Embedded System Design with MCU and FPGA

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Goal

Let us know more about bootloader and interrupt.

Problems

1. Where is the bootloader stored? Flash, SRAM, or EEPROM?

- The bootloader is on flash memory. [1]
- The bootloader is the little program that runs when we turn the Arduino on, and its main function will wait for the Arduino software on our computer to send a new program to the Arduino. In brief, the bootloader enables us to program the Arduino using just the USB cable.
- The differences between Flash, SRAM, and EEPROM:
  - Flash stores program image and initialize data.
  - SRAM stores data, such as static data, dynamically allocated data, local variables and interrupts.
  - EEPROM is non-volatile memory and reads byte-by-byte.

2. ATmega328 can work without Xtal or external clock, please explain the reason.

- We can configure the ATmega328 to use its internal 8 MHz RC oscillator as a clock source. [2]
- However, some drawbacks are using 8 MHz RC oscillator as a clock. The first one is that the precision of the external clock is higher than the internal 8 MHz RC oscillator, and the second one is that the speed of the external clock is higher too.

3. Atmel studio 7 or Arduino IDE, which one is your preference, explain the reason.

- Currently, I prefer to use Arduino IDE, because I am not familiar with using Atmel studio 7 and my notebook is MAC OS.
- In order to try the Atmel studio 7, I built the dual operating system on my laptop, and I found that Atmel studio 7 provides some tools for programmer to debug easier.
- Besides, I read some website, talking about Atmel studio 7, and found some advantages:
  - reduce code size
  - easy to integrate assembly routines
  - easy to manipulate compile/link options
  - ability to debug
  - ability to run code in a simulator
- Due to these advantages, I am willing to use Atmel studio 7.

Reference

[1] https://www.arduino.cc/en/Hacking/Bootloader?from=Tutorial.Bootloader

[2] https://www.hackster.io/techmirtz/arduino-without-external-clock-crystal-on-atmega328-d4fcc4