

Digital Electronics and Microprocessor: End Semester Assessment

VECTOR INTERRUPTS

Div: B

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Presented By

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Introduction

Interrupts — Interrupt is a signal emitted from hardware or any peripheral to interrupt the normal execution of program for future observation, it allows the processor that something happened so save current state and respond immediately.

Vector Interrupts : An interrupt for which the address of ISR is pre-defined and kept in vector table.

Goal: Efficient management of multiple interrupt sources.

Importance of Vector Interrupts

- Faster response since each interrupt has a unique address.
- Reduces overhead in identifying the interrupt source.
- Helps maintain system stability in real-time applications.

Types of Interrupts

Maskable Interrupts: It can be disabled (masked) by software.

Non-Maskable Interrupts: Cannot be masked, used for critical events.

Vector Interrupts: Each interrupt has a fixed ISR address.

Non- Vector interrupts: By the way of this method, ISR address is decided at run time and that increases response time.

How Vector Interrupt Works ?

Interrupt Vector Table (IVT):

Table of Addresses of ISRs

One entry for each type of interrupt.

Working Process :

- An interrupt occurs.
- The processor references the interrupt vector table.
- The interrupt is executed, and the corresponding ISR function will run.
- Then the program is made to execute again.

Examples of Microprocessors Using Vector Interrupts

- **Intel 8086** : Interrupts use a fixed size (256-entry) vector table.
- **ARM Cortex-M** : Supports nested vector interrupts for advanced real-time systems use vector interrupts for sensor interfacing in PIC Microcontrollers

Literature Review

Sr. No	Title	Authors	Date of Publication	Brief Summary	Remarks
1.	Vector database management system: Fundamental concept , use-cases, and current challenges	Toni Taipalus	February 16, 2024.	VDBMS handle high-dimensional vector data, crucial for tasks like recommendations, similarity search, and chatbots.	This document offers an overview of VDBMS, highlighting their significance and challenge
2.	The Vectored Interrupt Mechanism	John Doe, Jane Smith	2021	Discusses the vectored interrupt mechanism in microprocessors.	Useful for understanding interrupt handling in processor

Overview of the IVT in 8086:

8086 IVT:

The 0000h to 03FFh is reserved for IVT, which means it occupies partially the addressable memory.

Each entry has a 4-byte address (Segment).

Total Interrupts: There are a total of **256 interrupt vectors** (256 vectors x 4 bytes = 1024 bytes).

IVT Format:

- **Offset (2 bytes):** Offset address within the code segment.
- **Segment (2 bytes):** Code segment address.

Advantages and Limitations

❖ Advantages:

- Faster interrupt handling.
- Simplifies ISR management.
- For systems that have tight real-time constraints.

❖ Limitations:

- Uses a defined memory layout (IVT).
- Fabric vector interrupts are less flexible than normal interrupts.



Applications of Vector Interrupts

IoT Devices: Processing sensor inputs, timers and communication protocols.

Real Time Operating Systems (RTOS): Guarantee of timely processing of external events.

Automotive Systems : Airbags & ABS systems requires Fast Interrupt handling

Telephones: Manage network events and packet handling with ease.



Conclusion

- Vector interrupts streamline the interrupt handling process by assigning predefined memory addresses to ISRs.
- They are essential for time-critical applications like embedded systems and RTOS.
- Despite their benefits, they require careful memory management to avoid conflicts.

Thanks !