

Multimedia Systems

Spring 2023

Assignment #1

Points: 200

Deadline: 16-02-2023

Suppose two computers are connected through LAN of our institute as shown below. Assume that the IP addresses of these two computers are known. Also, each computer is connected with a camera through USB port or there is a built in camera.



These two computers will exchange the images taken by the respective cameras through an optimum way by transferring the images over the LAN using a reliable TCP communication protocol. Suppose one of the computers acts as the TCP server and the other one acts as the TCP client during the connection establishment. You need to implement the connection establishment using C socket programming. No other programming language is allowed for implementing the socket connection. Implement the following functionalities of the media transmission and produce a report as mentioned in the submission instructions.

- After the connection is established between the computers, they will exchange some greeting messages and start the media transfer process.
- Suppose one of them decides to initiate the transfer of an image. The first step is to capture an image using the camera attached. You may use OpenCV library for image capturing, saving, and related operations. Remember you are not supposed to compress the image to any known format. It will be a simple matrix of pixel values and the image capture has to be done in 8-bit grey scale mode only. This can be done by converting a color image through OpenCV functions. Restrict the size of the image to 640x480 resolution only. This can also be done using image resize function of OpenCV.
- Now, this grey scale image needs to be encoded using Huffman encoding scheme as discussed in the class. The Huffman encoding table and the output bit stream should be sent to the other computer through TCP socket that has already been created in step (a).
- At the receiver end, the receiver will receive the TCP packets (more than one packet may be required, but may not be necessary!). It will use the Huffman encoding table to decode the bitstream and reconstruct the matrix. Finally, it will use the OpenCV functions to display the image on the receiver's screen.

- e) The process should be duplex. This means, the communication can continue in both directions and multiple transfers are possible during the whole session.
- f) Measure the size of the data (including the Huffman table) that has been generated at the sender's end in terms of bits. Also, compare this size with respect to the original size of the image matrix in 8-bit pixel representation. Do you find any gain or loss in terms of bits? Repeat the experiment multiple times to see that if the statistics change over time or not. Put these analysis on the report.

Submission Guidelines:

- 1) Each submission should be a group submission through google classroom only. No email submission will be accepted.
- 2) Please submit the following files: source_group_no.zip, readme_group_no.txt, analysis_group_no.DOC/PDF all in a single zip file. This file should be named as the group_no.zip. The readme file tells me how to execute your code. No external dependencies should be there in your code except the Unix socket and OpenCV. In the doc file, each student's name, roll number and a contribution statement (student wise) must be given. A sample doc file header is given.

e.g. DIC/PDF File format

Group No: 001

Name:

Roll:

Contributions: Coding of XYZ, ABC functions, report writing, analysis etc.

Name:

Roll:

Contributions: Coding of PQR, MNP functions, debugging, etc.

[Followed by your actual documentation and analysis or results.]

N.B. Remember there are 100s of ways to detect copy. Try to solve by discussing within the group.