[toc]

课上测试

ch02

作业题目：C编程工具测试

学习C编程工具测试

- 完成附件中ch02 "C编程工具测试" 任务内容

作业提交要求 (1')

0. 记录实践过程和 AI 问答过程，尽量不要截图，给出文本内容
1. (选做)推荐所有作业托管到 gitee或 github 上
2. (必做)提交作业 markdown文档，命名为"学号-姓名-作业题目.md"
3. (必做)提交作业 markdown文档转成的 PDF 文件，命名为"学号-姓名-作业题目.pdf"

C编程工具测试

- 作业github链接

- 编写C代码hello.c，打印"hello 你的 8 位学号",给出编译预处理，编译，汇编，链接的gcc命令，及其运行结果，使用 git 记录过程。

  - 过程记录

```
root@Youer:~/test1008/ch02-TEST-TOOL# mkdir HELLO
root@Youer:~/test1008/ch02-TEST-TOOL# cd HELLO
root@Youer:~/test1008/ch02-TEST-TOOL/HELLO# nano hello.c
root@Youer:~/test1008/ch02-TEST-TOOL/HELLO# git add .
root@Youer:~/test1008/ch02-TEST-TOOL/HELLO# git commit -m "add hello.c"
[master (root-commit) b414218] add hello.c
Committer: root <root@Youer>
Your name and email address were configured automatically based
on your username and hostname. Please check that they are accurate.
You can suppress this message by setting them explicitly. Run the
following command and follow the instructions in your editor to edit
your configuration file:

    git config --global --edit

After doing this, you may fix the identity used for this commit with:

    git commit --amend --reset-author

1 file changed, 6 insertions(+)
create mode 100644 HELLO/hello.c
```

```
root@Youer:~/test1008/ch02-TEST-TOOL/HELLO# gcc -E hello.c -o hello.i
root@Youer:~/test1008/ch02-TEST-TOOL/HELLO# git add .
root@Youer:~/test1008/ch02-TEST-TOOL/HELLO# git commit -m "add hello.i"
[master 8d1971a] add hello.i
Committer: root <root@Youer>
Your name and email address were configured automatically based
on your username and hostname. Please check that they are accurate.
You can suppress this message by setting them explicitly. Run the
following command and follow the instructions in your editor to edit
your configuration file:

    git config --global --edit

After doing this, you may fix the identity used for this commit with:

    git commit --amend --reset-author

1 file changed, 744 insertions(+)
create mode 100644 HELLO/hello.i
root@Youer:~/test1008/ch02-TEST-TOOL/HELLO# ls
hello.c  hello.i
root@Youer:~/test1008/ch02-TEST-TOOL/HELLO# gcc -s hello.c -o hello.s
root@Youer:~/test1008/ch02-TEST-TOOL/HELLO# git add .
root@Youer:~/test1008/ch02-TEST-TOOL/HELLO# git commit -m "add hello.s"
[master 2faf72c] add hello.s
Committer: root <root@Youer>
Your name and email address were configured automatically based
on your username and hostname. Please check that they are accurate.
You can suppress this message by setting them explicitly. Run the
following command and follow the instructions in your editor to edit
your configuration file:

    git config --global --edit

After doing this, you may fix the identity used for this commit with:

    git commit --amend --reset-author

1 file changed, 0 insertions(+), 0 deletions(-)
create mode 100755 HELLO/hello.s
root@Youer:~/test1008/ch02-TEST-TOOL/HELLO# gcc -c hello.c -o hello.o
root@Youer:~/test1008/ch02-TEST-TOOL/HELLO# ls
hello.c  hello.i  hello.o  hello.s
root@Youer:~/test1008/ch02-TEST-TOOL/HELLO# git add .
root@Youer:~/test1008/ch02-TEST-TOOL/HELLO# git commit -m "add hello.o"
[master 0ca72d0] add hello.o
Committer: root <root@Youer>
Your name and email address were configured automatically based
on your username and hostname. Please check that they are accurate.
You can suppress this message by setting them explicitly. Run the
following command and follow the instructions in your editor to edit
your configuration file:

    git config --global --edit
```

```
After doing this, you may fix the identity used for this commit with:

    git commit --amend --reset-author

1 file changed, 0 insertions(+), 0 deletions(-)
create mode 100644 HELLO/hello.o
root@Youer:~/test1008/ch02-TEST-TOOL/HELLO# gcc hello.o -o hello
root@Youer:~/test1008/ch02-TEST-TOOL/HELLO# ls
hello  hello.c  hello.i  hello.o  hello.s
root@Youer:~/test1008/ch02-TEST-TOOL/HELLO# git add .
root@Youer:~/test1008/ch02-TEST-TOOL/HELLO# git commit -m "add hello"
[master abfe749] add hello
Committer: root <root@Youer>
Your name and email address were configured automatically based
on your username and hostname. Please check that they are accurate.
You can suppress this message by setting them explicitly. Run the
following command and follow the instructions in your editor to edit
your configuration file:

    git config --global --edit

After doing this, you may fix the identity used for this commit with:

    git commit --amend --reset-author

1 file changed, 0 insertions(+), 0 deletions(-)
create mode 100755 HELLO/hello
root@Youer:~/test1008/ch02-TEST-TOOL/HELLO# ./hello
hello 20221414
```

- git-log:

```
root@Youer:~/test1008/ch02-TEST-TOOL/HELLO# git log
commit abfe749056e3f0ca59aa5c0b8b8e1c911318675c (HEAD -> master)
Author: root <root@Youer>
Date:   Tue Oct 8 14:36:16 2024 +0800

    add hello

commit 0ca72d0df5465476bb0f560175e9ef2ad3933861
Author: root <root@Youer>
Date:   Tue Oct 8 14:35:50 2024 +0800

    add hello.o

commit 2faf72ce0581ab84419ab4e1cff3f9625fa8cdd8
Author: root <root@Youer>
Date:   Tue Oct 8 14:35:05 2024 +0800

    add hello.s
```

```
commit 8d1971a53f0e07cbf637759e7dc71877055b73b2
Author: root <root@Youer>
Date:   Tue Oct 8 14:34:01 2024 +0800

    add hello.i

commit b414218e6b979f9a3056a4061e8d3b28d0e10073
Author: root <root@Youer>
Date:   Tue Oct 8 14:32:35 2024 +0800

    add hello.c
:
```

- 下载课程代码，编译运行老师课上给出大端小端的代码，给出运行结果

    ○ 运行结果：

```
root@Youer:~/test1008/ch02-TEST-TOOL/bestidiocs2024/ch02/big-little-
endian# gcc -o cebitwise cebitwise.c
root@Youer:~/test1008/ch02-TEST-TOOL/bestidiocs2024/ch02/big-little-
endian# ./cebitwise
Little Endian (Bitwise Method)
root@Youer:~/test1008/ch02-TEST-TOOL/bestidiocs2024/ch02/big-little-
endian# gcc -o cebitfields cebitfields.c
root@Youer:~/test1008/ch02-TEST-TOOL/bestidiocs2024/ch02/big-little-
endian# ./cebitfields
Little Endian (Bit-field Method)
root@Youer:~/test1008/ch02-TEST-TOOL/bestidiocs2024/ch02/big-little-
endian# gcc -o celibrary celibrary.c
root@Youer:~/test1008/ch02-TEST-TOOL/bestidiocs2024/ch02/big-little-
endian# ./celibrary
Little Endian (Standard Library Method)
root@Youer:~/test1008/ch02-TEST-TOOL/bestidiocs2024/ch02/big-little-
endian# gcc -o cepointer cepointer.c
root@Youer:~/test1008/ch02-TEST-TOOL/bestidiocs2024/ch02/big-little-
endian# ./cepointer
Little Endian (Pointer Method)
root@Youer:~/test1008/ch02-TEST-TOOL/bestidiocs2024/ch02/big-little-
endian# gcc -o ceunion ceunion.c
root@Youer:~/test1008/ch02-TEST-TOOL/bestidiocs2024/ch02/big-little-
endian# ./ceunion
Little Endian (Union Method)
root@Youer:~/test1008/ch02-TEST-TOOL/bestidiocs2024/ch02/big-little-
endian# ls
cebitfields  cebitfields.c  cebitwise  cebitwise.c  celibrary
celibrary.c  cepointer  cepointer.c  ceunion  ceunion.c
root@Youer:~/test1008/ch02-TEST-TOOL/bestidiocs2024/ch02/big-little-
endian# git add .
root@Youer:~/test1008/ch02-TEST-TOOL/bestidiocs2024/ch02/big-little-
endian# git commit -m "Compile and run the endianness detection code"
[master 33a3d60] Compile and run the endianness detection code
Committer: root <root@Youer>
```

```
Your name and email address were configured automatically based
on your username and hostname. Please check that they are accurate.
You can suppress this message by setting them explicitly. Run the
following command and follow the instructions in your editor to edit
your configuration file:

    git config --global --edit

After doing this, you may fix the identity used for this commit with:

    git commit --amend --reset-author

5 files changed, 0 insertions(+), 0 deletions(-)
create mode 100755 cebitfields
create mode 100755 cebitwise
create mode 100755 celibrary
create mode 100755 cepointer
create mode 100755 ceunion
```

- 新建目录，拷贝要求2中代码，把代码中的 main 函数都去掉，编写ble.h(包含五个判断函数), main.c 通过命令行参数调用，比如 ./main 1 调用cebitwise.c 中的功能。编译运行代码，给出运行结果。使用 git 记录 过程（5分）

    ○ 运行结果:

    ```
    root@Youer:~/test1008/ch02-TEST-TOOL/bestidiocs2024/ch02/big-little-
    endian/Test03# ./bin/main 0
    Invalid function number
    root@Youer:~/test1008/ch02-TEST-TOOL/bestidiocs2024/ch02/big-little-
    endian/Test03# ./bin/main 1
    Little Endian (Bitwise Method)
    root@Youer:~/test1008/ch02-TEST-TOOL/bestidiocs2024/ch02/big-little-
    endian/Test03# ./bin/main 2
    Little Endian (Bit-field Method)
    root@Youer:~/test1008/ch02-TEST-TOOL/bestidiocs2024/ch02/big-little-
    endian/Test03# ./bin/main 3
    Little Endian (Standard Library Method)
    root@Youer:~/test1008/ch02-TEST-TOOL/bestidiocs2024/ch02/big-little-
    endian/Test03# ./bin/main 4
    Little Endian (Pointer Method)
    root@Youer:~/test1008/ch02-TEST-TOOL/bestidiocs2024/ch02/big-little-
    endian/Test03# ./bin/main 5
    Little Endian (Union Method)
    ```

- 新建目录，拷贝要求3中代码，制作静态库 libble.a,并调用 libble.a,编译运行代码，给出运行结果。使用 git 记录过程（5分）

    ○ 运行结果:

```
root@Youer:~/test1008/ch02-TEST-TOOL/bestidiocs2024/ch02/big-little-
endian/Test04# tree
.
├── bin
│   └── main
├── include
│   └── ble.h
├── lib
│   └── libble.a
└── src
    ├── cebitfields.c
    ├── cebitfields.o
    ├── cebitwise.c
    ├── cebitwise.o
    ├── celibrary.c
    ├── celibrary.o
    ├── cepointer.c
    ├── cepointer.o
    ├── ceunion.c
    ├── ceunion.o
    └── main.c

4 directories, 14 files
root@Youer:~/test1008/ch02-TEST-TOOL/bestidiocs2024/ch02/big-little-
endian/Test04# ./bin/main
Little Endian (Bitwise Method)
Little Endian (Bit-field Method)
Little Endian (Standard Library Method)
Little Endian (Pointer Method)
Little Endian (Union Method)
```

- 询问AI如何创建静态库并完成该测试

- 新建目录，按下面目录拷贝要求3中代码，编写 Makefile 编译运行代码，给出运行结果。使用 git 记录过程。

  - 运行结果

```
root@Youer:~/test1008/ch02-TEST-TOOL/bestidiocs2024/ch02/big-little-
endian/Test06# make run RUN_PARAM=0
LD_LIBRARY_PATH=./lib bin/main 0
Invalid function number
make: *** [Makefile:65: run] Error 1
root@Youer:~/test1008/ch02-TEST-TOOL/bestidiocs2024/ch02/big-little-
endian/Test06# make run RUN_PARAM=1
LD_LIBRARY_PATH=./lib bin/main 1
Little Endian (Bitwise Method)
root@Youer:~/test1008/ch02-TEST-TOOL/bestidiocs2024/ch02/big-little-
endian/Test06# make run RUN_PARAM=2
LD_LIBRARY_PATH=./lib bin/main 2
Little Endian (Bit-field Method)
```

```
root@Youer:~/test1008/ch02-TEST-TOOL/bestidiocs2024/ch02/big-little-
endian/Test06# make run RUN_PARAM=3
LD_LIBRARY_PATH=./lib bin/main 3
Little Endian (Standard Library Method)
root@Youer:~/test1008/ch02-TEST-TOOL/bestidiocs2024/ch02/big-little-
endian/Test06# make run RUN_PARAM=4
LD_LIBRARY_PATH=./lib bin/main 4
Little Endian (Pointer Method)
root@Youer:~/test1008/ch02-TEST-TOOL/bestidiocs2024/ch02/big-little-
endian/Test06# make run RUN_PARAM=5
LD_LIBRARY_PATH=./lib bin/main 5
Little Endian (Union Method)
```

- Makefile代码

```
# Makefile

CC=gcc
CFLAGS=-Iinclude -fPIC
AR=ar
ARFLAGS=rcs
DYNLIBFLAGS=-shared -fPIC -o
LIBNAME=libble
OUTDIR=lib
BINDIR=bin
OBJDIR=src

# 定义静态库文件名
STATIC_LIB=$(OUTDIR)/$(LIBNAME).a

# 定义动态库文件名
DYNLIB=$(OUTDIR)/$(LIBNAME).so

# 定义可执行文件名
BIN_TARGET=$(BINDIR)/main

# 定义源文件列表
SRC_FILES=$(wildcard src/*.c)
OBJ_FILES=$(SRC_FILES:src/%.c=$(OBJDIR)/%.o)

# 默认参数
RUN_PARAM ?= 1


# 默认目标
all: $(STATIC_LIB) $(DYNLIB) $(BIN_TARGET)

# 静态库
$(STATIC_LIB): $(OBJ_FILES)
        $(AR) $(ARFLAGS) $@ $(filter-out src/main.o, $^)

# 动态库
```

```
$(DYNLIB): $(OBJ_FILES)
        $(CC) $(DYNLIBFLAGS) $@ $(filter-out src/main.o, $^)

# 可执行文件
$(BIN_TARGET): src/main.o | $(STATIC_LIB) $(DYNLIB)
        $(CC) -o $@ src/main.o -L$(OUTDIR) -lble

# 编译对象文件
$(OBJDIR)/%.o: src/%.c
        $(CC) $(CFLAGS) -c $< -o $@

# 创建输出目录
$(OUTDIR):
        mkdir -p $(OUTDIR)

$(BINDIR):
        mkdir -p $(BINDIR)

# 清理目标
clean:
        rm -f $(OBJDIR)/*.o
        rm -f $(OUTDIR)/*.a
        rm -f $(OUTDIR)/*.so
        rm -f $(BINDIR)/*

# 运行目标
run: $(BIN_TARGET)
        LD_LIBRARY_PATH=./lib $(BIN_TARGET) $(RUN_PARAM)

# 显示目标
.PHONY: all clean run
```

- 目录结构树

```
root@Youer:~/test1008/ch02-TEST-TOOL/bestidiocs2024/ch02/big-little-
endian/Test06# tree
.
├── Makefile
├── bin
│   └── main
├── docs
├── include
│   └── ble.h
├── lib
│   ├── libble.a
│   └── libble.so
└── src
    ├── cebitfields.c
    ├── cebitfields.o
    ├── cebitwise.c
    ├── cebitwise.o
```

```
                ├── celibrary.c
                ├── celibrary.o
                ├── cepointer.c
                ├── cepointer.o
                ├── ceunion.c
                ├── ceunion.o
                ├── main.c
                └── main.o

    5 directories, 17 files
```

- AI学习

    - [询问如何构建makefile并解决报错](#)
    - [询问如何在make run命令中添加和使用自定义参数](#)

- 提交 git log 结果：

```
root@Youer:~/test1008/ch02-TEST-TOOL/bestidiocs2024/ch02/big-little-
endian/Test06# git log --graph --oneline --all
* 2618d26 (HEAD -> master) complete requirement 6
* 532f72f complete requirement 4 and 5
* d87cdd1 complete requirement 3
* 0b8d249 adjust directory structure
* 6f4a05d delete main func in codes
* 3d16119 Copy codes to Test03
* 33a3d60 Compile and run the endianness detection code
* 007a5e3 init commit
root@Youer:~/test1008/ch02-TEST-TOOL/bestidiocs2024/ch02/big-little-
endian/Test06# git log
commit 2618d26cf033a6b690de8874693848f3d8883b43 (HEAD -> master)
Author: root <root@Youer>
Date:   Tue Oct 8 17:19:00 2024 +0800

    complete requirement 6

commit 532f72f9e8af0f1138dd5794d2f8118f0f138fba
Author: root <root@Youer>
Date:   Tue Oct 8 16:21:51 2024 +0800

    complete requirement 4 and 5

commit d87cdd1a90f087fbcf774a560a4c1355f7fce32e
Author: root <root@Youer>
Date:   Tue Oct 8 15:40:21 2024 +0800

    complete requirement 3

commit 0b8d249aa51b8d6b9a6aaa13425b51f728127ddf
Author: root <root@Youer>
Date:   Tue Oct 8 15:18:42 2024 +0800
```

```
        adjust directory structure

commit 6f4a05d05d6cd2b903339bffc6a8cade7e53c024
Author: root <root@Youer>
Date:   Tue Oct 8 15:09:03 2024 +0800

    delete main func in codes

commit 3d16119a079d1b1aba0957b0f9db7cfe25cce0e5
Author: root <root@Youer>
Date:   Tue Oct 8 15:06:11 2024 +0800

    Copy codes to Test03

commit 33a3d60c93210d0544c7f7fddeea4b72d253b06c
:
```