

Miscellaneous

Stat 580

References

- Part of this slide set is based on *Essential C* by Nick Parlante:

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Structures

Structures

- declaration such as `struct xxx` define a new type

```
struct fraction {  
    int numerator;  
    int denominator;  
};
```

- C uses the period (.) to access the fields in a record

```
struct fraction f1;  
f1.numerator = 1;
```

- you can copy two records of the same type using a single assignment statement
- however `==` does not work on structs
- C allows the use of array of structures

Example

```
#include<stdio.h>

struct fraction {
    int numerator;
    int denominator;
};

int main() {
    struct fraction f1, f2;          /* declare two fractions */
    f1.numerator = 22;
    f1.denominator = 7;
    f2 = f1;      /* this copies over the whole struct */
    return 0;
}
```

Example

```
#include<stdio.h>

struct card {
    int num;
    char *suit;
};
void printcard(struct card c);

int main() {
    struct card c = {1, "diamond"};
    struct card *cp;

    printcard(c);
    cp = &c;
    printcard(*cp);

    /* (*struct_ptr).member is the same as struct_ptr->member */
    printf("%s %d\n", cp->suit, cp->num);
    /* what is *(cp->suit+2) */

    return 0;
}

void printcard(struct card c) {
    printf("%s %d\n", c.suit, c.num);
}
```

Example

```
#include<stdio.h>

struct card {
    int num;
    char *suit;
} cards[52]; /* extern storage class */

void create_cards();
void print_card(struct card c);

int main() {
    create_cards();
    print_card(cards[2]);
    return 0;
}
```

Example

```
void create_cards(){
    int i, ind;

    for (i=0; i<52; i++) {
        cards[i].num = i % 13 + 1;
        ind = i / 13; /* integer division */
        switch(ind){
            case 0:
                cards[i].suit = "heart";
                break;
            case 1:
                cards[i].suit = "diamond";
                break;
            case 2:
                cards[i].suit = "spades";
                break;
            case 3:
                cards[i].suit = "clubs";
        }
    }
}
```


Command line arguments

Command line arguments

- allow user to specify arguments on the command line
- these arguments are handled using main() function arguments

```
int main(int argc, char *argv[])
```

- argc is the number of arguments on the command line
 - including the name of the program itself
- argv is an array of pointers to the values of the arguments
 - argv[0] is the name of the program
 - memory of these values are provided by the operating system
 - these values are treated as string and should be converted (via e.g. atoi, atof from C standard library) if a numeric value is desired.

Example

```
#include <stdio.h>

int main(int argc, char *argv[]){
    int i;
    printf("Number of arguments: %d\n", argc);
    printf("Arguments:\n");
    for (i=0; i<argc; i++){
        printf("%s\n", argv[i]);
    }
    return 0;
}
```

Example

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>

int main(int argc, char *argv[]){
    char word[100];
    int n, i;

    if (argc != 3){
        printf("This program prints a word for n times\n");
        printf("usage: funname word n\n");
        printf("        word: the word that you want to repeat\n");
        printf("        n: number of times\n");
        return 1;
    }

    strcpy(word, argv[1]);
    n = atoi(argv[2]);

    for (i=0; i<n; i++)
        printf("%s\n", word);

    return 0;
}
```

File input and output

File

- data are usually stored in a file on your hard drive
- typical steps:
 1. Inclusion of header file: `include <stdio.h>`
 2. Declaration: declare a variable of (pointer) type `FILE *`
 3. Connection: establish a connection between the variable and the file on your hard drive (`fopen()`)
 4. I/O: perform I/O (`fgetc()`, `fscanf()`, `fputc()`, `fprintf()`)
 5. Disconnection: break the connection (`fclose()`)

Example

```
#include <stdio.h>

int main(){
    FILE *f;    /* declaration */
    int x, y;

    f = fopen("abc.txt", "r"); /* connection */

    while(fscanf(f, "%d %d\n", &x, &y)==2)
        printf("%d %d\n", x, y);

    fclose(f);
    return 0;
}
```

abc.txt:

```
1 4
6 7
2 5
23 56
23 45
```

Example

```
#include <stdio.h>

int main(){
    FILE *f;
    double slen, swid, plen, pwid;
    char species[20];

    f = fopen("iris.csv", "r");

    fscanf(f, "%*[^\\n]\\n", NULL);
    while(fscanf(f, "%lf,%lf,%lf,%lf,%[^\\"]\\\"\\n",
                &slen, &swid, &plen, &pwid, species)==5)
        printf("%f, %f, %f, %f, %s\\n", slen, swid, plen, pwid, species);
    fclose(f);

    return 0;
}
```

First 5 rows of iris.csv:

```
"Sepal.Length", "Sepal.Width", "Petal.Length", "Petal.Width", "Species"
5.1,3.5,1.4,0.2,"setosa"
4.9,3,1.4,0.2,"setosa"
4.7,3.2,1.3,0.2,"setosa"
4.6,3.1,1.5,0.2,"setosa"
```