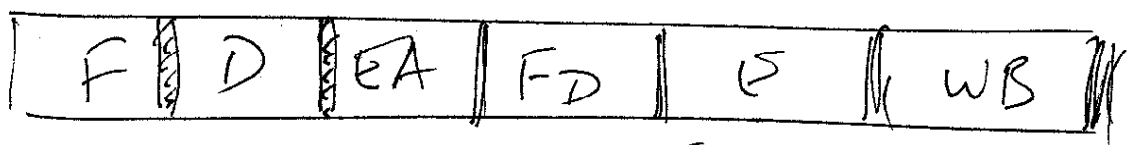


STAGES



F_M D_M E_{M1} E_{M2} E_{M3} WB_M
 F_A D_A

Alpha 21064

200 MHz

1992

Pentium 5 STAGE

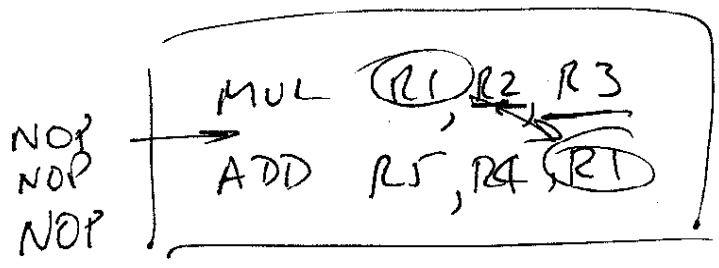
66 MHz

1995

Pentium Pro

12 Stages

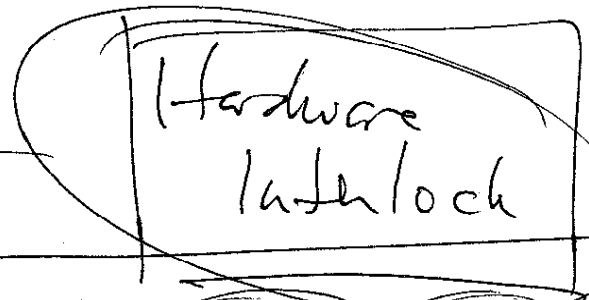
?



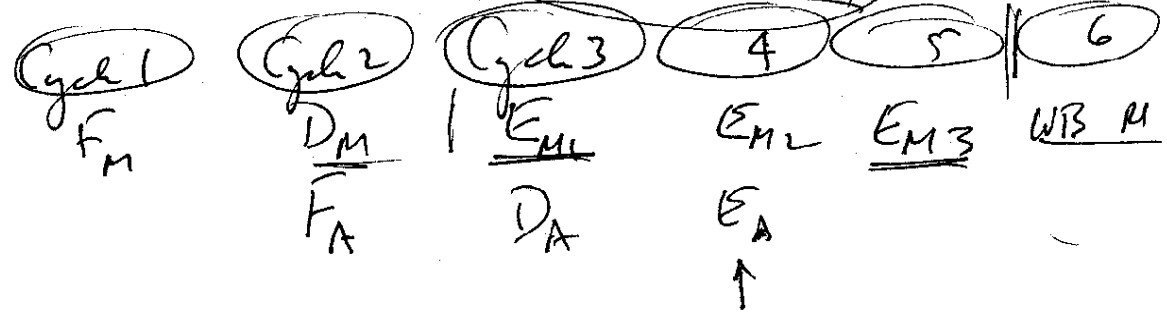
MIPS

Data Kuch

Flow Dependency
RAW Hazard



MUL example
ADD



28 Jan/2

ADD R1, R2, R3

ADD R1, R2

ADD LABEL

ADD

John Cocke

~1982

ASPLCOS 1982

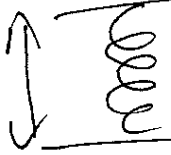
"OPEN" MCODE

Semantic Gap

VAX

X86

HLL



ISA

AOBLE

Single Compiler

Serious Compiler

Little opportunity

Single code

Tuning at the factory

MOPS/MINS

~~ISA~~

Control Signals

