

Voorbees

Talk on exceptional cases.

Nov 26, '56

Possible Indicators: I, E, Z?, DC, C?

↑ zero mantissa?

↑ cancellation?

Exp. over & under only when at least one of the operand mantissas is non-zero.

Notation:  $\emptyset$  indicates zero mantissa.

$\mathcal{N}$  " non-zero mantissa

(1) If I or E exists in either operand, the primary opn. (+, -, x, /) is not performed. (norm?) <sup>maybe</sup>

(2) If one or both of the operands is  $\emptyset$  The primary opn. is not performed. (norm?)

Four types of noz.

1.  $\mathcal{N}$  ordinary no.
2.  $\emptyset$  zero mantissa no. not the result of underflow.
3.  $\mathcal{N}_I \equiv I$  ord. no. with I bit
4.  $\emptyset_E$  zero mant. with underflow tag.

others:  $\mathcal{N}_E$  is set to  $\emptyset_E$  in any operation

$\emptyset_I$  no opn. can produce this.

$\mathcal{N}_{IE}$  do not exist

$\emptyset_{IE}$  " " "

assume division is normalized

Breakins: 4 triggers

(like can be visible)

Hi OV 1

Lo UN 4

DC 5

Hi UN 2

Lo UN 3

1. Triggers are always turned on by exceptional events
2. 2 bits in opn. needed. (1 for breakin or no breakin) (end)  
(1 for reset or no reset, triggers) (beginning)
3. (a) turn on control triggers when exceptional case occurs,  
(b) loc. of instr. is preserved,  
(c) Test for BI or no BI
  - (1) If BI tr to fast mem. loc. 1, 2, 3, 4 or least no. in 2-trigger on (do not reset) & store loc. of BI instr.
  - (2) If no BT leave trigger on, leave loc. preserved

Fast may be on stores only?

### Reset

4. Reset, reset all 4 triggers & clear loc. preserve, done before performing primary instr.

	N		N <sub>I</sub>		0		0 <sub>E</sub>	
	BI	no BI	BI	no BI	BI	no BI	BI	no BI
N	$\neq$ $\neq$ unknown, A+B constant N <sub>I</sub>		constant BI $\neq$ N <sub>I</sub>		$\neq$ $\neq$ unknown result 0 <sub>E</sub> due to mem		$\neq$ $\neq$ unknown result 0 <sub>E</sub> due to mem	
N <sub>I</sub>			constant BI N <sub>I</sub>		constant BI $\neq$ N <sub>I</sub>		constant BI $\neq$ N <sub>I</sub>	
0					constant BI 0		constant BI (or 0?)	
0 <sub>E</sub>							constant BI 0 <sub>E</sub>	

for normalized

changes due to unknown,

could be removed  
 $a + 0 = a$   
 case

mpy

	$\eta$	$\eta_I$	$\emptyset$	$\emptyset_E$
$\eta$	BI - $\eta$ ? $\eta_I$ ? $\emptyset$ autoexp common $\emptyset$ autoexp	c	$\eta_I$	c   $\emptyset$   c   $\emptyset_E$ ( $\eta \emptyset$ )?
$\eta_I$		c	$\eta_I$	c   $\emptyset$   c   $\emptyset_E$ ( $\eta_I$ )?
$\emptyset$			c	c   $\emptyset$   c   $\emptyset_E$ ( $\eta \emptyset$ )?
$\emptyset_E$				c   $\emptyset_E$ ( $\eta \emptyset$ )?

divide (numerator)

(denom)

	$\eta$	$\eta_I$	$\emptyset$	$\emptyset_E$				
$\eta$	- $\eta$ ? $\eta_I$ ? $\emptyset$ autoexp $\emptyset$ noDC	c	$\eta_I$	c   $\emptyset$   c   $\emptyset$ ( $\eta \emptyset$ )				
$\eta_I$	c	$\emptyset_E$ ( $\emptyset$ )	c	$\eta_I$	c   $\emptyset$   c   $\emptyset$ ( $\emptyset_E$ )			
$\emptyset$	DC	noDC	DC	noDC	DC	noDC	DC	noDC
$\emptyset$	A, B	$\eta_I$	A, B	$\eta_I$	A, B	$\emptyset$ ?	A, B	$\eta_I$ ?, $\emptyset_E$ ?
$\emptyset_E$	A, B	$\eta_I$		$\eta_I$		$\emptyset$ ?, $\eta_I$		
$\eta$	<del><math>\emptyset</math></del>	$\eta_I$ ?						

Signed Exp:

- $\emptyset: [-(2^{12}-1), \pm \emptyset]$  ,  $\emptyset_E: \emptyset$  with  $E$ ,  $\eta_I: I$  or  $\pm$ ?
- $\emptyset: [\text{any exp}, \pm \emptyset]$  ,  $\emptyset_E: \emptyset$  with  $E$  ,

mod exp.

- $\emptyset: [\neq \emptyset, \neq \emptyset]$   
or  $[\text{any}, \neq \emptyset]$