CS 350 Module Three Journal

In embedded systems, devices like sensors and actuators communicate through different interfaces. These interfaces allow the system to send or receive information, and each one has its own strengths and weaknesses. In this comparison, we will look at three common interfaces: GPIO, SPI, and I2C.

GPIO is one of the simplest interfaces and is used for basic on/off signals. It lets a microcontroller read or send simple digital signals, like turning an LED on or off or reading if a button is pressed. GPIO is easy to use and doesn’t need extra components, which makes it great for simple tasks. However, it is limited because it can’t handle complex tasks or communicate with multiple devices at the same time.

SPI is a faster interface that allows data to be transferred between the microcontroller and other devices like sensors or memory. It uses four wires: a clock signal to keep time, data lines to send and receive information, and a chip select line to choose which device is active. SPI is very fast, which makes it useful for tasks like controlling displays or sensors that need quick communication. However, it requires more pins to connect each device, and it can’t connect as many devices as I2C.

I2C is different because it uses just two wires: one for data and one for the clock. It can connect multiple devices on the same two wires, which makes it very efficient when you need to save space or pins. I2C is often used for connecting sensors or small devices in networks. However, it’s slower than SPI and can be more complicated to manage when several devices need to talk at the same time. It’s also not as reliable in long-distance communication.

To summarize, GPIO is best for simple tasks like turning something on or off. SPI is good for fast communication with devices, while I2C is great for connecting many devices using fewer pins. Each interface has its own place, and which one you choose depends on what your project needs.