

Build Your Own Data Logger

Module 3: Proof of Concept

Submodule 6 – Interrupts

Terminology Starter Guide

Video	Intro
Sequential / Synchronous Programming (in this context)	<p>Instructions (or code) is executed in the steps, order, or “sequence” it is written.</p> <p>An instruction cannot run until the previous instruction has been completed.</p>
Event Based Programming / Asynchronous Programming (in this context)	<p>In computer programming, event-driven programming is a programming paradigm in which the flow of the program is determined by events such as user actions (mouse clicks, key presses), sensor outputs, or messages from other programs or threads.</p>
Polling (in this context)	<p>Constantly checking in the main loop function to see if an event has occurred.</p> <p>For example, in an Arduino command line application, in the void loop function, when the <code>cmd.poll()</code> constantly checks if a keyword has been typed into the command line.</p>
Interrupt Pin	<p>A dedicated pin on the microcontroller that is triggered by an external peripheral or device such as a motion sensor or real-time clock.</p> <p>When the interrupt pin changes state (from low to high or high to low), the MCU stops all the processes, and executes a specific function defined outside the main code of the application.</p>
Interrupt Service Routine (ISR)	<p>The function called by the MCU when the interrupt pin changes state.</p>

<p>Momentary switch</p>	<p>A momentary switch only stays active for the amount of time it's pressed. If no force is put on it, it will go to an idle state so it's only active for a moment.</p> <p>This is in contrast to when a switch makes a change that stays in effect until the switch is used again.</p> <p>For example, a light switch turns the lights on (or off) and they stay on (or off) until the switch is used again.</p>
<p>Active Low</p>	<p>When a pin's idle state is high and it's active state is low, we call it active-low.</p> <p>An example are the pushbuttons on the WildLogger board.</p>
<p>Active High</p>	<p>When a pin's idle state is low and it's active state is high, we call it active-high.</p> <p>An example is the PIR sensor on the WildLogger board.</p>
<p>Signal Edge / Edge / Transition (in electronics)</p>	<p>When a digital signal changes from low to high or from high to low. The edge created from this transition is called the signal edge or rising/falling edge.</p>
<p>Falling Edge</p>	<p>When a digital signal goes from high-to-low.</p>
<p>Rising Edge</p>	<p>When a digital signal goes from low-to-high.</p>
<p>Clean Edge</p>	<p>When the transition from low-to-high or high-to-low has no bounce due to mechanical imperfections.</p> <p>Clean edges come from pure electronic switching, whereas mechanical switching often has unclean edges.</p>

<p>Mechanical</p>	<p>The physical parts of the electronics, peripheral or devices.</p> <p>eg. tTe moving contacts on a push button are the mechanical parts. Most manual switches are mechanical.</p> <p>Mechanicals also refer to enclosures, connectors, cables, and mountings which are essential to a design, but non-electronic.</p>
<p>Bounce (eg. Push Button Bounce)</p>	<p>When the transition from low-to-high or high-to-low is unstable due to imperfect contact</p> <p>Eg.In a push button, the imperfect contact between the pushbutton and the pushbutton body due to non-smooth surfaces when it's pressed.</p>
<p>Debounce Delay</p>	<p>The amount of time the software or hardware waits after the pushbutton has been pressed, before triggering the interrupt event.</p> <p>Used to ensure the pushbutton connection is stable before triggering an event.</p>
<p>Volatile Variable (in Arduino)</p>	<p>The volatile keyword informs the compiler that the flagged variable is being used, and can change at any time, from any part of the sketch or program, and to keep it in the program.</p> <p>Often when compiling, there are multiple passes of optimization to remove unused variables and conserve memory.</p> <p>The volatile keyword informs the compiler that even if the variable looks like it won't be used, it should not remove it.</p>
<p>Compiler</p>	<p>A compiler is a software program that transforms code written by a developer in a high-level programming language such as</p>

	<p>C++ into a low level object code (binary code) in machine language, which can be understood by the processor.</p> <p>Compiled languages that are converted to machine language binary code are often much smaller and faster than interpreted languages such as java and python.</p> <p>This is the reason they are often used when performance or memory size is a priority.</p>
PIR Sensor	Passive Infra-red sensor.
Heat Signature	The amount of electro-magnetic energy radiating from an object, the wavelength of which is determined by its temperature.
Black Body Radiation	The same as heat signature. The amount of electro-magnetic energy radiating from an object, the wavelength of which is determined by its temperature.
Pyroelectric crystals	<p>Crystals that generate a voltage when a change in heat occurs in the crystal.</p> <p>A positive change in heat generates a positive voltage.</p> <p>A negative change in heat, generates a negative voltage.</p>
Pyroelectricity	The ability of certain materials to generate a temporary voltage when they are heated or cooled.
Piezoelectric crystals	<p>Crystals that generate a voltage when a 'deflection' or change in shape occurs through compression or being struck.</p> <p>Used in microphones.</p>
Piezoelectricity	Piezoelectricity is the electric charge that accumulates in certain solid materials (such

	<p>as crystals, certain ceramics, and biological matter such as bone, DNA and various proteins) in response to applied mechanical stress.</p> <p>The word piezoelectricity means electricity resulting from pressure and latent heat.</p>
Relay (in electronics)	<p>A relay is an electrically operated switch (versus a mechanical switch) that opens or closes circuit contacts electronically.</p> <p>Relays have a low power switch that controls electrical contacts that turn on and off a connection with higher current.</p> <p>For example, an Arduino pin can control a relay to make a connection that controls the flow of electricity to a light bulb, turning it on. It can then break the connection, turning it off.</p>
Pulse	<p>A rapid change in the amplitude of a voltage signal from a baseline value to a higher or lower value, followed by a rapid return to the baseline value.</p> <p>For example, a rapid transition from low to high and then back to low or vice versa.</p>
Thermistor	<p>A thermistor is a type of resistor whose resistance is dependent on temperature, more so than in standard resistors.</p> <p>The word is a combination of thermal and resistor.</p>
Light-Dependent Resistor (LDR), Photoresistor, Photo-conductive cell	<p>A type of resistor whose resistance varies depending on the amount of light falling on its surface.</p>
Resistor	<p>A resistor is a passive two-terminal electrical component that implements electrical resistance as a circuit element.</p>



	<p>In electronic circuits, resistors are used to reduce current flow, adjust signal levels, to divide voltages, bias active elements, and terminate transmission lines, among other uses.</p>
Fresnel Lens	<p>A spherical Fresnel lens is equivalent to a simple spherical lens, using ring-shaped segments that are each a portion of a sphere, that all focus light on a single point.</p> <p>This type of lens produces a sharp image, although not quite as clear as the equivalent simple spherical lens due to diffraction at the edges of the ridges.</p>
Watch Dog Timer (WDT), Computer operating properly (COP) Timer	<p>A clock circuit that waits for a 'check in' event from the device, whilst counting down from zero.</p> <p>If the check in occurs before the watchdog timer reaches zero, the watchdog timer resets to the starting number and starts counting down again.</p> <p>If the check in doesn't occur before the watchdog timer (WDT) reaches zero, due to some fault condition, such as a hang, the WDT triggers an interrupt or a system reset in the main program.</p> <p>We will be using watchdogs when we improve our code for reliability.</p>