COMMUNICATION PROTOCOLS

Hassan El-seoudy
Electrical team member, ROBO-TECH.
September 08, 2018

SPI

- Used by the ICSP (in-circuit serial programming).
- Useful not only for programming AVR chips, but also for other types of communications between ICs.
- Synchronous serial data link standard that operates in full duplex mode.
- Devices communicate in master/slave mode where the master device initiates the data frame.
- The connection does not need to be reversed.
- You can also hook other useful ICs to your Arduino as well. Examples include a temperature chip and a 4-digit 7-segment LED display driver.
- The Arduino IDE even has a library that implements this protocol.

I2C/TWI

- A multi-master serial single-ended computer bus invented by Philips that is used to attach low-speed peripherals to a motherboard, embedded system, cellphone, or other electronic device.
- Since it uses only two wires, so connections are simple. One line is for the clock and the other for the data.
- Like the SPI interface, these lines do not need reversing either.
- Its primary value is driving other chips over a common serial bus without tying up a lot of pins. Each device has its own unique address, so you can connect up to 128 devices to your AVR chip.
- The Arduino IDE has a library that implements this protocol

USI (AT-Tiny Chips: Not usual Arduino)

- USI which stands for Universal Serial Interface, does not stand for a communication protocol, but is Atmel's implementation of serial communication on many of the ATtiny series chips.
- This interface can be used for both two wire (I2C/TWI) and three wire (SPI) synchronous data transfer – either master or slave.

UART|USART

- UART stands for Universal Asynchronous Receiver/Transmitter.
- Actually a piece of computer hardware that implements asynchronous serial communication.
- It is the one used to communicate over the serial port (via USB) connection to your computer.
- UARTs are commonly used in conjunction with communication standards such as EIA, RS-232, RS-422 or RS-485.
- The USART hardware is implemented over the TXD & RXD pins. Its presence also permits fuller support of the SPI protocol than does chips containing USI only (most ATtiny chips).

CAN and LIN

- **CAN (Controller Area Network)** and **LIN (Local Interconnect Network)** implement communications used in automobiles.
- **CAN bus** (for controller area network) is a vehicle bus standard designed to allow microcontrollers and devices to communicate with each other within a vehicle without a host computer.
- **LIN (Local Interconnect Network)** is a serial network protocol used for communication between components in vehicles.

USB

- It is supported on only certain ATmega chips and no ATtiny ones.
- With version 1.0 now released of the IDE, it is supported. The official Arduino board is called Leonardo. Since it has not yet been released, the version 1.0 of the IDE has it commented out in the boards.txt file.
- Native USB provides more than simply eliminating an extra IC. Your Arduino/AVR chip can now function as a USB device. That means instead of being limited to serial communication, the AVR chip can mimic popular USB peripherals such as keyboards and mice. The number of cool applications are endless.

EBI/EMI

- A computer bus for interfacing small peripheral devices like flash memory with the processor.
- It is used to expand the internal bus of the processor to enable connection with external memories or other peripherals.
- EBI can be used to share I/O pins controlling memory devices that are connected to two different memory controllers.
- Use of EBI reduces the total number of system pins required causing the system cost to come down.