UNIT-2

COMPUTER ARITHMETIC

Data Representation

- Fixed point representation
- Floating point representation

Fixed point representation

- It have limited range of values and have relatively simple hardware.
- Unsigned number- +ve integer including zero
- Signed number- -ve integer including zero.
- Computer hardware recognize all 1’s and 0’s.
- The unsigned number is represented with only the magnitude field.
- Signed number representation- +ve – 0

  -ve- 1

Signed Numbers

- **Need to be able to represent both *positive* and *negative* numbers**

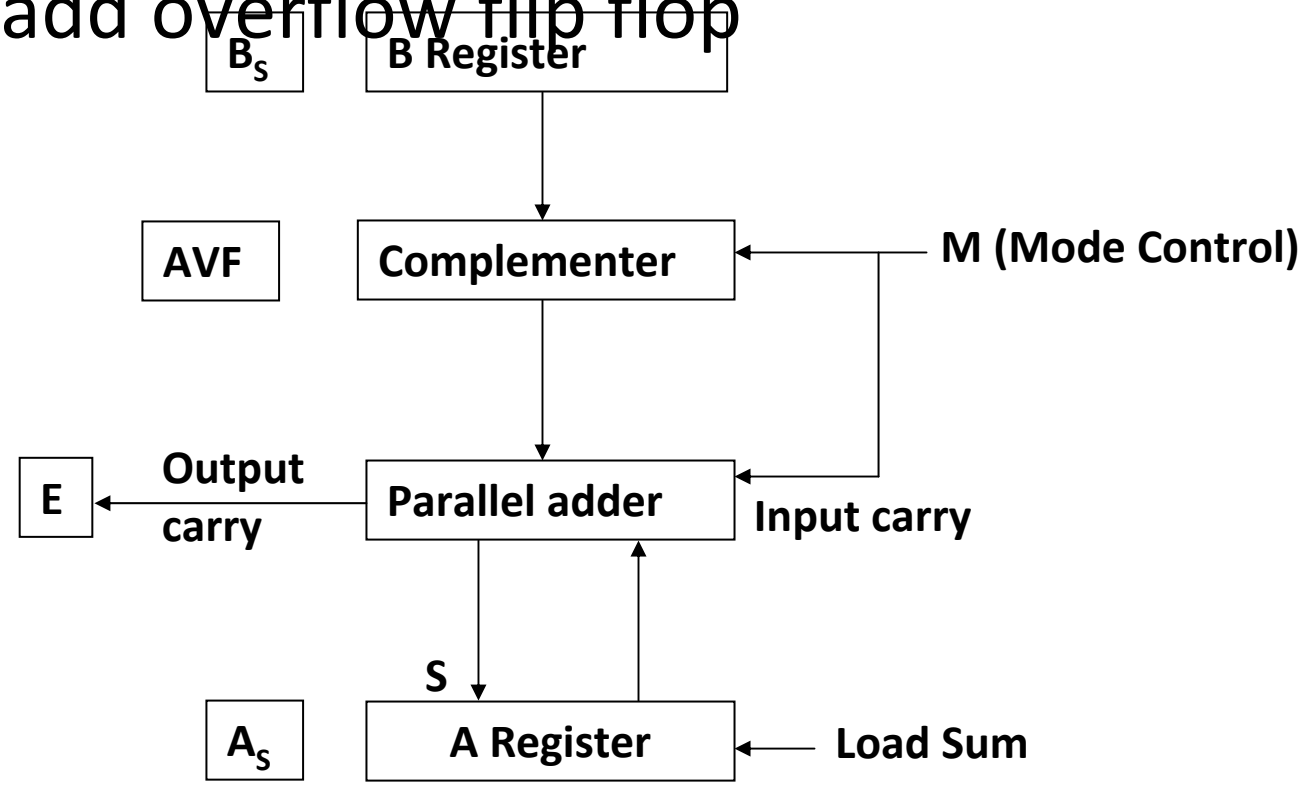
- **- Following 3 representations**
- **Signed magnitude representation**
- **Signed 1's complement representation**
- **Signed 2's complement representation**

Addition and Subtraction of signed magnitude numbers

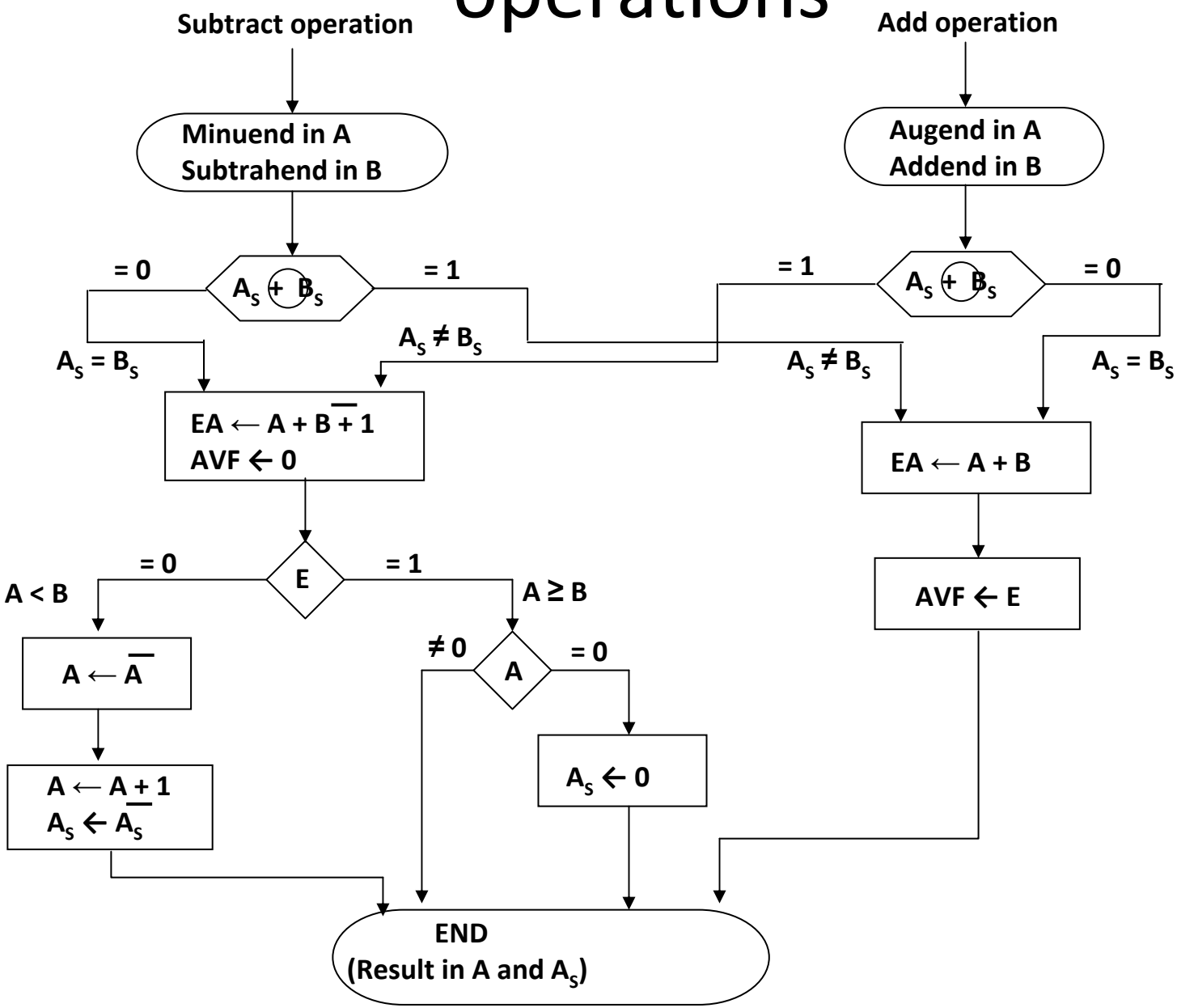
Operation	Add Magnitudes	Subtract Magnitudes		
		When $A > B$	When $A < B$	When $A = B$
$(+A) + (+B)$	$+(A + B)$			
$(+A) + (-B)$		$+(A - B)$	$-(B - A)$	$+(A - B)$
$(-A) + (+B)$		$-(A - B)$	$+(B - A)$	$+(A - B)$
$(-A) + (-B)$	$-(A + B)$			
$(+A) - (+B)$		$+(A - B)$	$-(B - A)$	$+(A - B)$
$(+A) - (-B)$	$+(A + B)$			
$(-A) - (+B)$	$-(A + B)$			
$(-A) - (-B)$		$-(A - B)$	$+(B - A)$	$+(A - B)$

Hardware for signed magnitude addition and subtraction

- AVF- add overflow flip flop

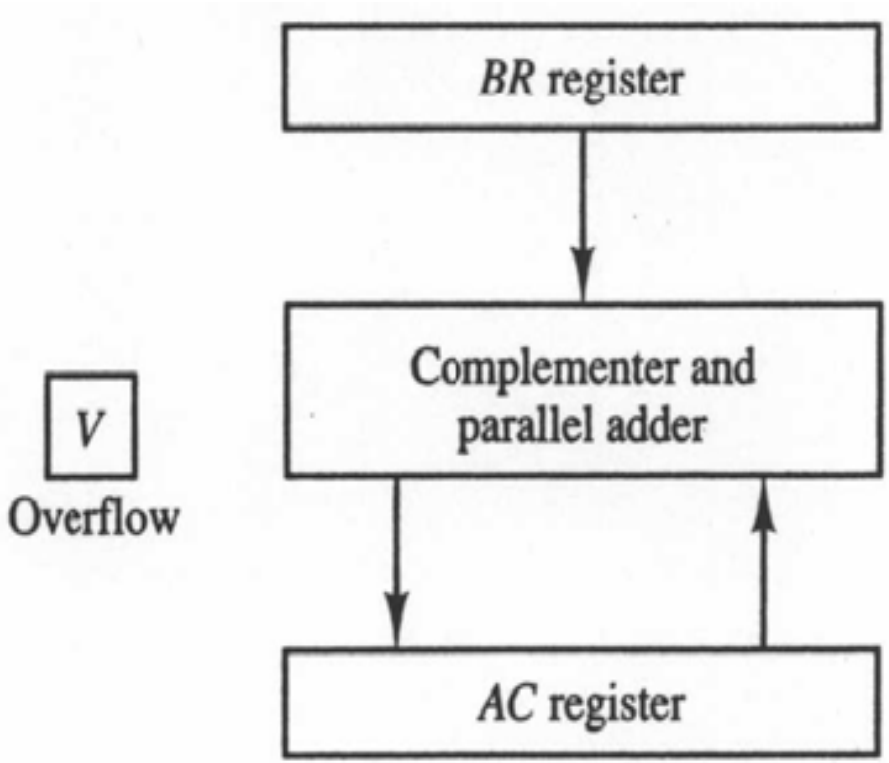


Flow chart for add and subtract operations

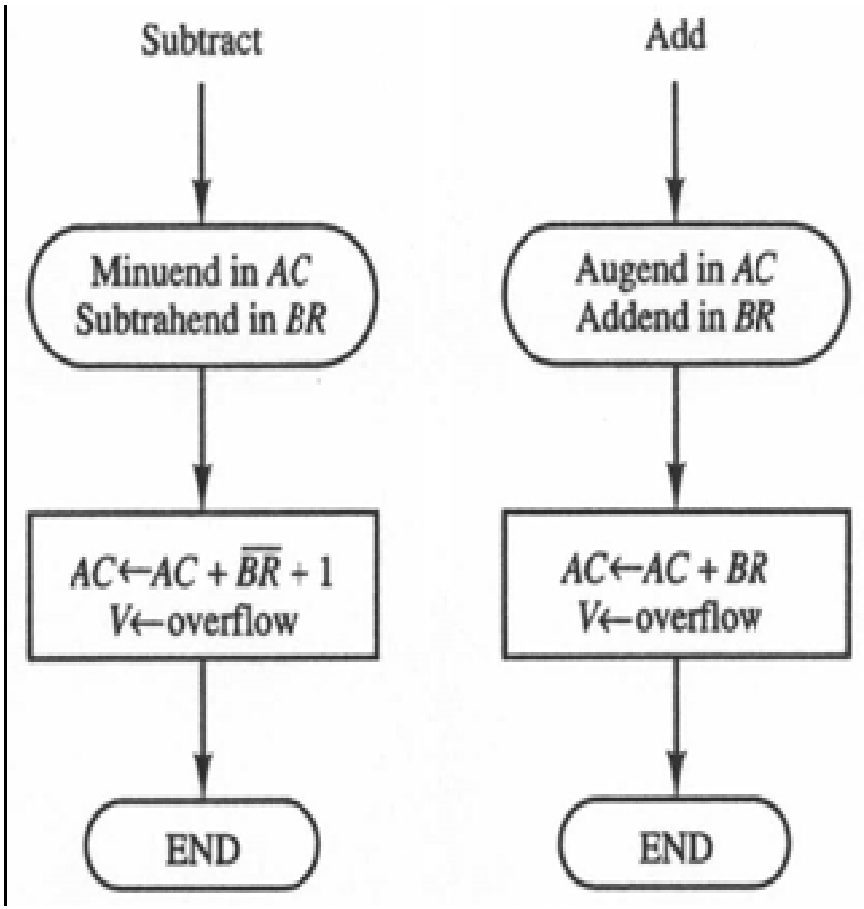


Signed 2's complement addition and subtraction

Hardware :



Flowchart :



References

Text Book

- M. M. Mano, Computer System Architecture, Prentice-Hall,2004