

ENGR151 Recitation Class 4

week 6

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Computer & Programming, MatLab-scripting
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Presentation Overview

- 1 Playbook Review
C5
- 2 Worksheet Review
W5
- 3 Referencing

Here is the link for the recording of this RC: [Click Here](#)

Disclaimer:

The answers provided here are not guranteed to be correct. Please use them as a references only and verify with reliable source.

Note:

only go through some questions that we think they are necessary.

What is the benefit of C compared to assembly?

- Higher-level abstraction
- less code
- faster development

Note: [click here](#) for more about assembly

What is UNIX?

UNIX is a multitasking, multi-user operating system. serves as the foundation for many modern operating systems, including Linux and macOS.

Note: [click here](#) for more about unix

Explain what the zero overhead principle is?

No additional performance or memory cost is introduced by using higher-level constructs (e.g., classes or functions).
namely you don't introduce the library, class or function that your don't need in your code!

Why Avoid Microsoft Visual C++ in ENGR151

- **Window centered!!!:** It is primarily designed for Windows applications, which limits portability to other platforms like Linux or macOS.
- Limited Support for Standard Libraries.
- Limited Compiler Compatibility: Your code might work well here, but issues often happen when compiling code with another compiler.

Function Prototypes and gcc What is a function prototype?

A function prototype declares a function's name, return type, and parameters without implementation, informing the compiler how the function will be called.

- Example: `int add(int a, int b);`

What is gcc?

gcc is the GNU Compiler Collection used to compile C, C++, and other languages.

How to compile a C program?

Use the command:

```
gcc -o (+ gcc flags to maintain good code and easy  
debugging) program_name source_file.c
```


Variable Scope What is the scope of a variable?

- **Local scope:** Inside a function or block; accessible only within that block.
- **Global scope:** Declared outside any function; accessible throughout the program.
- **Static scope:** Retains value across multiple function calls but accessible only within the same function.

Note: Never use global variable in ENGR151, it is not necessary.

What is a header file?

A header file contains function prototypes, macro definitions, and constants for reuse across multiple source files.

Why include header files at the top?

To ensure all necessary declarations and dependencies are available before compiling.

What does #define do?

#define is used to define macros or constants at compile time.

- Example: `#define PI 3.14159`

How does #define differ from variables?

- do not use memory at runtime
- the compiler substitutes the value or expression wherever the macro appears.

Usages for #ifdef

- Conditional Compilation: Include or exclude code based on whether a symbol is defined.
- Check if necessary libraries and header files are included.

Advantages and Drawbacks of Macros

- Improves code readability and reuse.
- Faster than functions (no runtime overhead).

Drawbacks:

- Harder to debug.
- No type checking, leading to potential bugs.

Functions as macros:

Simple functions that involve small computations, e.g.:

```
#define SQUARE(x) ((x) * (x))
```

Identifying Mistakes Example:

```
int main() {  
    printf("Hello, world!");  
    return 0;  
}
```

Error: Missing closing quote.

Message: Try it yourself...

Why avoid writing everything in main()?

Reduces code readability and makes debugging difficult. Better to break code into modular functions.

Good function length in ENGR151:

You should know and obey that rigidly. It is important for code quality

Good file length in ENGR151:

You should know and obey that rigidly.

How is the original file split?

By dividing code into header files and source files.

What is `#ifndef` used for in `ans.h`?

`#ifndef` prevents multiple inclusions of the same header file, avoiding redefinition errors.

How to compile multiple files?

use makefile! Try not to use bash command line, messy and hard to change...

Why include `ans.h` in both `ans_main.c` and `ans.c`?

To ensure both files have consistent declarations and can use shared functions.

What is a library?

A library is a collection of precompiled functions that can be reused in different programs.

Why is `-lm` necessary when using mathematical functions?

The `-lm` flag links the math library, which contains functions like `sqrt()` and `cos()`.

What are all the gcc flags and their importance?

- **-o**: Specify output filename.
- **-Wall**: Enable all warnings.
- **-g**: Include debugging information.
- **-O**: Optimize the code.
- **-c**: Compile without linking.

Note: For some questions, we won't directly provide the entire source code. Instead, we will provide ideas, a piece of code or pseudo-code to help guide you through worksheet questions.

Decode and run the following program.

```
#define fosho def
#define kthx return
#define wutz print

fosho double(x):
    kthx x * 2
wutz(double(6))
```

W5 Review

```
def double(x):  
    return x * 2  
print(double(6))
```

- 1. Using chapter 2, write a C program which returns the density of a body given its circumference, and both the distance and period of a body orbiting around it. Read the data from the keyboard.**
- 2. What variable(s) can be defined using `#define`? Adjust your code accordingly.**
 - Unchangeable variables?
 - Constants

Try it out yourself!

Calculate Density of a Body

Code:

```
#define PI 3.1415927f
#define G 6.674e-11f // Gravitational constant

// Function to calculate the density of the body
float calculate_density(float circumference, float
distance, float period) {
    float radius = circumference / (2 * PI);
    float volume = (4.0f / 3.0f) * PI * pow(radius,
3);
    float mass = (4 * PI * PI * pow(distance, 3)) /
(G * period * period);
    return mass / volume;
}
```

The XOR swap algorithm is an algorithm that swaps two values of distinct variables without using any temporary variable.

1. Write a `#define SWAP(a,b)` macro to swap two integers `a` and `b`.

Hint: look up how xor can be used

2. Write a short C function to demonstrate the previous macro.

XOR Swap Macro

Macro Code:

```
#define SWAP(a, b) \  
    a = a ^ b; \  
    b = a ^ b; \  
    a = a ^ b; \
```


References

- Manuel. *c5.pdf*. JI Canvas, 2024. [Link].
- Manuel. *w5.pdf*. JI Canvas, 2024. [Link].

The End

Questions? Comments?