TMS320 DSP
DESIGNER'S NOTEBOOK

Addressing Peripherals as Data Structures in C

APPLICATION BRIEF: SPRA226

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TEXAS INSTRUMENTS

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Addressing Peripherals as Data Structures in C

Abstract

A DSP's peripheral-specific registers can be manipulated in C. Two methods are presented for handling this task. Each method has different advantages and disadvantages. Method 1 is very useful for addressing peripheral or memory buffers that are device specific. Method 2 is preferred for addressing peripherals or memory buffers which are not device specific (i.e., peripherals are user specified). Details of both methods and short code listings are used to describe the techniques.

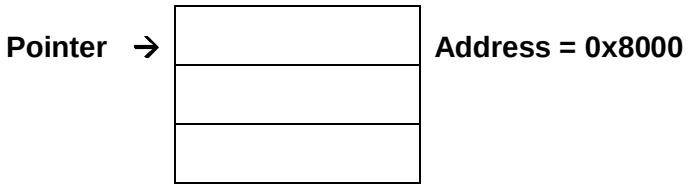
Design Problem

How can I manipulate a DSP's device peripheral-specific registers in C?

Solution

A data structure is usually assigned to `.bss` by the C compiler. A peripheral such as a serial port has control registers with an address different from `.bss`. The problem is to connect the two.

Method 1: Use a pointer to the peripheral.



Peripheral as memory locations

1.1 First declare a structure that logically represents the memory locations of the peripheral.

```
struct controller   {
                    unsigned int status;
                    ...
                    };
```

1.2 Declare a pointer to the structure and initialize it to the peripheral's address.

```
struct controller *IFperipheral = (struct controller *) 0x8000;
```

1.3 In your code, access the peripheral's memory values indirectly.

```
IFperipheral -> status = 0;
```

Method 2: Placing the structure in its own section.

2.1 Declare a peripheral instead of a pointer.

```
struct controller IFperiph;
```

2.2 Use inline assembly to give the structure its own section.

```
asm("_IFperiph .usect \"periph\", 128);
                  /* 128 is the size of struct */
```

This creates a user-defined section that can be linked to any address.

2.3 Use your linker command file to map the section to memory.

```
periph: load = 0x8000
```

2.4 Address the structure elements directly.

```
IFperiph.status = 0;
```

Both methods work. Sometimes the pointer method is most efficient. Other times, the second method is best. Method 1 is very useful for addressing peripheral or memory buffers that are device specific. Method 2 is preferred for addressing peripherals or memory buffers which are not device specific (i.e., peripherals are user specified). This method ensures the task of mapping and aligning user-specific peripherals and/or memory buffers to the linker. The choice depends on the individual application. For more information, read the TMS320C30 Peripheral Run-time Support Library Users Guide. Also see: DSP Applications Using the ’C30 EVM, “C Coding Tips for Application-Specific Processors.”