CN HW3

B06902048 資工三 李峻宇

Environment : Ubuntu 16.04, openCV 3.3.1, g++5.4.0

Something to note : when you `make clean` , My Makefile will remove sender, receiver and agent.

How to execute my program :

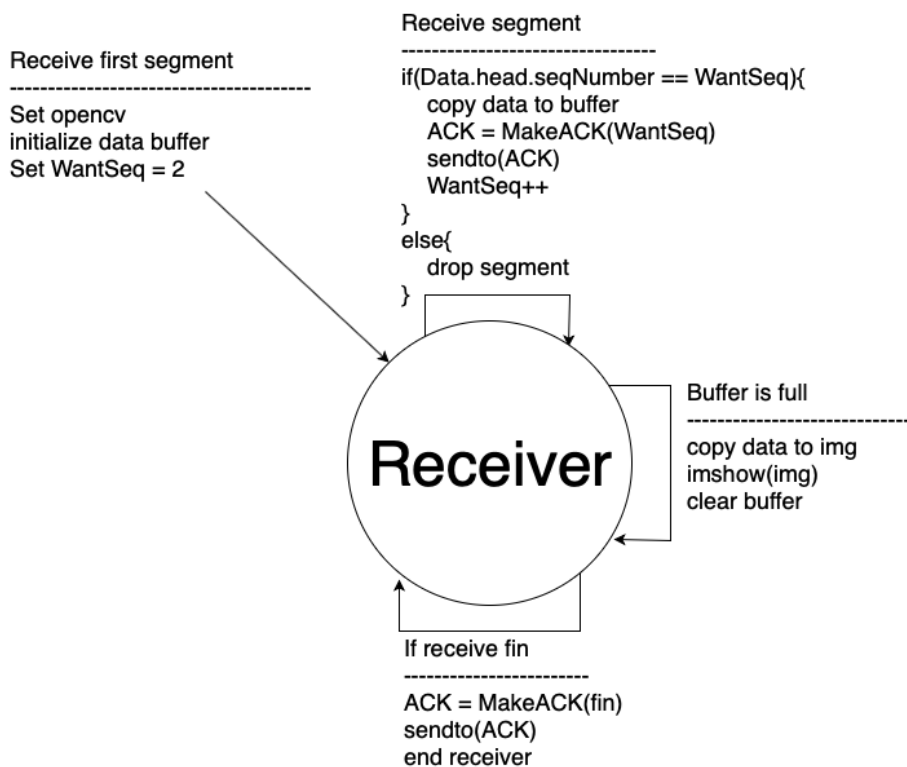Type `make` to compile `receiver.cpp` , `agent.c` , and `sender.cpp`

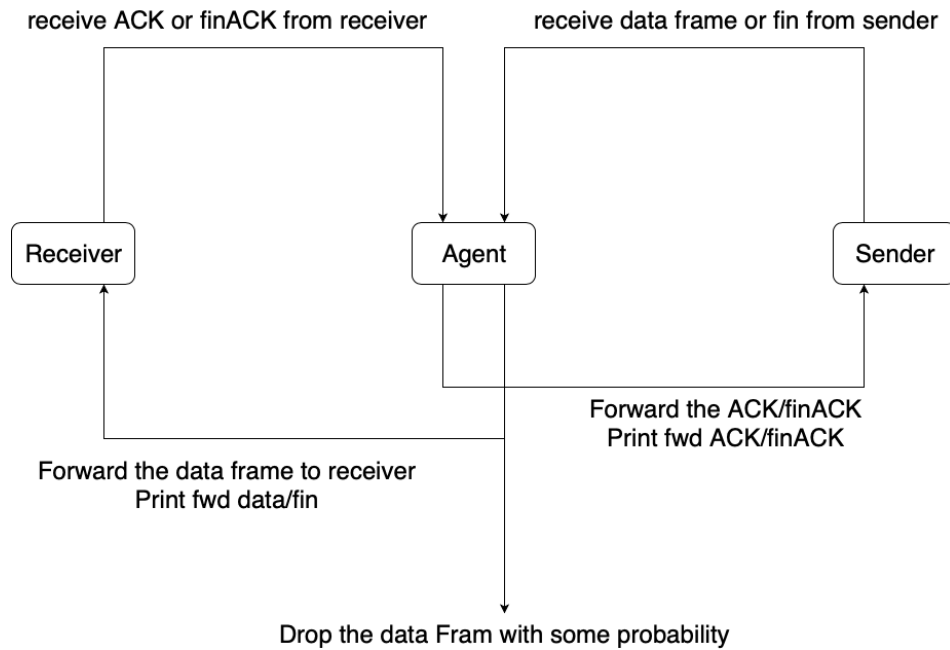`./receiver <agent IP> <agent port> <receiver port>`

`./agent <sender IP> <receiver IP> <sender port> <agent port> <receiver port> <loss_rate>`

`./sender <agent IP> <agent port> <sender port> <filepath>`

Flowchart(FSM)

Receiver :

Agent :

receive ACK or finACK from receiver

receive data frame or fin from sender

Receiver

Agent

Sender

Forward the ACK/finACK
Print fwd ACK/finACK

Forward the data frame to receiver
Print fwd data/fin

Drop the data Fram with some probability

Sender :

Check input format
Open file
Compute video's width, height and imgSize
Send first Segment containing width, heigh and imgSize
Set winSize = 1 threshold = 16

```
Buffer for UnsentData is empty
--------------------------------------------------------
cap >> img
if(!img.empty()){
    while( pos < imgsize){
        MakeSegment(img.data[pos], Data);
        Data.head.seq = NextSeq;
        UnsentData.push_back(Data);
        NextSeq++;
        pos += 1000;
    }
}
```

```
Receive ACK
---------------------------------------------------------------
Set timer
Data = WaitACK.pop_front();
while(ACK.head.seqNumber > Data.head.seq){
    Data = WaitACK.pop_front
}
Data = Unsent.pop_front();
WaitACK.push_back(Data);
sento(Data)
if(N < Threshold){
    Data = UnsentDara.pop_front();
    WaitACK.push_back(Data);
    sent(Data);
    winSize += 1;
}
else{
    winSize += 1/winSize;
}
```

```
Timeout
--------------------
while(!WaitACK.empty()){
    Data = WaitACK.pop_back();
    UnsentData.push_front(Data);
}
threshold = max(1, winSize/2);
winSize = 1;
```

Sender

```
winSize <= WaitACK.size()
-----------------------------------------
Data = UnsentData.pop_front();
WaitACK.push_back(Data)
sendto(Data)
```

WaitACK.empty() && UnsentData.empty()

Receive FinACK

End the sender

Send Fin

Data.head.fin = 1;
sendto(Data)

Timeout
----
sendto(Data)
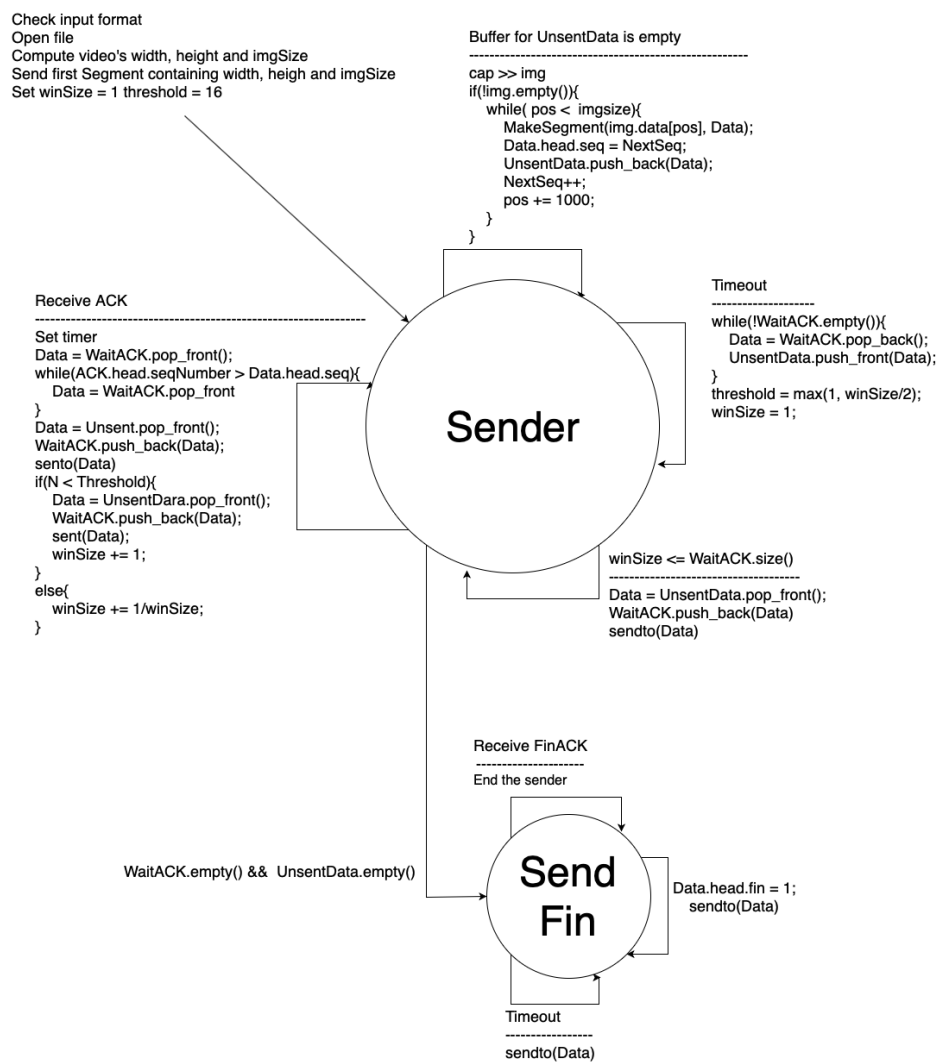
Note

My receiver often ends with a `segmentation fault` in the main return 0, and I don't know why, but I sure it worked successfully.

Someone said that my receiver may somehow corrupt the stack in main so it's lost the return address.

However, I think it's nothing about CN and the video was successfully played, so let it go~

And there might be some problem like this screenshot:

```
send    data    #258025,        winSize = 4
recv    ack     #258022
send    data    #258026,        winSize = 4
recv    ack     #258023
send    data    #258027,        winSize = 4
recv    ack     #258024
send    data    #258028,        winSize = 5
send    data    #258029,        winSize = 5
time    out,            threshold = 2
resend  data    #258025,        winSize = 1
recv    ack     #258028
*** Error in `./sender': double free or corruption (!prev): 0x0000000001e0d880 ***
======= Backtrace: =========
/lib/x86_64-linux-gnu/libc.so.6(+0x777e5)[0x7fd5c15917e5]
/lib/x86_64-linux-gnu/libc.so.6(+0x8037a)[0x7fd5c159a37a]
/lib/x86_64-linux-gnu/libc.so.6(cfree+0x4c)[0x7fd5c159e53c]
./sender[0x4056cc]
./sender[0x40553a]
./sender[0x404fbe]
./sender[0x4043a3]
./sender[0x403e7b]
./sender[0x4027f5]
/lib/x86_64-linux-gnu/libc.so.6(__libc_start_main+0xf0)[0x7fd5c153a830]
./sender[0x401b49]
======= Memory map: ========
00400000-0040b000 r-xp 00000000 08:01 1178984                   /home/cn/Desktop/CN_hw3/sender
0060a000-0060b000 r--p 0000a000 08:01 1178984                   /home/cn/Desktop/CN_hw3/sender
0060b000-0060c000 rw-p 0000b000 08:01 1178984                   /home/cn/Desktop/CN_hw3/sender
01d49000-0222f000 rw-p 00000000 00:00 0                         [heap]
7fd590000000-7fd59065e000 rw-p 00000000 00:00 0
7fd59065e000-7fd594000000 ---p 00000000 00:00 0
7fd594000000-7fd594021000 rw-p 00000000 00:00 0
7fd594021000-7fd598000000 ---p 00000000 00:00 0
7fd598000000-7fd598655000 rw-p 00000000 00:00 0
7fd598655000-7fd59c000000 ---p 00000000 00:00 0
```

I think it is something wrong with function library, because I never use `malloc()` or `free()` in my Sender. If you encouter this, please execute it again, thanks!!