LW: Pass By Constant Reference

Due by Fri, 15 Feb 2019 08:00:00-0600

Objectives

- To understand that:
  - argument passing is similar to initialization,
  - when a function is called, each formal argument is initialized by its corresponding actual argument, and
  - when a constant reference is provided as a formal parameter, the corresponding actual argument will be referred to by the formal parameter, but will not be mutable.

Labwork

1. There are questions throughout this document that you will need to respond to for credit.
2. Download the skeleton code for this lab from **`https://drive.google.com/open?id=0B_ouNNuWgNZCeUMwSlVwSG1NbFU`**
   a. You must compile and run this code on **`compute.cse.tamu.edu`**, executing the command **`g++-7.2.0 -std=c++17 LW_Pass-By-Const-Ref.cpp`** to compile, and then **`./a.out`** to run the resultant executable.
3. At this point, I haven't updated the function declaration or definition to pass the arguments to our vint_half_sum function by constant reference. We will do that in a moment.
4. First, compile and run the program.
5. Now update the function declaration and definition to pass the argument by constant reference; if you're unsure how to do this, update the function declaration to `int vint_half_sum(vector<int> const&);` and the first line of the function definition to read `int vint_half_sum(vector<int> const& v)`.
6. Compile the program and then answer the following questions?
   a. What error message is presented to you by the compiler?

```
error: assignment of read-only location '(&
v)->std::vector<int>::at(((std::vector<int>::size_type)i))'
        v.at(i) = v.at(i) / 2;
```

   b. What do you think that this error message means?

Since we've passed the vector as a constant the value cannot be changed.

c. How could you update the code such that the running sum being calculated in vint_half_sum is still correct, but that the vector isn't modified?

Remove the line
"v.at(i) = v.at(i) / 2;"
And add the line
"sum = sum/2;"
After "sum += v.at(i);"

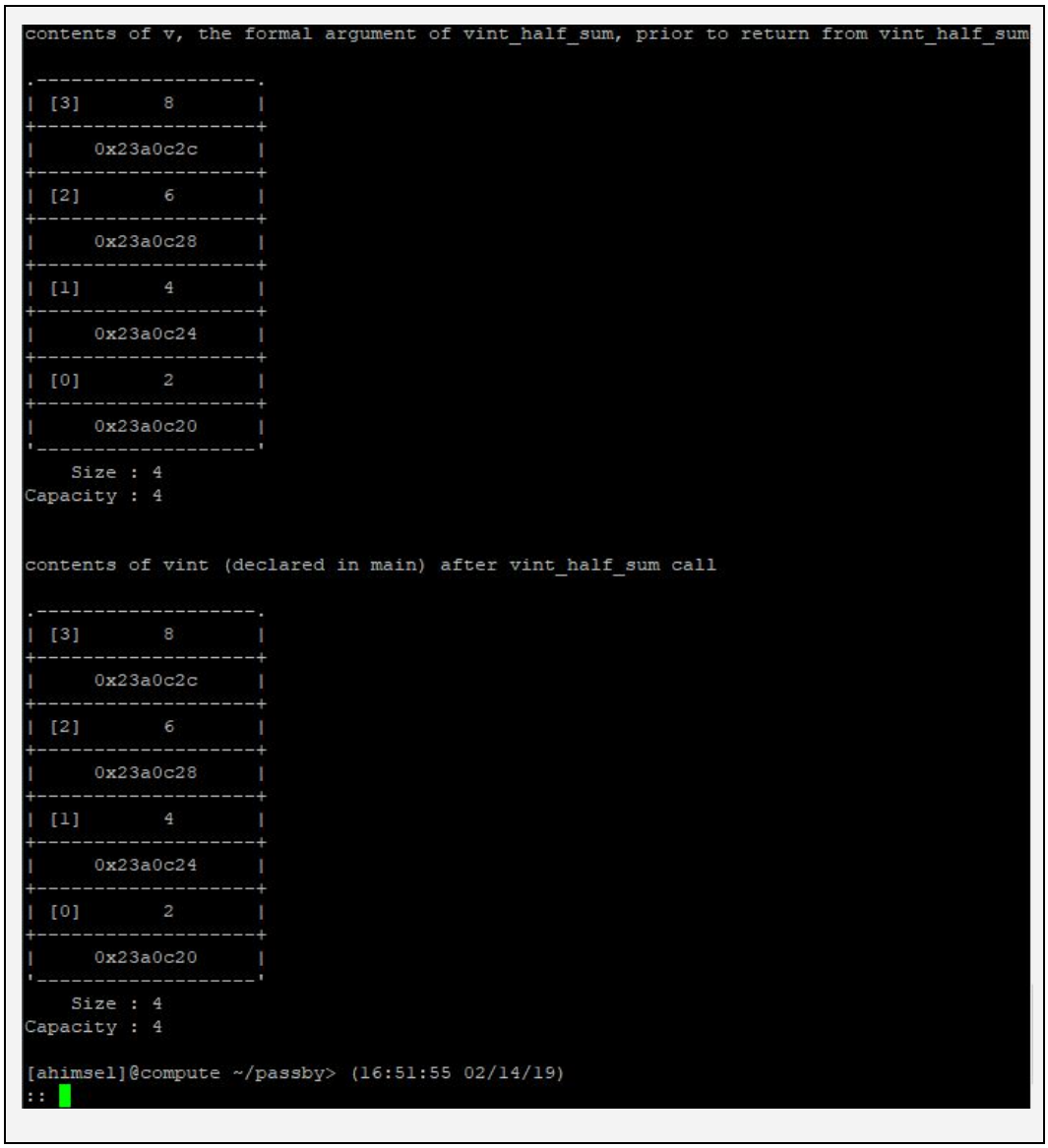
7. As I mentioned in the form of a comment in the provided code, it really doesn't make much sense to first assign `v.at(i) = v.at(i) / 2;` and then `sum += v.at(i);` when we could have simply `sum += v.at(i)/2;` provided that this function should simply calculate the sum of one-half the value of each element of the vector.
8. How does pass by constant reference differ from pass by reference?

The function does not make a copy of the object that is passed to it, but passing by constant reference it does not make changes to the original vector.

9. How does pass by constant reference differ from pass by value? When might you choose the former over the latter? The latter over the former?

When using pass by value a duplicate of the original vector is made at a new address, when using pass by constant reference the function uses a reference to the original memory address that cannot be modified. You would use pass by value when you need to make changes to a duplicate vector.

10. Capture the output written to the terminal window by this program in the form of a screenshot; if you cannot include everything, that's okay. Drag and drop or paste your screenshot to the box below:


contents of v, the formal argument of vint_half_sum, prior to return from vint_half_sum
[3] 8
0x23a0c2c
[2] 6
0x23a0c28
[1] 4
0x23a0c24
[0] 2
0x23a0c20
Size : 4
Capacity : 4
contents of vint (declared in main) after vint_half_sum call
[3] 8
0x23a0c2c
[2] 6
0x23a0c28
[1] 4
0x23a0c24
[0] 2
0x23a0c20
Size : 4
Capacity : 4
[ahimsel]@compute ~/passby> (16:51:55 02/14/19)
::

```
[ahimsel]@compute ~/passby> (16:48:47 02/14/19)
:: g++-7.2.0 -std=c++17 LW_Pass-By-Const-Ref.cpp

[ahimsel]@compute ~/passby> (16:51:51 02/14/19)
:: ./a.out
contents of vint (declared in main) before vint_half_sum call

.-------------------.
| [3]       8       |
+-------------------+
|     0x23a0c2c     |
+-------------------+
| [2]       6       |
+-------------------+
|     0x23a0c28     |
+-------------------+
| [1]       4       |
+-------------------+
|     0x23a0c24     |
+-------------------+
| [0]       2       |
+-------------------+
|     0x23a0c20     |
'-------------------'
    Size : 4
Capacity : 4


contents of v, the formal argument of vint_half_sum, upon entry to vint_half_sum (direc
tly after initialization with the actual argument from main, vint)

.-------------------.
| [3]       8       |
+-------------------+
|     0x23a0c2c     |
+-------------------+
| [2]       6       |
+-------------------+
|     0x23a0c28     |
+-------------------+
| [1]       4       |
+-------------------+
|     0x23a0c24     |
+-------------------+
| [0]       2       |
+-------------------+
|     0x23a0c20     |
'-------------------'
    Size : 4
Capacity : 4
```

Submission

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