Topics: Pointers, Structs with Functs, Strings as Arrays

Approach: Discussion, Explanation, Discussion

Main Ideas: Pointers, Structs with Functions, Strings

1. Admin

   Remember to check ☞ http://www.cs.tufts.edu/comp/11
   Reading: 9.1, 9.2
   Midterm Wednesday

2. Intro: Palindromes

   a. What are they?
   b. Here are 470K words, which ones are palindromes?
   - how could you find them?
   c. Here are some sentences, which ones are palindromes?
   - how would you find them?

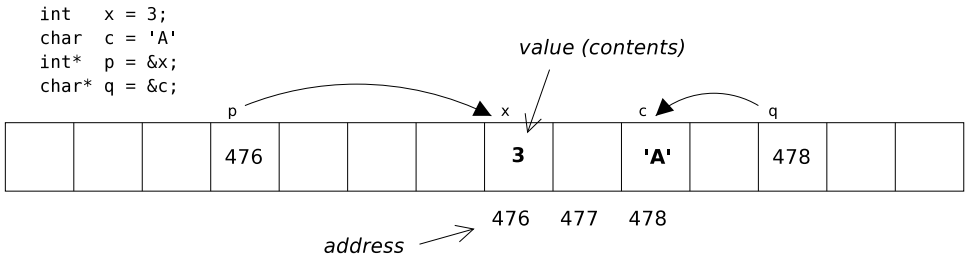
3. Pointer Facts: do ptr1

   - fact: every variable has an address in memory
   - term: *pointer variable* a variable that holds an address
   - &var : finds the address of a variable
   - *ptr : synonym for the variable at address stored in ptr
   - int* p : create an int pointer variable
   - ☞ Do ptr probs: ptr2, ptr3 (note: passing ptrs to funcs)

4. Quiz

5. Problem: Reverse a List

   a. Solution 1
   - a struct with the list, capacity, used
   - some functions
   Q: do we call by value or call by reference?
   b. Solution 2
   - put the functions into the struct
   - note: no need to worry about ref vs val



```
:::::::::::::: ptr1.cpp ::::::::::::::
#include <iostream>
using namespace std;

// ptr1.cpp -- practice using pointers
//  predict output AND draw memory diagram

int f(int*, int);

int main()
{
        int     x,y;
        int     *p, *q;

         y = 2;
         x = 3;
         p = &x;
         q = p;
         *q = *p - 2;
         *p = y;
        x = f(&y, *p);
        cout << x << " " << y << " " << *p << " " << *q << endl;

        return 0;
}
int f(int* t, int u)
{
        *t = 2 * u;
        return 1 + *t;
}
:::::::::::::: ptr2.cpp ::::::::::::::
#include <iostream>

using namespace std;

int main()
{
        int     x,y;
        int     *p, *q;
        int     **z;

        y = 2;
        x = 3;
        p = &x;

        q = &y;

        z = &p;

        **z = 12;
        z  = &q;
        cout << **z << endl;
}
```

```
:::::::::::::: ptr3.cpp ::::::::::::::
#include <iostream>
using namespace std;

// ptr3.cpp -- more practice using pointers
//  predict output AND draw memory diagram

void f(string *, string *);
void show(string n[]);

int main()
{
       string  n[] = { "ali", "bev", "cam", "dan", "eva", "" };
       string  *p, *q;

       show(n);
       p = &n[2];
       q = p + 1;
       f(p, q);
       show(n);
       f(p-1, q+1);
       show(n);
       return 0;
}
void show(string a[])
{
       int    i;
       for(i=0; a[i] != ""; i++)
              cout << a[i] << " ";
       cout << endl;
}
void f(string* p1, string *p2)
{
       string  temp;
       temp = *p1;
       *p1  = *p2;
       *p2  = temp;
}
```

Put Diagrams and Output Here

```
:::::::::::::: ptr4.cpp ::::::::::::::
#include <iostream>
using namespace std;

// ptr2.cpp -- more practice using pointers
//  predict output AND draw memory diagram

int main()
{
       int    a[5] = { 0, 7, 2, 8, 3 };
       int    *p, *q;
       int    **z;
       int    m;

       p = &a[2];
       q = p+1;
       z = &p;
       m = *p + *q;
       ++(*z);
       ++(*p);
       cout << m << " " << **z  << " " << *q << endl;
       for(int i=0; i<5; i++)
              cout << a[i] << endl;

       return 0;
}

:::::::::::::: ptr5.cpp ::::::::::::::
#include <iostream>

using namespace std;

int main()
{
       int    x,y;
       int    *p, *q;
       int    **z;

        y = 2;
        x = 3;
        p = &x;
        q = p;
        *q = *p - 2;
        *p = y;
        cout << x + *p + ++*q << endl ;
        cout << " p and q are " << (unsigned long) p << " and " <<
                                   (unsigned long) q << endl;

        cout << "about to store a long in a pointer..." << endl;

        p = (int *) 4;

        cout << " p and q are " << (unsigned long) p << " and " <<
                                   (unsigned long) q << endl;

        cout << "The data stored at location 4 is: " ;
        cout << *p << endl;
}
```

```
:::::::::::::: revlist1.cpp ::::::::::::::
#include <iostream>
using namespace std;

// revlist1.cpp -- reverse a list of words
//
// input: a list of strings; output: the list in reverse
// uses: an array of strings,
// TODO: stop if no more space in array
// TODO: Write functions for each operation (readin, revprint)
// TODO: reverse all the words also
//       example:  this is a test -> tset a si siht
// TODO: report if list of strings is a palindrome
// TODO: allow for any number of strings
//

const int CAPACITY = 1000;           // space in the array

struct WordList {
       string  words[CAPACITY];      // storage
       int     used;                 // number used
       int     capacity;             // total space available
};

int main()
{
       WordList  list;                      // create a struct
       list.capacity = CAPACITY;     // set its properties
       list.used     = 0;

       string  w;

       // read in
       while( cin >> w )
       {
              list.words[list.used] = w;
              list.used++;
       }

       // print out
       for(int i = list.used-1; i>=0 ; i-- )
       {
              cout << list.words[i] << endl;
       }
}
```