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# External Interrupt (EXTI)

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# Introduction

- The EXTI (External Interrupt) is a peripheral in STM32F407 microcontroller that allows the processor to respond to external events or interrupts generated by various external sources.
- EXTI provides a way for the microcontroller to handle time-critical and asynchronous events in real-time without continuously polling for changes.

# Modes

- **Interrupt Mode**
  - In this mode, the processor is interrupted by an external event, and the corresponding Interrupt Service Routine (ISR) is executed. This allows the microcontroller to respond promptly to external events with minimal latency.
- **Event Mode**
  - In this mode, the processor is notified of the external event, but no interrupt is generated. Instead, the event flag is set, and the processor can check the flag status later to handle the event. Event mode is useful for handling non-time-critical events that do not require immediate attention.

# Trigger

- Rising Edge
- Falling Edge
- Both Edge

# Applications

- **User Input**
  - Responding to user input, such as button presses, without continuously polling the GPIO pins.
- **Sensor Handling**
  - Reacting to external events from sensors, such as detecting motion or changes in analog values.
- **Real-Time Control**
  - Handling time-critical events in real-time control systems, ensuring rapid response to external stimuli.
- **Communication**
  - Notifying the processor of incoming data or messages from communication interfaces (UART, SPI, I2C, etc.).

# Examples

- **Button Press**
  - Configuring a GPIO pin connected to a button in interrupt mode to perform a specific action when the button is pressed.
- **Sensor Interrupt**
  - Using EXTI to detect motion from a motion sensor and triggering appropriate actions.
- **Communication Notification**
  - Utilizing EXTI to notify the processor of incoming data from a UART or other communication interface.

# Registers

- **EXTI_IMR**
  - Interrupt Mask Register, enabling or disabling individual EXTI lines for generating interrupts.
- **EXTI_RTSR/EXTI_FTSR**
  - Rising/Falling Edge Trigger Selection Registers, determining whether interrupts are triggered on rising or falling edges of the EXTI sources.
- **EXTI_PR**
  - Pending Register, indicating which EXTI lines have pending interrupt requests.