COMS 1003: Introduction to Computer Programming in C

The C Preprocessor

November 22nd, 2005
Announcements

• Homework 3 is due
• We'll design HW 4 next class
• Enjoy your Thanksgiving weekend
Outline

• HW 3 questions

• The C pre-processor macro language
  - includes/header files
  - define statements, macros, macros with args
  - conditional compilation

• The GNU m4 macro facility
Preprocessing

• Not the C language!

• A stage of compilation that transforms source code to source code before actual parsing & compiling

• Can view output with gcc -E
Preprocessor Rules

- Directives start with ' #'
- Statements do not end with a ';'
- Direct textual replacement
  - be careful!
Including Content of Other Files

- Use an 'include' directive
- `#include <stdio.h>`
- `#include "myheader.h"`
- creates a dependency
- a header file is a good place to gather important global data and function declarations
Header Files

• Specifies some public or standard interface

• Contains:
  - function declarations
  - variable declarations
  - extern variables
  - macro definitions
  - simple preprocessor definitions
#define

- The 'operational' instruction for the macro language
- Causes a definition of one string in terms of another
  - #define MYFLAG 3056
  - usually a single line, use \ to extend
- Can be more complex
“Function” Macros

- Provide a way to use \#define statements to create a function-like construct
- Dangerous if not done correctly
  - arguments may be evaluated more than once
  - text replacement may interfere with surrounding program
Common Bugs

#define MYFLAG 100;
#define forever while(1)

while(forever)
{
    x = MYFLAG;
}
Swap and New Examples

- swap(type, x, y)
  - swap(int, 5, 6)
- char *name = new(char, 100);
Simple Decision Control

- `#if/#else/#elif`

- `#ifdef/#endif/#ifndef`
  - `ifndef` is like: `#if !defined(SYMBOL)`
    - 'defined(SYMBOL)' returns 1 if the symbol is defined in the file (or in the files included)

- `#ifdef DEBUG`
  - `gcc -DDEBUG myprogram.c`
Protecting Header Files From Multiple Inclusion

• #ifndef MYHEADER
  #define MYHEADER

  //the statements of myheader.h go here

  #endif