

* LOOP UNROLLING:-

- 1) Loop unrolling is a loop transformation technique that attempts to optimize a program's execution speed.
- 2) It can be automatic or manual.
- 3) It is used to simplify the code for the processor.

Advantages

Disadvantages

- | | |
|---|---|
| 1) Branch Penalty is minimized | 1) The code gets too large/unreadable |
| 2) Significant | 2) May use too much memory/storage/registers resulting into |
| 3) Can be process some actions if the size of data is known | 3) Might increase the chances of bugs & errors. |
| 4) Offer customization | On |



RAW Hazard (Read after write) :-

Reading data which is in use by some other instruction raise this hazard.

Example

```

LD $1
ADD $1, 2
LD $1 $4, $1 x
    
```

WAH Hazard (Write after Write)

Writing the data which is already getting written by someone

```

E.X ADD $1, 2
      ADD $1, $4 x
    
```

~~WAR~~ Hazard (Write after read)

```

LD $1, data
MOV data, 'new data' x
    
```

SOLUTIONS:-

- Forwarding: - Passing the operands to other instruction.
- Stalling: - Delaying some stages of instruction to avoid hazard.

BRANCH PREDICTION:-

It is the prediction of the processing to be started based on some decision yet to be taken by user.

Working:-

When a condition appear the processor take a guess based on the frequent use if the guess appear to be correct it speedup otherwise it process the other side taking sometime but eventually cover up.

1. STATIC PREDICTION:-

All decisions are taken at compile time

2. DYNAMIC PREDICTION:-

It does not allow the prediction scheme to adapt to behaviour that changes overtime.

MAPPING TECHNIQUE:-

To be able to predict the system maintain caches of most frequently used item/processes.



* DIRECT MAPPING:-

It place every block ~~of~~ ~~size~~ of memory in cache till cache is full. The block is divided into two parts.

* Associative Mapping:-

It is a very flexible technique because it map related data in related portions. Each block is capable to enter in the cache line it can be identified that word is necessary.

* Set-Associate Mapping:-

It is a combination of both direct & associate mapping excluding all the problems that come in direct & associate.