Operating System Architectures
Haiku Project

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1 Introduction

The main goal of this project is to write a program that generates "Haiku" poems. Haiku is a specific type of Japanese poem which has 17 syllables divided into three lines of 5, 7 and 5 syllables. Haiku is typically written on the subject of nature. The word haiku (pronounced hahy-koo) is derived from the Japanese word hokku meaning starting verse.

2 Version 1

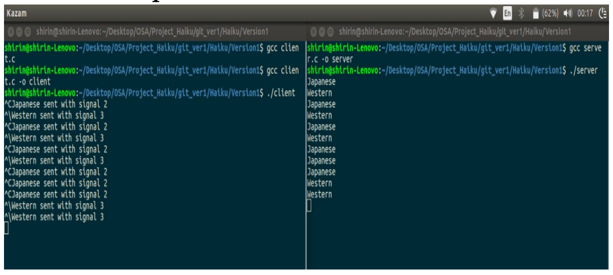
There are 2 dedicated programs (client.c and server.c) and 1 header file (message.h) for version 1. Client must send signals (SIGINT and SIGQUIT) to server, server has to receive the signal and print the type of poem for each signal (japanese for SIGINT and western for SIGQUIT).

Message queues used to send signal from client to server. There is message_id_generator() function used in both programs to create and access the queue. Additionally, there is message_buffer structure in both programs which contains message_type and message_signal_type variables.

In client.c, there is sig_handler() function , which receives signal, initialises the received signal to message_signal_type and sends it to the message queue and increments the global variable counter by one. This process takes place until counter is equal to 100, after, program stops running.

In server.c, queue is accessed with the help of msg_id_generator() function. There is 2D array haiku_category which contains SIGINT and SIGQUIT on itself. Server receives signal from queue using msgrcv() system call. When received signal is equal to haiku_category[0][0] (means SIGINT signal), it prints "japanese" type, when it's equal to haiku_category[1][0] (means SIGQUIT signal), it prints "western" type, after, the global variable counter is incremented by one. This process takes place until counter is equal to 100 and then program stops running.

Server Output:



```
shirin@shirin-Lenovo:~/Desktop/OSA/Project_Haiku/git_ver1/Haiku/Version1$ gcc clien
t.c
shirin@shirin-Lenovo:~/Desktop/OSA/Project_Haiku/git_ver1/Haiku/Version1$ gcc clien
t.c -o client
shirin@shirin-Lenovo:~/Desktop/OSA/Project_Haiku/git_ver1/Haiku/Version1$ ./client
^CJapanese sent with signal 2
^\Western sent with signal 3
^CJapanese sent with signal 2
^\Western sent with signal 3
^CJapanese sent with signal 2
^\Western sent with signal 3
^CJapanese sent with signal 2
^CJapanese sent with signal 2
^CJapanese sent with signal 2
^\Western sent with signal 3
^\Western sent with signal 3
```

```
shirin@shirin-Lenovo:~/Desktop/OSA/Project_Haiku/git_ver1/Haiku/Version1$ gcc serve
r.c -o server
shirin@shirin-Lenovo:~/Desktop/OSA/Project_Haiku/git_ver1/Haiku/Version1$ ./server
Japanese
Western
Japanese
Western
Japanese
Western
Japanese
Japanese
Japanese
Western
Western
```

NOTE:
Compile client.c: gcc client.c -o client
Compile server.c: gcc server.c -o server
Execute client: ./client
Execute server: ./server

3 Version 2

There are 2 dedicated programs (writer.c and reader.c) and 1 header file (message.h) for version 2. Additionally, there 2 directories (japanese and western) that contain .txt files and there is 1 haiku poem for each file. Writer must take the poems from these 2 directories and sent them to reader via message queue. Reader must take all the poems from queue and write 3 random poems to .txt files for each category.

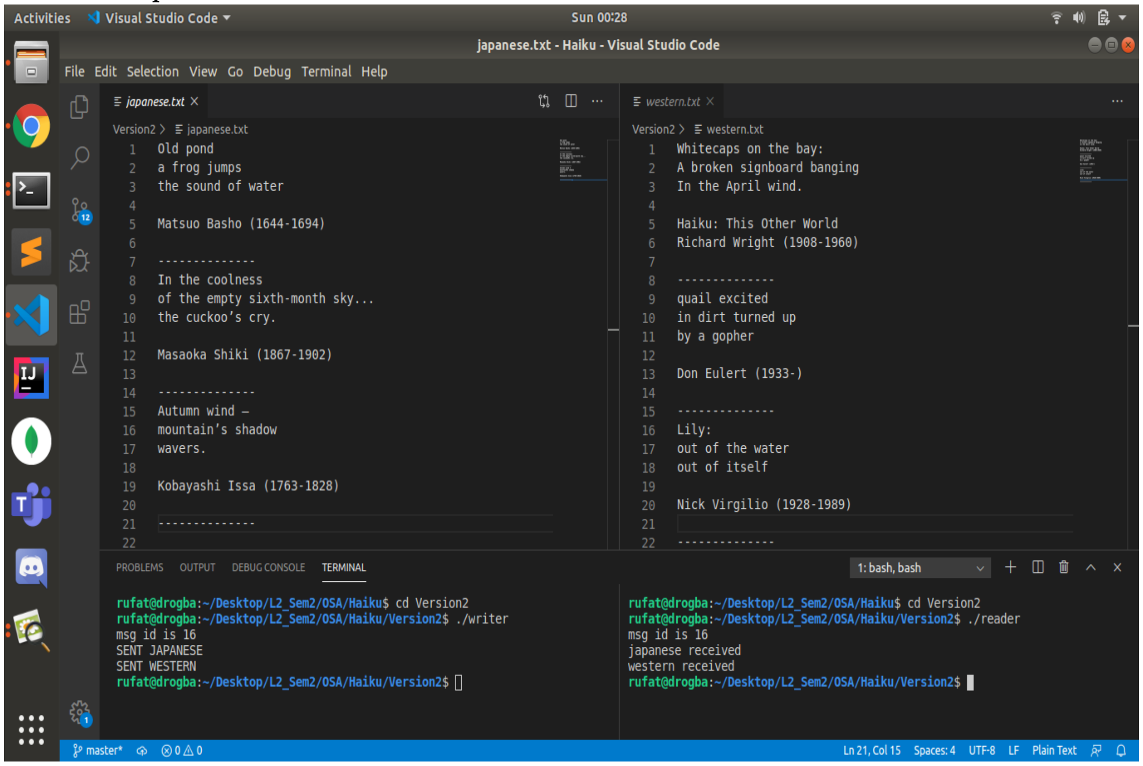
Message queues used to send data from writer to reader. There is msg_id_generator() function used in both programs to create and access the queue. There is also message_buffer structure in message.h (message.h is included in both programs) which contains message_type and haiku_array.

In writer.c, 2 message_buffer structures are declared (message_jap, message_western). There is haiku_to_arr() function which receives pointer to message_buffer structure and type of message as an parameter. There is haikuAmount integer declared inside this function() that holds the number of haiku based on category of haiku. If arguments of this function are structure message_jap and type 1, function enters the japanese directory, takes all the poems from .txt files inside that directory and writes to message-> haiku_array and if arguments are structure message_western and type 2, function enters the western directory, takes all the poems from .txt files inside that directory and writes to message-> haiku_array. In main() function, this function is called twice (for japanese and western). It means both structures are full now with its poems. So, all the data are sent to the same queue with the help of msgsnd() system call.

In reader.c, 2 message_buffer structures are declared (message_jap and message_western). There is read_haiku() function which receives haiku category as parameter. If category is 1, it receives the data of message_jap structure from the queue, generates 3 different random haikus using generate_random_number() function and writes them to the "japanese.txt" file. Same when category is 2, it receives the data of message_western structure from the queue, generates 3 different random haikus using generate_random_number() function and writes them to the "western.txt" file. If there is no such .txt files, it will automatically create it. In main() function, this function is called twice (category 1, category

2). When the work is completed, queue is emptied using msgctl() system call.

Server Output:



```
japanese.txt
Old pond
a frog jumps
the sound of water

Matsuo Basho (1644-1694)

-------------
In the coolness
of the empty sixth-month sky...
the cuckoo's cry.

Masaoka Shiki (1867-1902)

-------------
Autumn wind –
mountain's shadow
wavers.

Kobayashi Issa (1763-1828)

-------------

```

```
western.txt
Whitecaps on the bay:
A broken signboard banging
In the April wind.

Haiku: This Other World
Richard Wright (1908-1960)

-------------
quail excited
in dirt turned up
by a gopher

Don Eulert (1933-)

-------------
Lily:
out of the water
out of itself

Nick Virgilio (1928-1989)

-------------
```

```
rufat@drogba:~/Desktop/L2_Sem2/OSA/Haiku$ cd Version2
rufat@drogba:~/Desktop/L2_Sem2/OSA/Haiku/Version2$ ./writer
msg id is 16
SENT JAPANESE
SENT WESTERN
rufat@drogba:~/Desktop/L2_Sem2/OSA/Haiku/Version2$
```

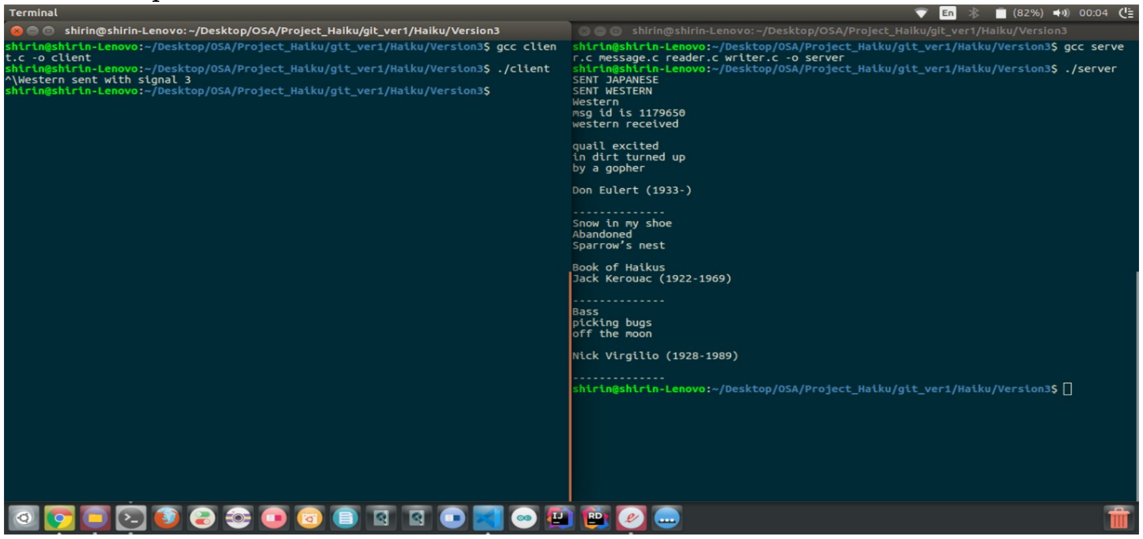
```
rufat@drogba:~/Desktop/L2_Sem2/OSA/Haiku$ cd Version2
rufat@drogba:~/Desktop/L2_Sem2/OSA/Haiku/Version2$ ./reader
msg id is 16
japanese received
western received
rufat@drogba:~/Desktop/L2_Sem2/OSA/Haiku/Version2$
```

NOTE:
Compile writer.c: gcc writer.c -o writer
Compile reader.c: gcc reader.c -o reader
Execute writer: ./writer
Execute reader: ./reader

4 Version 3

In version 3 our previous 2 versions are combined into 1 version. In this version, the main point is to print a haiku of a given type when the matching signal is received. As in version 1, the client program stays the same. But on the server, there are some changes. In version3 two different message-ids are used by the server. The first one is used to communicate with the client and the second one is used to send haikus that read from .txt file to reader program. Then in the main function haikus are read from the text files into the array. After these arrays are sent to reader program over second message-id. Inside the while function server just waits for and respond from the client and according to the response's category, it calls read_haiku(int category) method. Inside read_haiku() method it reads the message queue according to its category and prints 3 randomly chosen haiku then prints them to terminal.

Server Output:



```
shirin@shirin-Lenovo:~/Desktop/OSA/Project_Haiku/git_ver1/Haiku/Version3$ gcc clien
t.c -o client
shirin@shirin-Lenovo:~/Desktop/OSA/Project_Haiku/git_ver1/Haiku/Version3$ ./client
^\Western sent with signal 3
shirin@shirin-Lenovo:~/Desktop/OSA/Project_Haiku/git_ver1/Haiku/Version3$
```

```
shirin@shirin-Lenovo:~/Desktop/OSA/Project_Haiku/git_ver1/Haiku/Version3$ gcc serve
r.c message.c reader.c writer.c -o server
shirin@shirin-Lenovo:~/Desktop/OSA/Project_Haiku/git_ver1/Haiku/Version3$ ./server
SENT JAPANESE
SENT WESTERN
Western
msg id is 1179650
western received

quail excited
in dirt turned up
by a gopher

Don Eulert (1933-)

--------------
Snow in my shoe
Abandoned
Sparrow's nest

Book of Haikus
Jack Kerouac (1922-1969)

--------------
Bass
picking bugs
off the moon

Nick Virgilio (1928-1989)

--------------
shirin@shirin-Lenovo:~/Desktop/OSA/Project_Haiku/git_ver1/Haiku/Version3$
```

NOTE:
Compile writer.c: gcc client.c -o client
Compile reader.c: gcc server.c message.c reader.c writer.c -o server
Execute client: ./client
Execute server: ./server