

UNIT III

EMBEDDED FIRMWARE DEVELOPMENT ENVIRONMENT

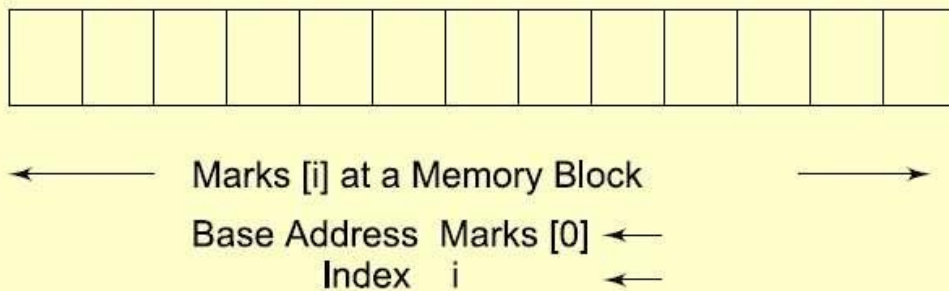
3.2

DataStructures : Arrays

- Array : A structure with a series of data items sequentially placed in memory
 - (i) Each element accessible by an identifier name (which points to the array) and an index i (which define offset from the first element)
 - (ii) i starts from 0 and is + ve integer

An array at a memory block with one pointer for its base, first element with index = 0. Data word can be retrieved from any element by defining the pointer and index

Vector (One Dimensional Array)



One dimensional array (vector) Example 1:

Un signed int *salary* [11];

salary[0] – 1st month salary.

Salary [11]–12th month salary

Each integer is of 32-bit (4 bytes);

Salary assigned 48 bytes address space

Example 2: sio *COM*[1];

COM [0]– COM1 port data record with structure equivalent to *sio*

COM [1]– COM2 port data record with structure equivalent to *sio*

COM assigned 2*8 characters = 16 bytes address space

Two dimensional array Example 3:

Unsigned int *salary*[11,9];

Salary [3,5]– 4th month 6th year salary

Salary [11,4] – 12th month 5th year salary

Salary assigned 12*10*4=480 bytes address space

Multi-dimensional
arrayExample4:

Char *pixel* [143,175, 23];

pixel [0, 2, 5] – 1st horizontal line index *x*,3rd vertical line index *y*, 6th color *c.pixel*

assigned144*176*24 =608256bytes address space in a colored picture of resolution144x176 and 24colors.

Programming using functions and function queues

_ Use of multiple function calls in the main ()

_Use of multiple function calls in cyclic order

_Use of pointer to a function

_Use of function queues and

_Use of the queues of the function pointers built by the ISRs.

It reduces significantly the ISR latency periods. Each device ISR is therefore able to execute within its stipulated deadline

1. Multiple function calls

2. Multiple function calls in cyclic order

Use

- One of the most common methods is the use of multiple function-calls in a cyclic order in an infinite loop of the *main* ().

3. Use of function pointers

* sign when placed before the function name then it refers to all the compiled form of the statements in the memory that are specified with in the curly braces when declaring the function.

- A returning data type specification (for example, void) followed by'(**function Name*) (*function Arguments*)'calls the statements of the *function Name* using the *function Arguments*, and on are turn, it returns the specified data object. We can thus use the function pointer for invoking a call to the function.

4. Queue of Function-pointer

Application

_ Makes possible the designing of ISRs with short codes and by running the functions of the ISRs at later stage so all pending ISRs finishes

Multiple ISRs insertion of Function pointers into a Queue

- The ISRs insert the function pointers
- The pointed functions in the queue execute at later stages by deleting from the queue
- These queued functions execute after the service to all pending ISRs finishes

Priority Function Queue of Multiple ISRs

- When there are multiple ISRs, a high priority interrupt service routine is executed first and the lowest priority.

- The ISRs insert the function pointers into a priority queue of function pointers[ISR can Now be designed short enough so that other source don't miss a deadline for service]