**3-3 Journal: Peripheral Interfaces in Embedded Systems**

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**Identifying Three Interfaces**

Three identified interfaces I have discussed are the general purpose input/output (GPIO), pulse width modulation (PMW), and universal asynchronous receiver and transmitter (UART). According to Bulter, "GPIO refers to a set of pins on your computer's mainboard or add-on card." (Bulter, 2022, para 2). The GPIO handles digital signals on applications like button presses or other simple motors. PMW, on the other hand, controls the analog devices by switching signals on and off when converting digital signals to analog output. (Kohlhase, 2020). Lastly, UART enables communication between two devices using pins to transmit and receive data. Without UART, it allows connection between computers or other Bluetooth devices.

**Differences Between the Interfaces**

Although GPIO, PMW, and UART have different functionalities within microcontrollers, they all have other purposes, such as communication and application. With GPIO and PWM, there is no communication protocol since GPIO is a digitally controlled pin, and PWM uses a duty cycle to control behavior; however, with UART, there must be communication with devices so that entire data can be transferred and received. Regarding applications, GPIO focuses on a switch to turn something on and off. At the same time, PMW can turn a sound frequency on or off. UART does not have this functionality. UART is only capable of communicating from one device to another.

**Using One Interface Over the Other**

GPIO, PMW, and UART also differ on why the interfaces are being used. GPIO is designated for digital control of on/off functions such as turning on a light switch. The primary purpose of PWM is to control analog devices through digital signals, such as an LED dimmer. By controlling the duty cycle of the PMW signal, the lights can be altered to become lighter or darker regardless of the voltage being channeled. UART would strictly communicate between devices when exchanging data, such as the Raspberry Pi, to the computer.

**References**

Butler, S. (2022, April 11). *What is GPIO, and what can you use it for?* How-To Geek. <https://www.howtogeek.com/787928/what-is-gpio/>

Kohlhase, K. (2020, September 15). Pulse Width Modulation (PWM): What is it? how can I use it? *DigiKey*. <https://www.digikey.com/en/blog/pulse-width-modulation>