CS-350-T3346 Emerging Systems Architectures & Technologies

3-3 Journal: Peripheral Interfaces in Embedded Systems

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Below are the three interfaces I chose to explain in this journal entry. I will outline each with a brief description, then I will explain how they are similar and the differences and finally I will discuss why you would use one interface over another.

* **GPIO** – GPIO (General Purpose Input/Output) describes a connection that can be used for input or output depending on the peripheral. Connections come in the form of pins and they are the physical structure that connects a microcontroller to a peripheral. Pins can be configured as either an input or output but not at the same time. If a pin were to be configured as an input and output, it would create a short because the pin could possibly be assigned opposing values. It uses register to keep the values in memory.
* **PWM –** PWM (Pulse-Width Modulation) is another way used to communicate with pins, in which a periodic output is pulsed high for a particular amount of time and low the rest of the time. With the use of variables such as duty cycle and period a PWM can be very easily used to flash a LED or interact with a motor that can accept varying amounts of power. Pins have the same characteristics as outlined in GPIO and PWMs also make use of register to contain the state of the pin.
* **UART** – UART (Universal Asynchronous Receiver/Transmitter) is a serial I/O that communicates between two systems. Usually, it is used to communicate between software and a peripheral. UART uses serial ports to facilitate this communication and the two systems must agree on the parameters for the connection before it can be established. UART is slower when compared to other technologies and very prone to misconfiguration issues, but they have been around for a very long time and remain important today. UART uses a couple protocols such as RS-232 and RS-485 for communications and it can also use USB to communicate. Again, as with the previous two UART uses registers to store the data being transmitted and received. UART can utilize the use of GPIOs to communicate with other peripherals.

One of the most notable similarities is they are used to communicate with peripherals via pins. They all use registers to contain information or the state of a pin. GPIO typically either send 1’s or 0’s whereas PWM can send varying values to pins and UART transmits and receives data streams. Another similarity is they are used to communicate with peripherals and devices via pins. The way they communicate with peripherals and the purpose they serve is different. UART often uses GPIOs to communicate with peripherals. PWM and UART are more complex than GPIO as it usually involves calculations or processing data received.

As to which interface to use over another, in my opinion there is not one interface you would use over another as they all have a specific focus on the type of communication they provide. I would say it really depends on the need as to which interface one would choose. For example, if there was a need for streams of data to be sent and receives I would say UART would be the best choice, if the purpose was motors for a remote control car PWN might be the best choice and if you needed to control a LED GPIO might be the best. So, there is no one interface better than another it strictly comes down to the requirements of the situation.