Alt_MSP430 Business Case

The MSP430 microprocessor from Texas Instruments is low power and has very good code density. However it now suffers from limited address space. The original ISA also omits one very useful addressing mode: register indirect with pre-decrement.

The solution herein increases the set of data sizes from two (byte and 16-bit) to three (byte, 16-bit and 24 or 32-bit). The third data size supports larger addresses using a register file of 24 or 32-bit registers. By supporting the third data size larger addresses have the support of the full ISA. The third data size comes at a cost: unnecessary and little used op-codes are removed and only available through a prefix instruction.

The second fix is to support the five addressing modes: register, register indirect, register indirect post increment, register indirect pre decrement and register indirect with immediate offset. The five register modes are accomplished by limiting access to the register file to twelve general purpose registers. Five modes times twelve registers is sixty codes fitting into six bits. Four codes remain which can be used for immediate, absolute, frame relative, and PC relative. One of the twelve registers is the stack pointer.

The MSP430 ISA has a register or memory to memory mode. The author prefers a replace mode which allows all four register indirect modes in specifying the destination address.