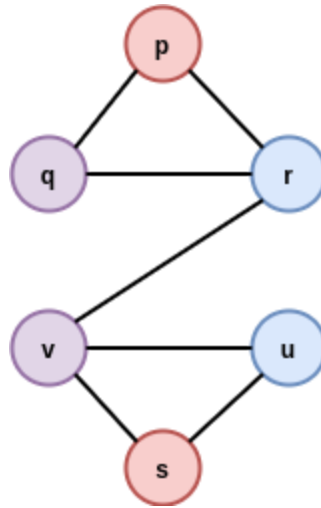
## Control Flow Graph



## Liveness and Next Use

S.No	Statement	Liveness	Next Use
1	$p = q+r$	Live: {p,q,r}	$p \rightarrow 2, q \rightarrow 2, r \rightarrow 5$
2	$s = p+q$	Live: {s} , Dead: {p,q}	$s \rightarrow 3$
3	$u = s*v$	Live: {u, s, v}	$u \rightarrow 4, s \rightarrow 7, v \rightarrow 8$
4	$\text{if}(u>100)$	Live: {u}	$u \rightarrow 5$
5	$v = r+u$	Live: {v, r}	$v \rightarrow 8, r \rightarrow 8$
6	else		
7	$q = s*u$	Nothing is live	
8	$q = v+r$	Nothing is live	

## Register Interference Graph



## Target Code

```
LD R0, q
ADD R0, r
MOV R0, p
ADD R0, q
MOV R0, s
MUL R0, v
MOV R0, u
CMP R0, #100
JLT LABEL
ADD R0, r
MOV R0, v
LABEL: MUL R0, s
LD R0, v
ADD R0, r
ST R0, q
```