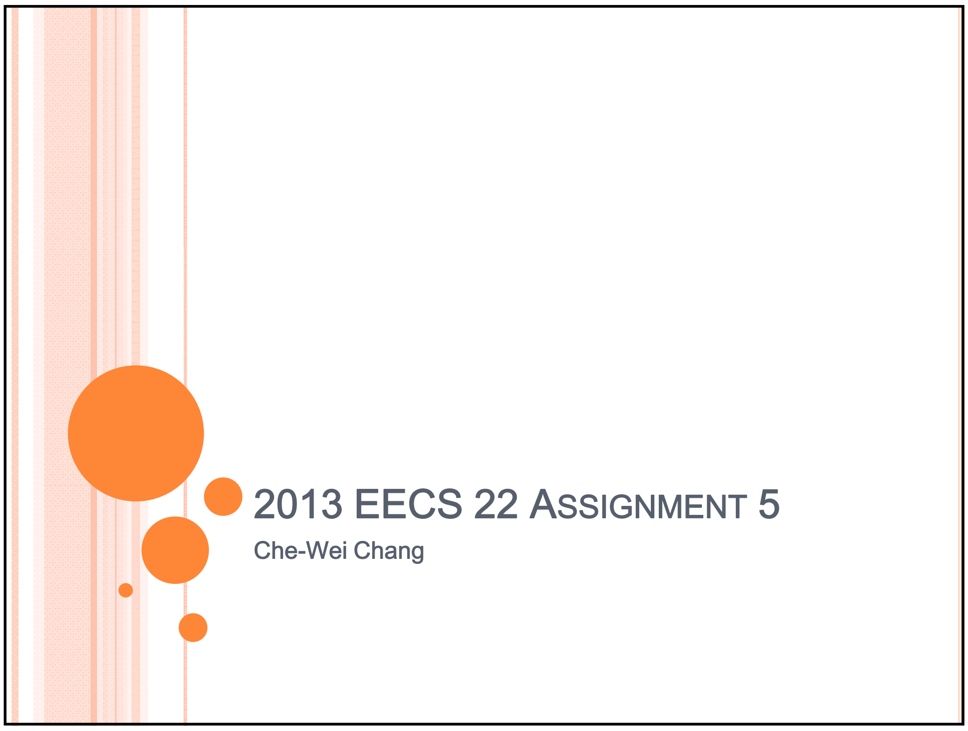
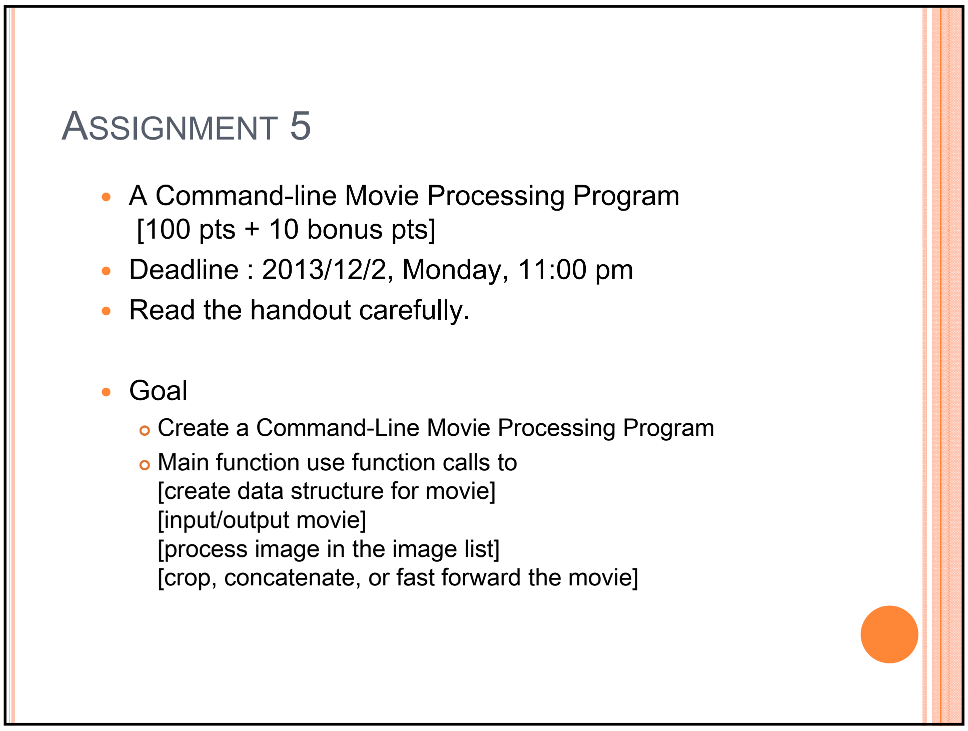


2013 EECS 22 Assignment 5

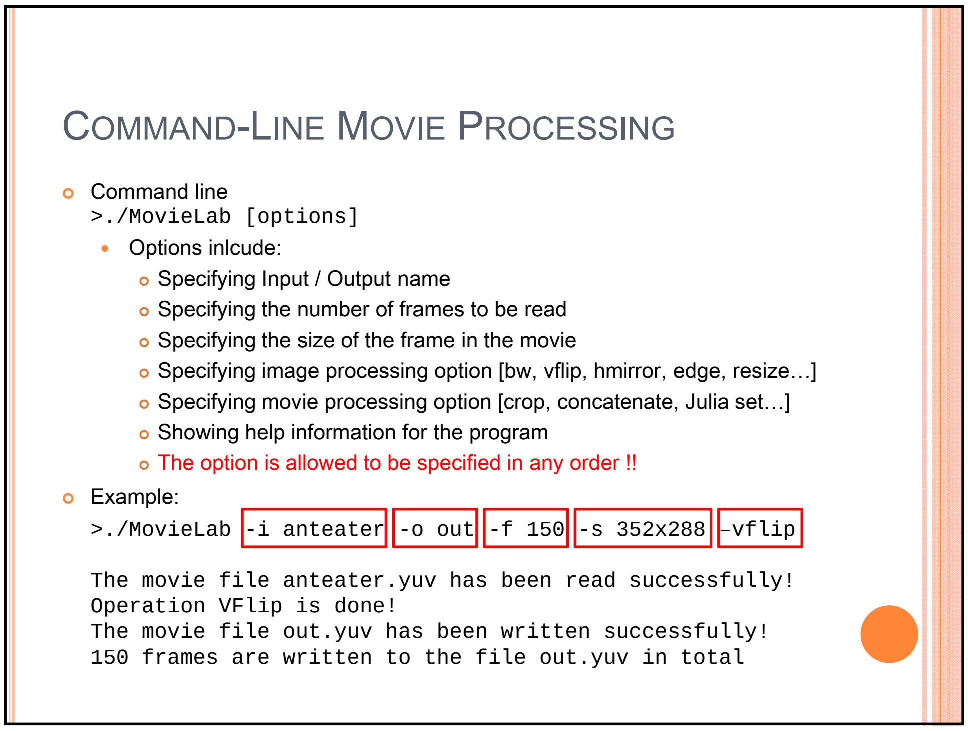
Che-Wei Chang



Assignment 5

- A Command-line Movie Processing Program
  [100 pts + 10 bonus pts]
- Deadline : 2013/12/2, Monday, 11:00 pm
- Read the handout carefully.

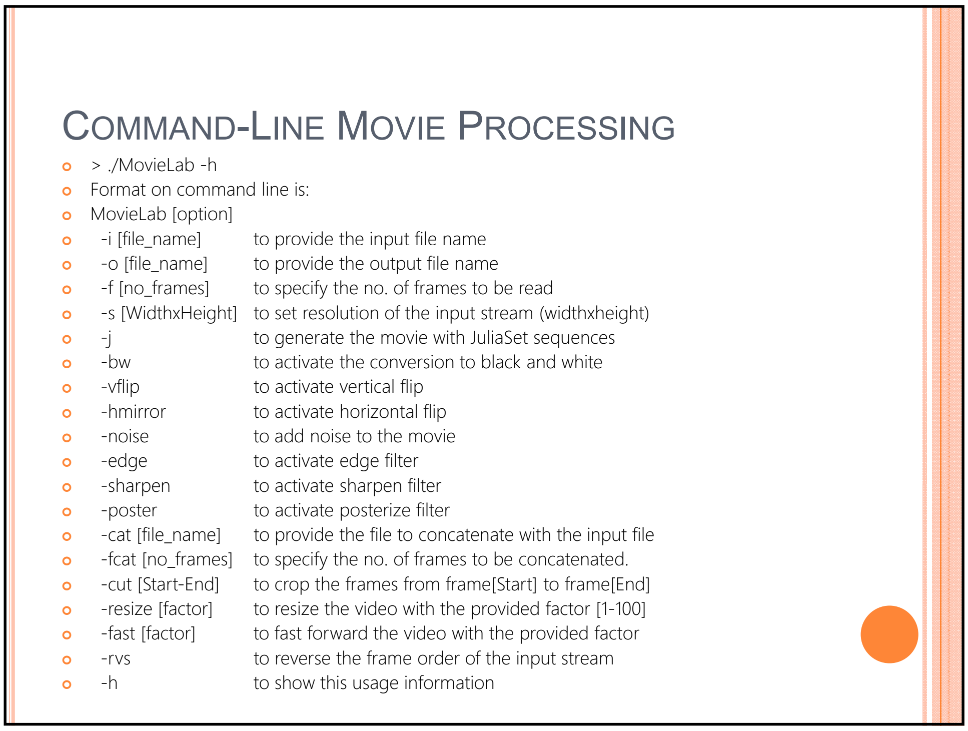
- Goal
  - Create a Command-Line Movie Processing Program
  - Main function use function calls to
    [create data structure for movie]
    [input/output movie]
    [process image in the image list]
    [crop, concatenate, or fast forward the movie]



Command-Line Movie Processing

- Command line
  `>./MovieLab [options]`
  - Options inlcude:
    - Specifying Input / Output name
    - Specifying the number of frames to be read
    - Specifying the size of the frame in the movie
    - Specifying image processing option [bw, vflip, hmirror, edge, resize…]
    - Specifying movie processing option [crop, concatenate, Julia set…]
    - Showing help information for the program
    - The option is allowed to be specified in any order !!
- Example:

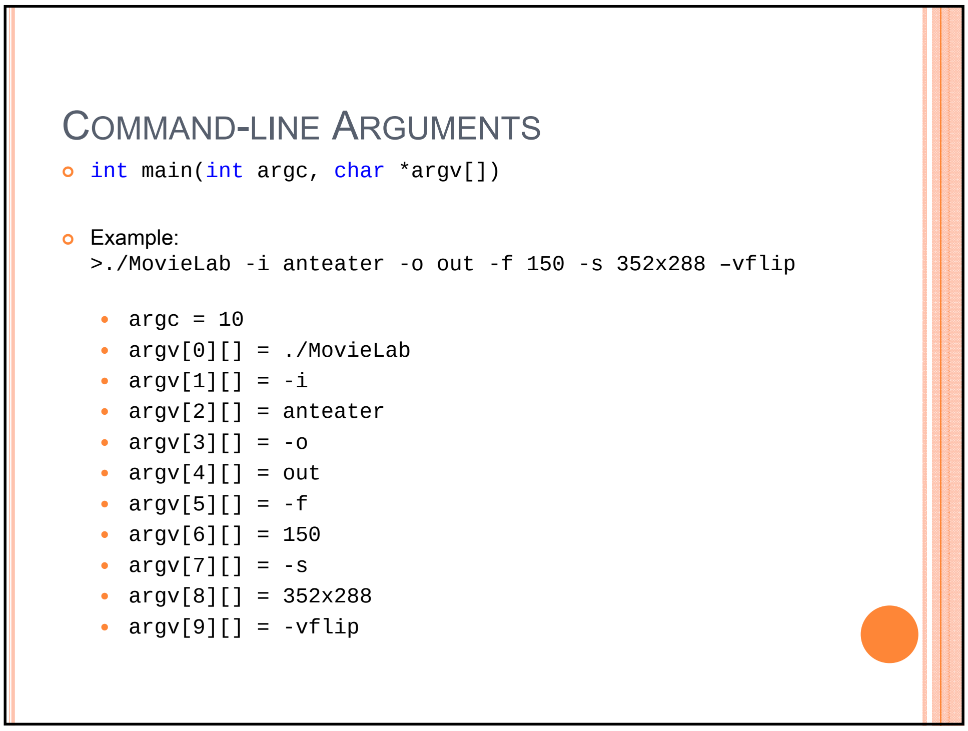
```
>./MovieLab -i anteater -o out -f 150 -s 352x288 –vflip

The movie file anteater.yuv has been read successfully!
Operation VFlip is done!
The movie file out.yuv has been written successfully!
150 frames are written to the file out.yuv in total
```



Command-Line Movie Processing

- > ./MovieLab -h
- Format on command line is:
- MovieLab [option]

-i [file_name]	to provide the input file name
-o [file_name]	to provide the output file name
-f [no_frames]	to specify the no. of frames to be read
-s [WidthxHeight]	to set resolution of the input stream (widthxheight)
-j	to generate the movie with JuliaSet sequences
-bw	to activate the conversion to black and white
-vflip	to activate vertical flip
-hmirror	to activate horizontal flip
-noise	to add noise to the movie
-edge	to activate edge filter
-sharpen	to activate sharpen filter
-poster	to activate posterize filter
-cat [file_name]	to provide the file to concatenate with the input file
-fcat [no_frames]	to specify the no. of frames to be concatenated.
-cut [Start-End]	to crop the frames from frame[Start] to frame[End]
-resize [factor]	to resize the video with the provided factor [1-100]
-fast [factor]	to fast forward the video with the provided factor
-rvs	to reverse the frame order of the input stream
-h	to show this usage information

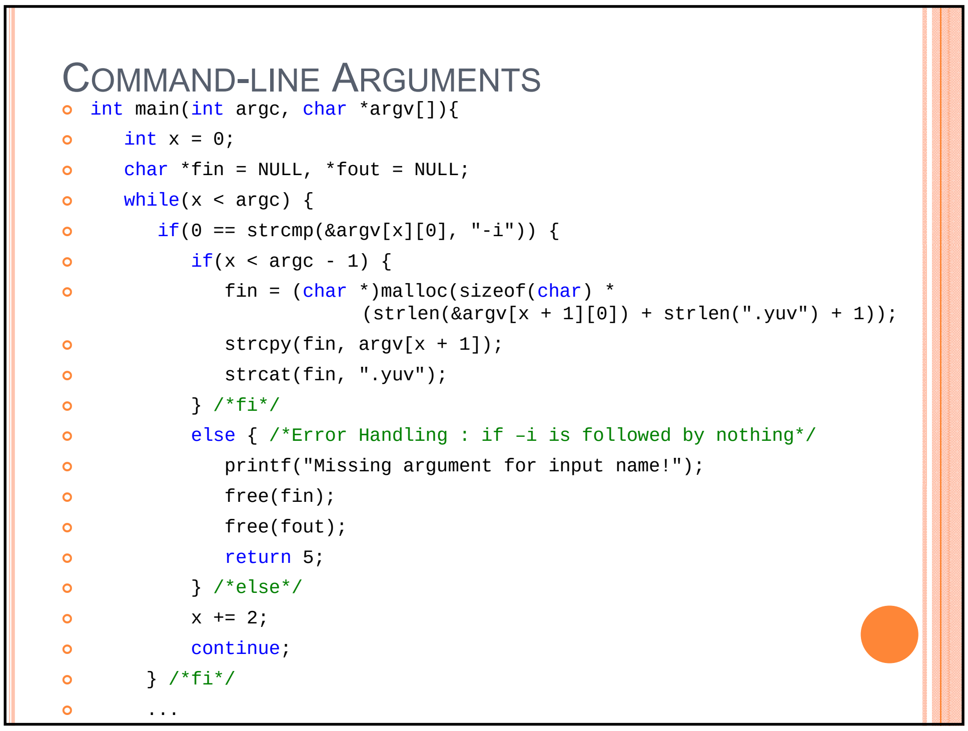


Command-line Arguments

- `int main(int argc, char *argv[])`

- Example:
  `>./MovieLab -i anteater -o out -f 150 -s 352x288 –vflip`

  - `argc = 10`
  - `argv[0][] = ./MovieLab`
  - `argv[1][] = -i`
  - `argv[2][] = anteater`
  - `argv[3][] = -o`
  - `argv[4][] = out`
  - `argv[5][] = -f`
  - `argv[6][] = 150`
  - `argv[7][] = -s`
  - `argv[8][] = 352x288`
  - `argv[9][] = -vflip`



Command-line Arguments

```
int main(int argc, char *argv[]){
   int x = 0;
   char *fin = NULL, *fout = NULL;
   while(x < argc) {
      if(0 == strcmp(&argv[x][0], "-i")) {
         if(x < argc - 1) {
            fin = (char *)malloc(sizeof(char) *
                        (strlen(&argv[x + 1][0]) + strlen(".yuv") + 1));
            strcpy(fin, argv[x + 1]);
            strcat(fin, ".yuv");
         } /*fi*/
         else { /*Error Handling : if –i is followed by nothing*/
            printf("Missing argument for input name!");
            free(fin);
            free(fout);
            return 5;
         } /*else*/
         x += 2;
         continue;
     } /*fi*/
     ...
```

Command-line Arguments (Cont.)

- Use sscanf to read formatted data from the string
- Example: read the size of frame from the command line arguments

```
    ...
    if(0 == strcmp(argv[x], "-s")) {
       if(x < argc - 1) {
          if (sscanf(argv[x + 1], "%dx%d", &Width, &Height) != 2) {
             /* Error Handling Here */
          }
       }
       else {
          /* Error Handling Here */
       }
       x += 2;
       continue;
    } /*fi*/
    ...
```

Double Linked List for Movie

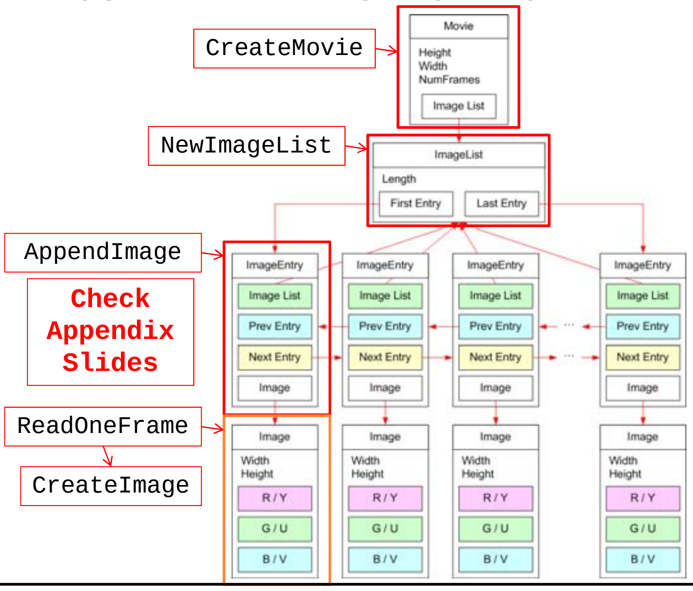
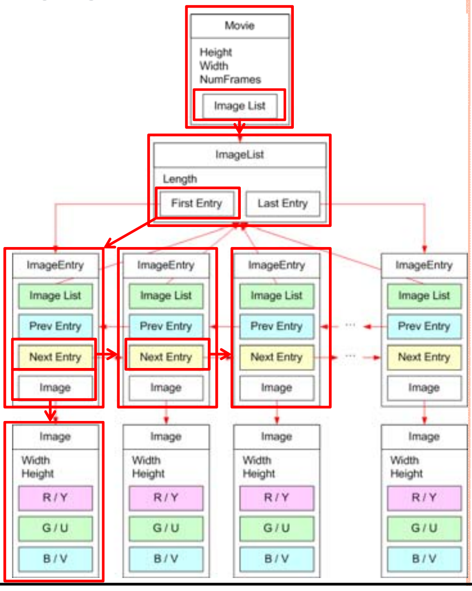


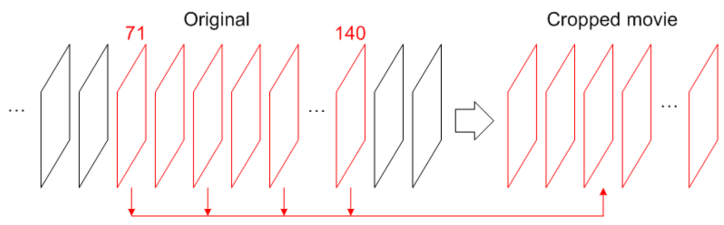
Image Processing Options

- BlackNWhite, Vflip, Hmirror, AddNoise, Edge, Sharpen, Posterize, Resize,
- Reuse the DIP functions defined in the previous assignment
- Traverse the list and apply the DIP function to the image in the Entry.
- List Traversal
  - Start from the first entry in the image list.
  - Use the Next pointer in current entry to find the next entry.
  - End when there is no more next entry in the list.



Movie Processing Option: Cropping

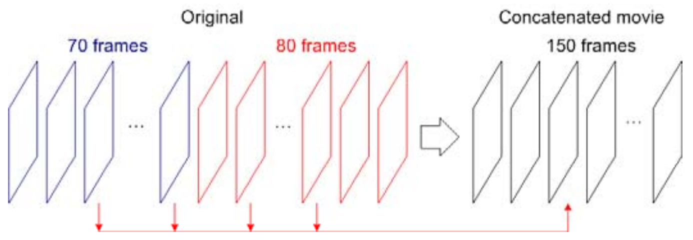
- Goal:
  For a given start frame s and end frame e, creating a cropped movie by taking frame from s to e from the original movie.



```
./MovieLab -i anteater -o out -f 150 -s 352x288 -cut 71-140
The movie file anteater.yuv has been read successfully!
Operation Fast Forward is done! Number of frames = 70
The movie file out.yuv has been written successfully!
70 frames are written to the file out.yuv in total
```

Movie Processing Option: Concatenating

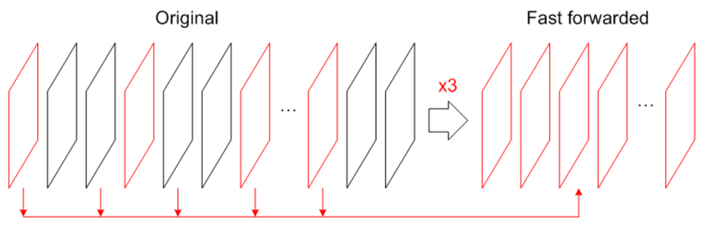
- Goal:
  For two given movies with n frames and m frames respectively, creating a cropped movie with n + m frames by concatenating these two movies.



-
  ```
  ./MovieLab -i m1 –cat m2 -o out -f 70 -s 352x288 -fcat 80
  The movie file anteater.yuv has been read successfully!
  Operation Fast Forward is done! Number of frames = 150
  The movie file out.yuv has been written successfully!
  150 frames are written to the file out.yuv in total
  ```

Movie Processing Option: Fast Forwarding

- Goal:
  For a given fast forwarding factor n, creating a fast forwarded movie by taking every n -th frames and generating a shortened movie.

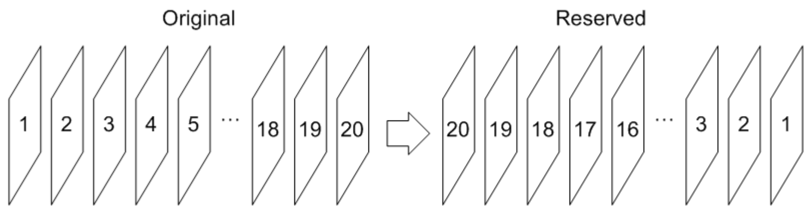


-
  ```
  ./MovieLab -i anteater -o out -f 150 -s 352x288 -fast 3
  The movie file anteater.yuv has been read successfully!
  Operation Fast Forward is done! Number of frames = 50
  The movie file out.yuv has been written successfully!
  50 frames are written to the file out.yuv in total
  ```

Movie Processing Option: Reverse

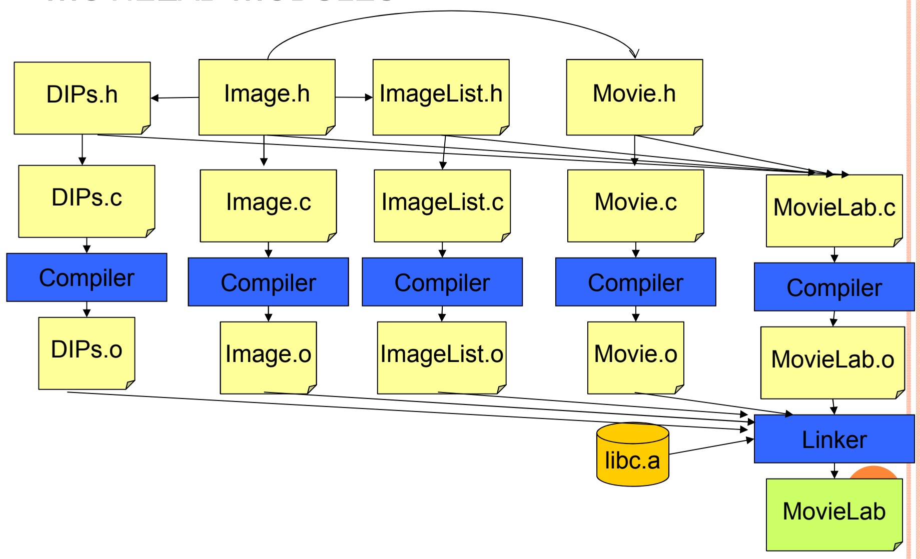
Check Appendix Slides

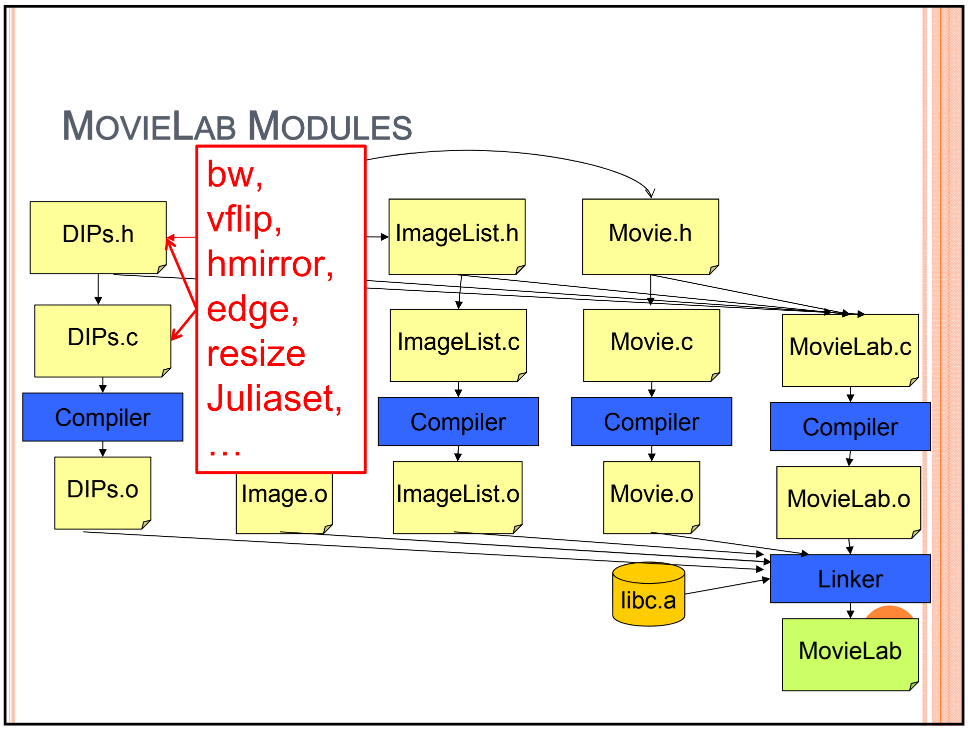
- Goal:
  Manipulate the double-linked list and save the frames to the output movie in the reverse order.



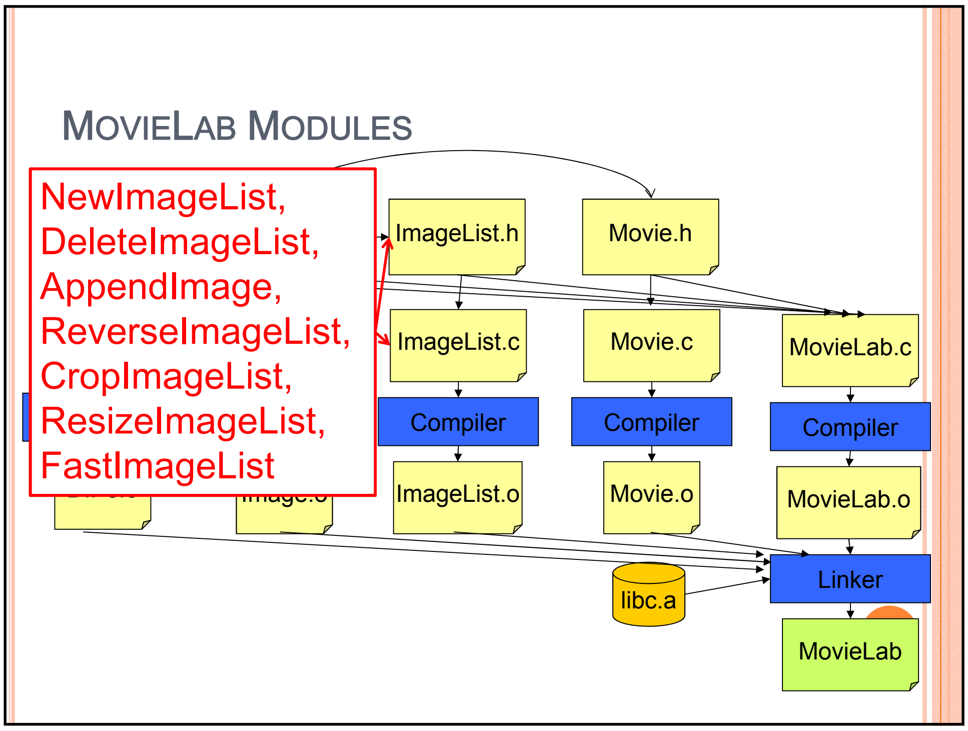
```
./MovieLab -i anteater -o out -f 150 -s 352x288 -rvs
The movie file anteater.yuv has been read successfully!
Operation Reverse is done!
The movie file out.yuv has been written successfully!
150 frames are written to the file out.yuv in total
```

MovieLab Modules



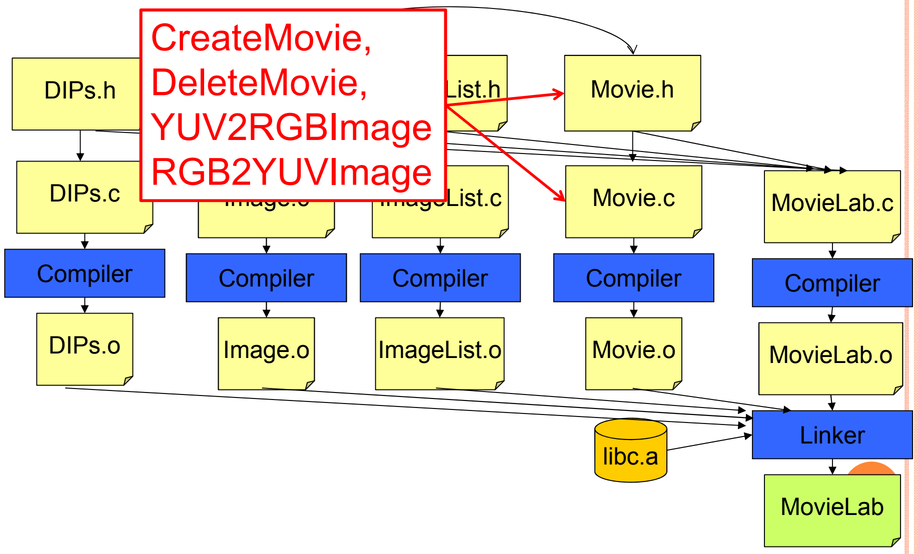


MovieLab Modules

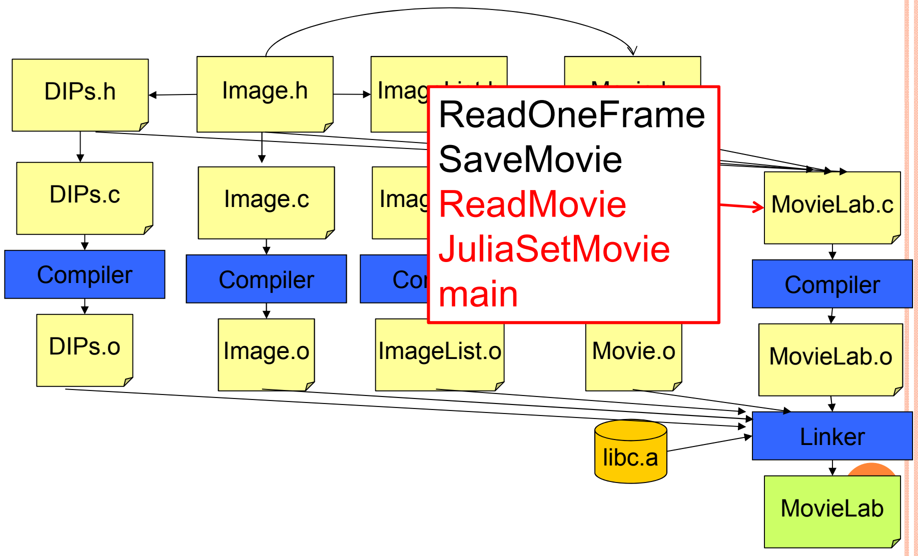


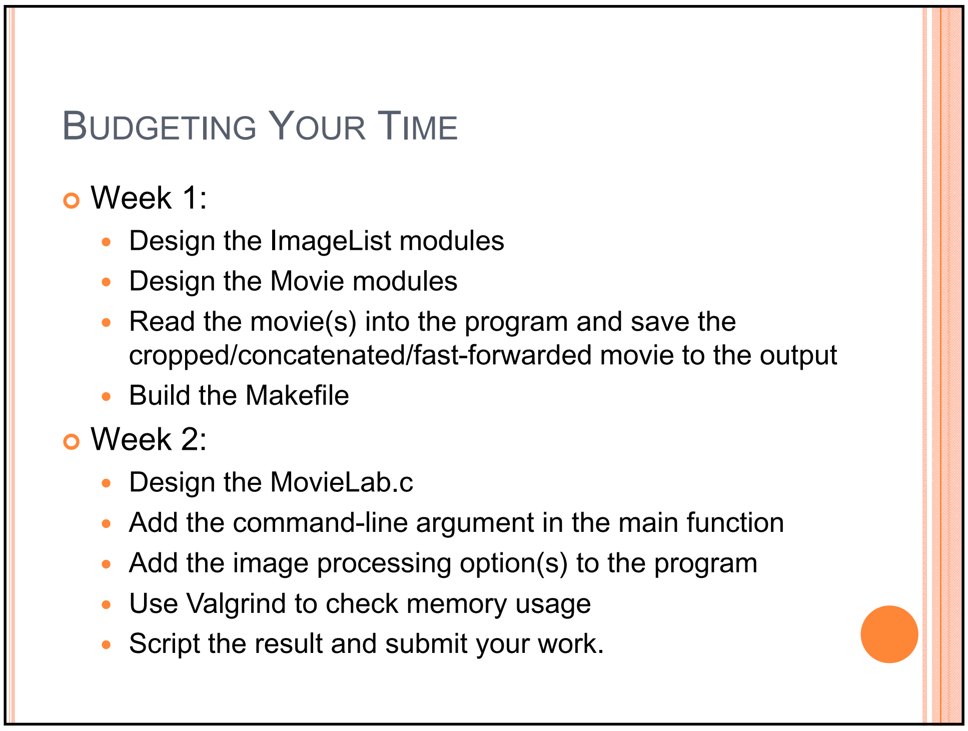
MovieLab Modules

MovieLab Modules



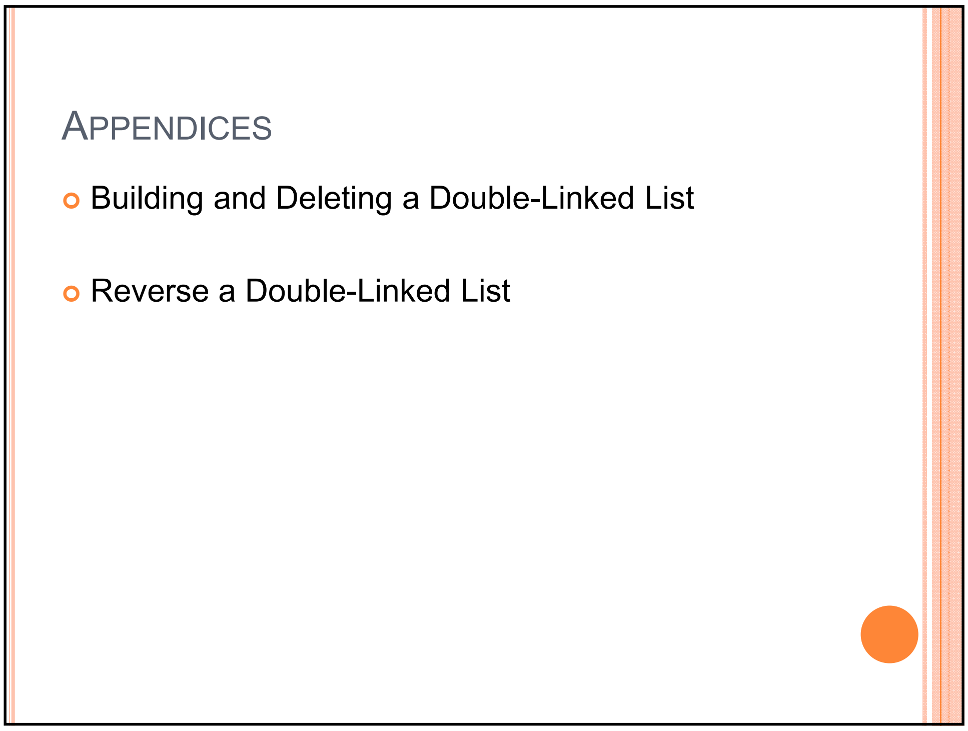
MovieLab Modules





Budgeting Your Time

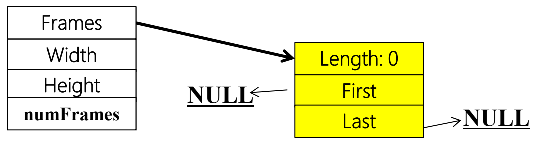
- Week 1:
  - Design the ImageList modules
  - Design the Movie modules
  - Read the movie(s) into the program and save the cropped/concatenated/fast-forwarded movie to the output
  - Build the Makefile
- Week 2:
  - Design the MovieLab.c
  - Add the command-line argument in the main function
  - Add the image processing option(s) to the program
  - Use Valgrind to check memory usage
  - Script the result and submit your work.



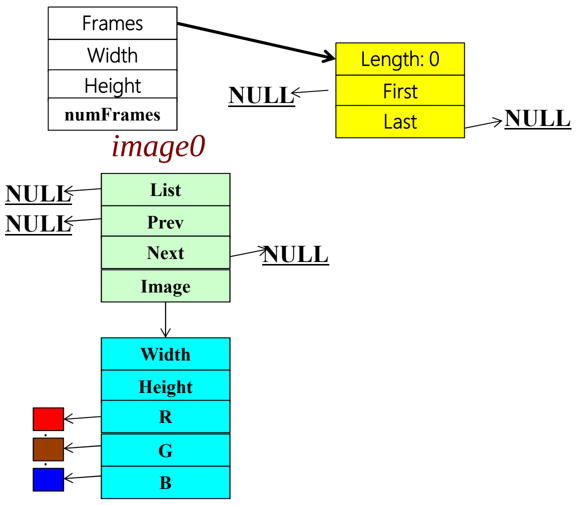
Appendices

- Building and Deleting a Double-Linked List
- Reverse a Double-Linked List

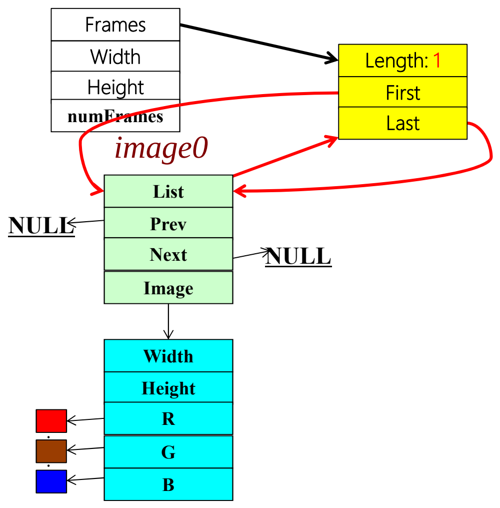
Double-Linked List: EMPTY



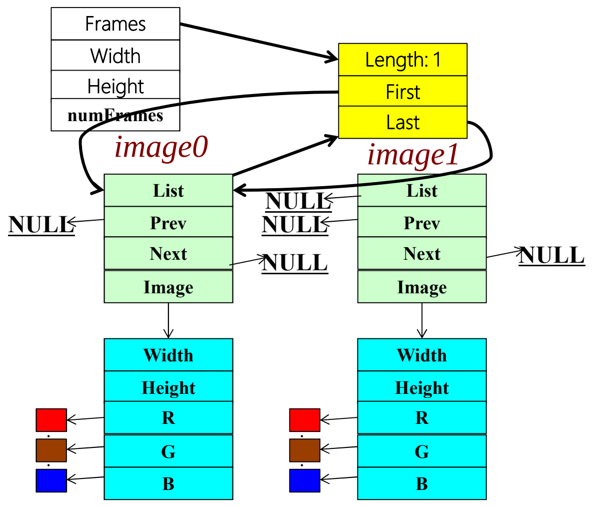
Double-Linked List: Append



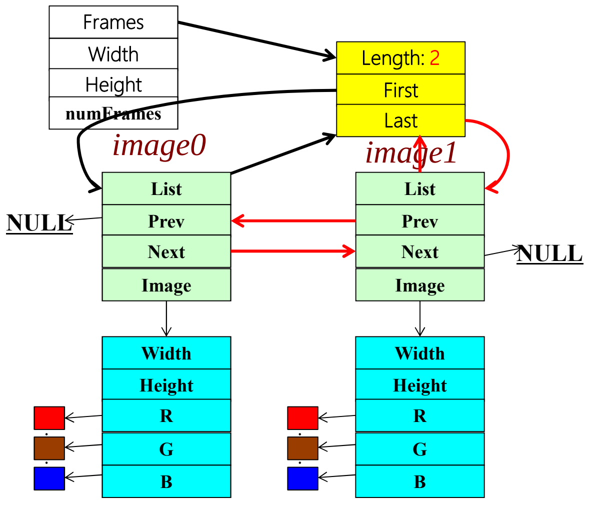
Double-Linked List: Length = 1



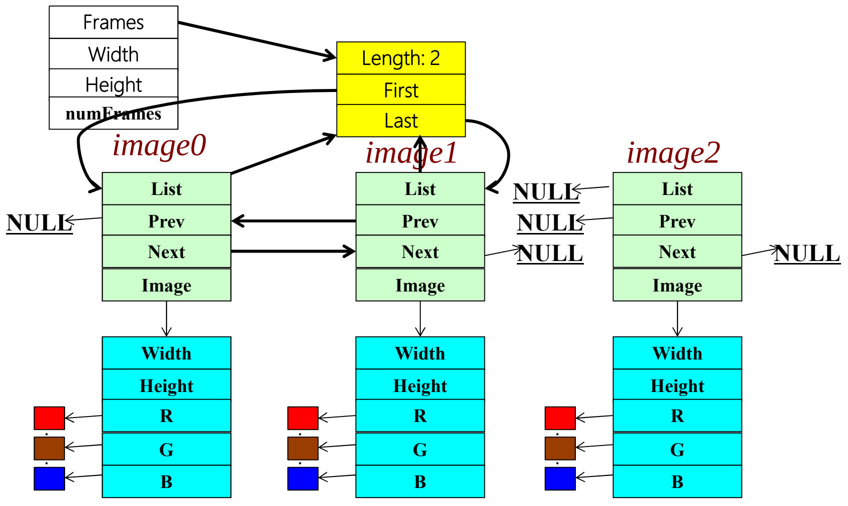
Double-Linked List: Append



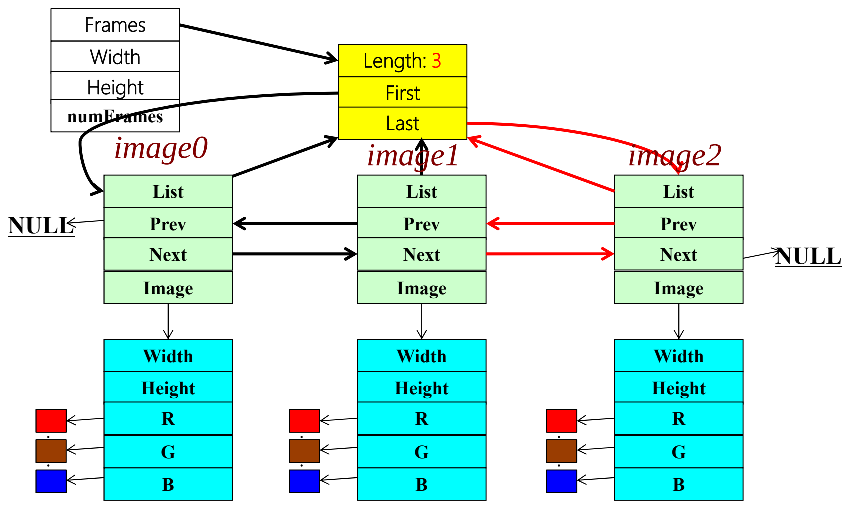
Double-Linked List: Length = 2



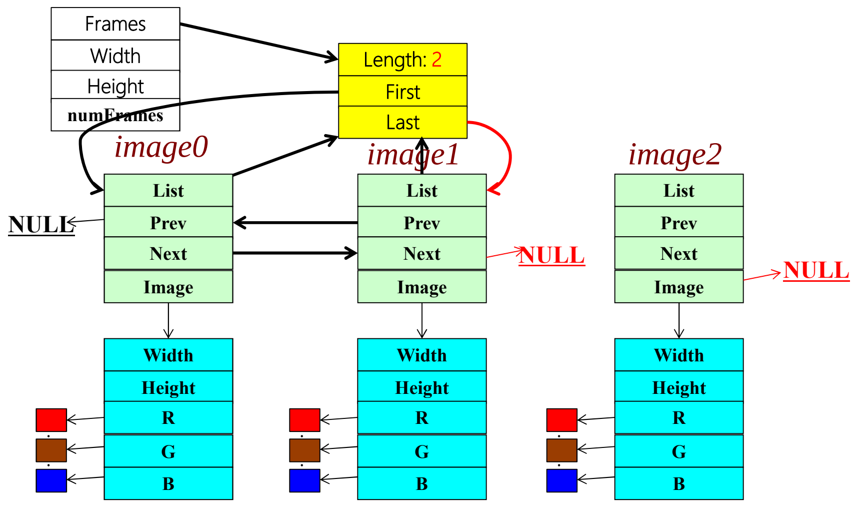
Double-Linked List: Append

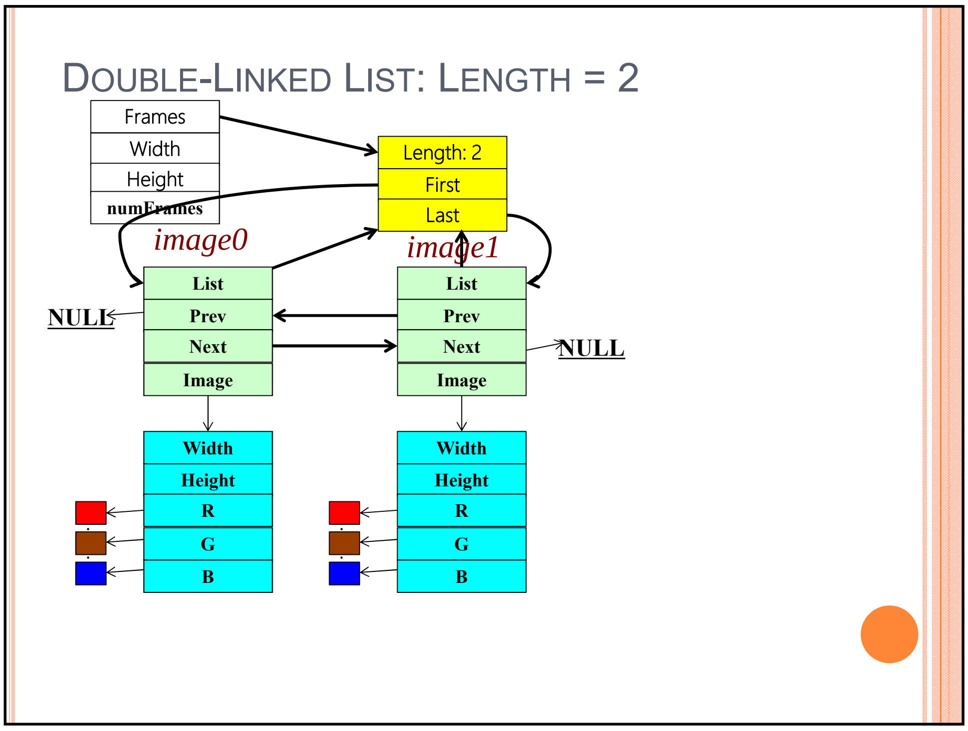


Double-Linked List: Length = 3

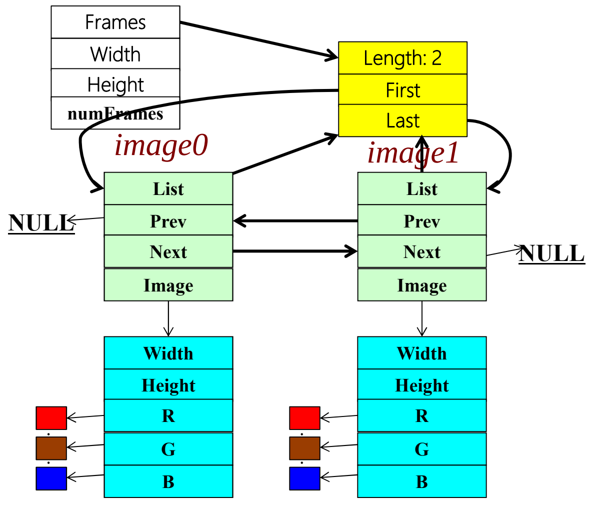


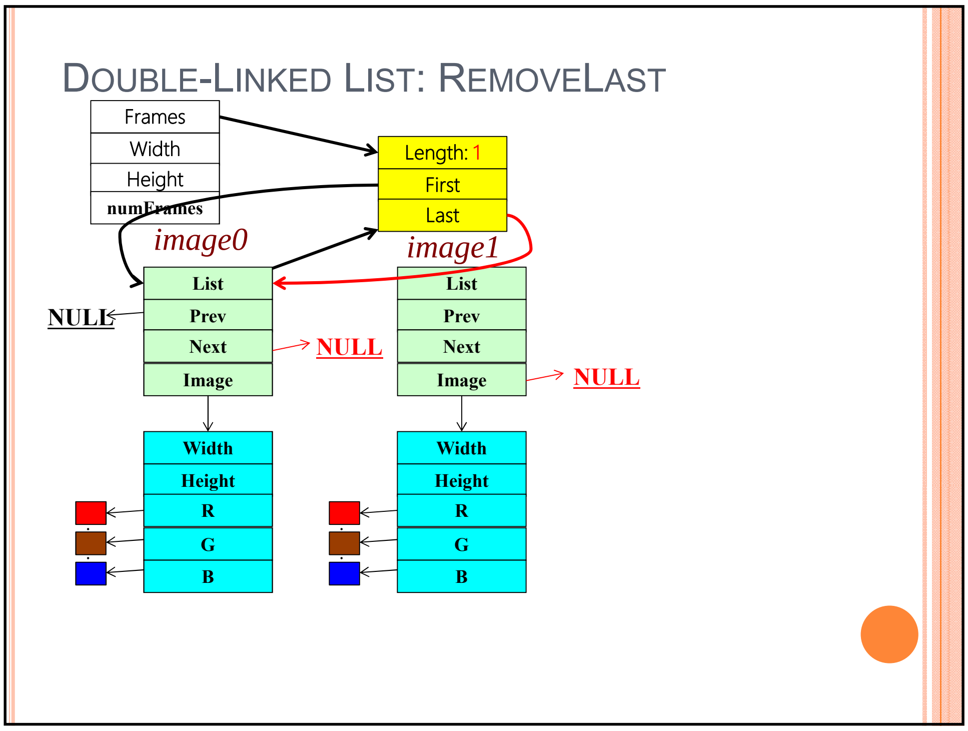
Double-Linked List: RemoveLast



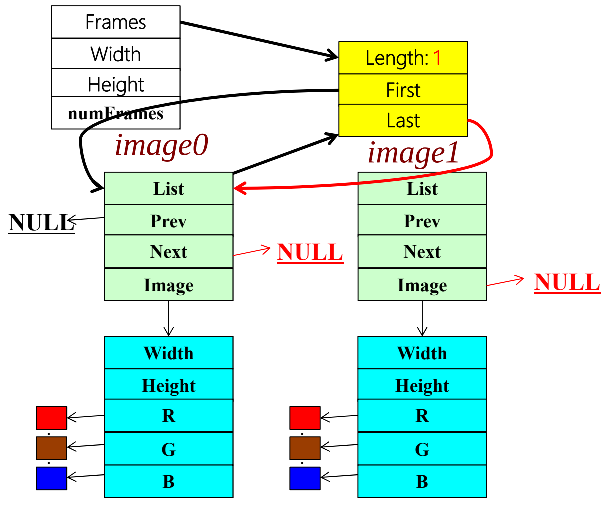


Double-Linked List: Length = 2

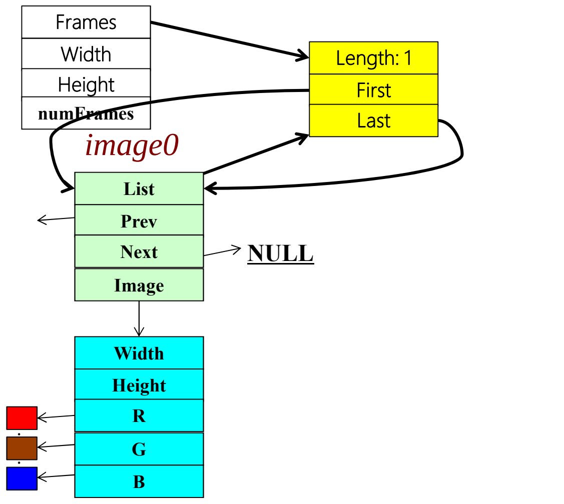




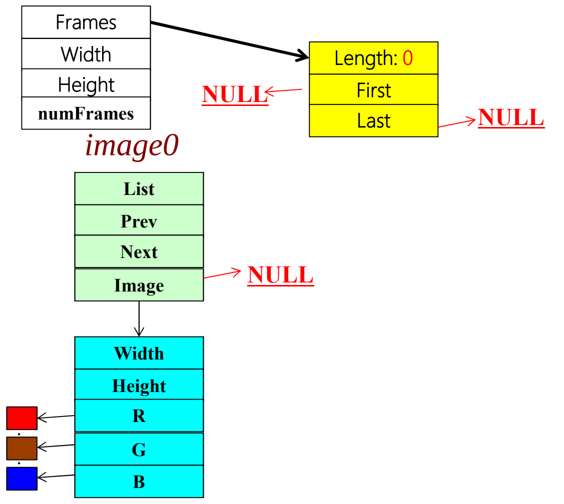
Double-Linked List: RemoveLast



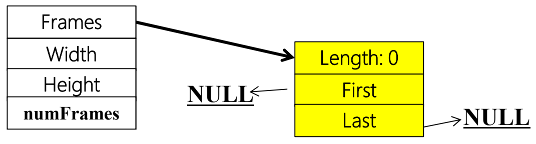
DOUBLE-LINKED LIST: LENGTH = 1



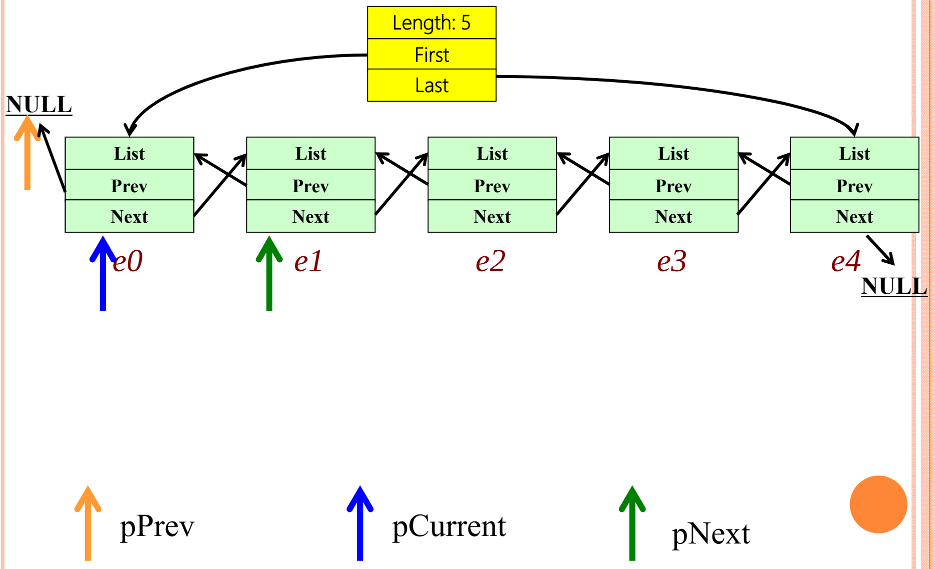
DOUBLE-LINKED LIST: REMOVELAST

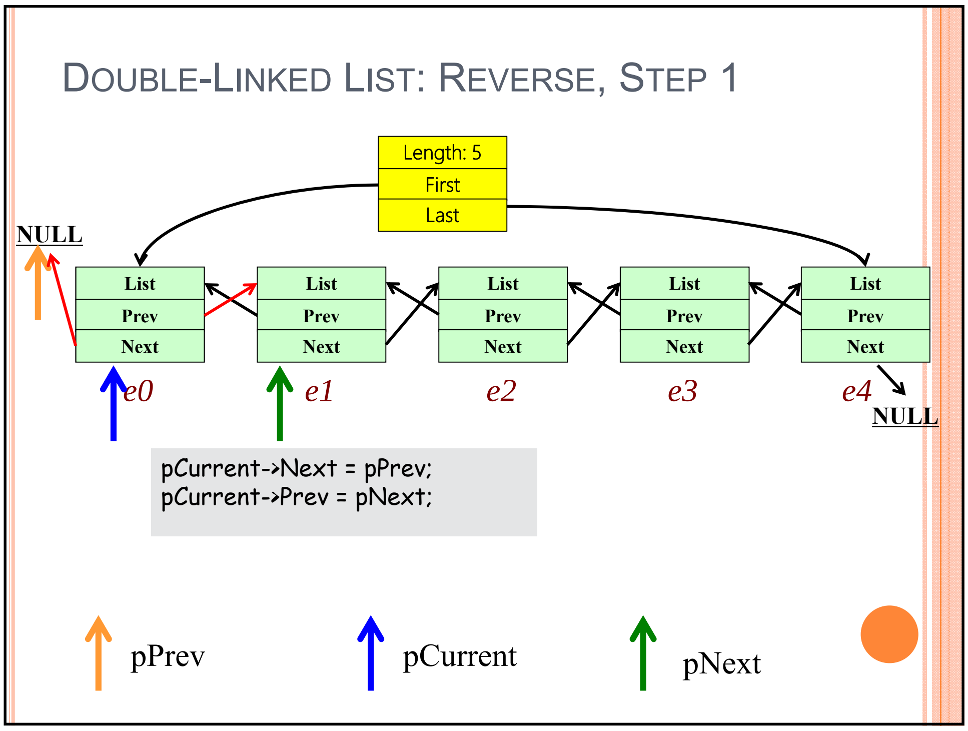


Double-Linked List: EMPTY



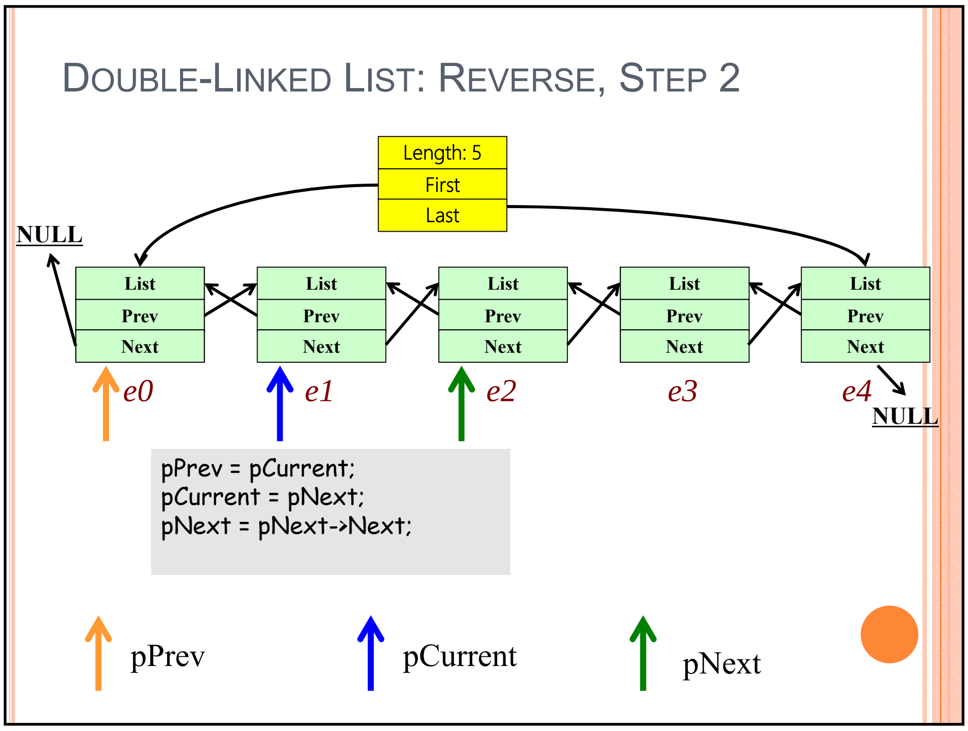
Double-Linked List: Reverse, Initial





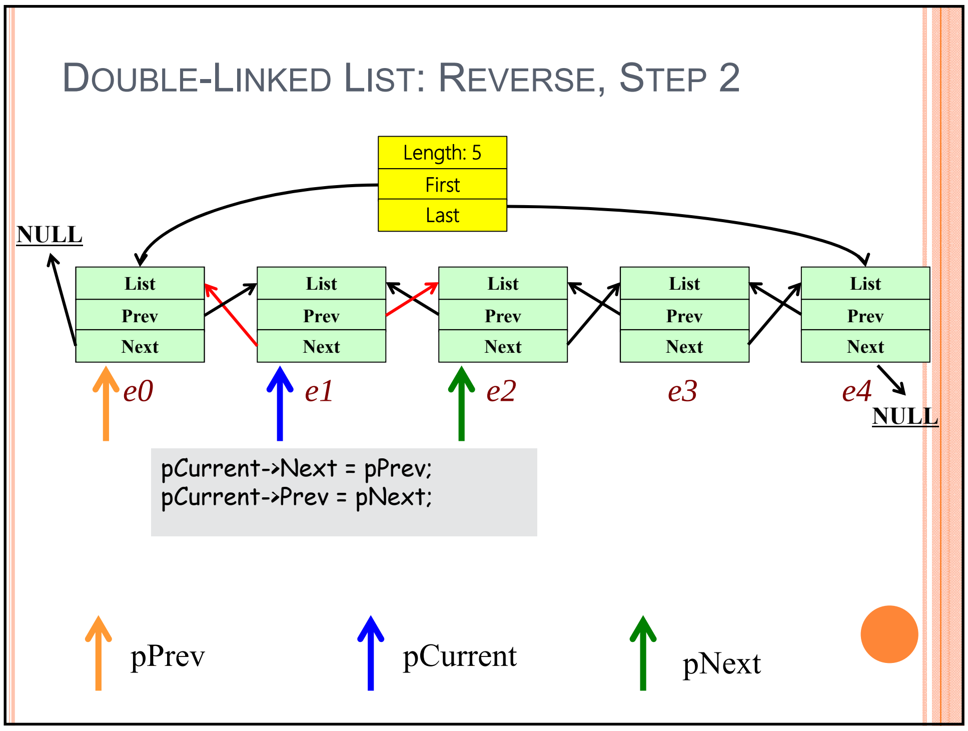
Double-Linked List: Reverse, Step 1

```
pCurrent->Next = pPrev;
pCurrent->Prev = pNext;
```



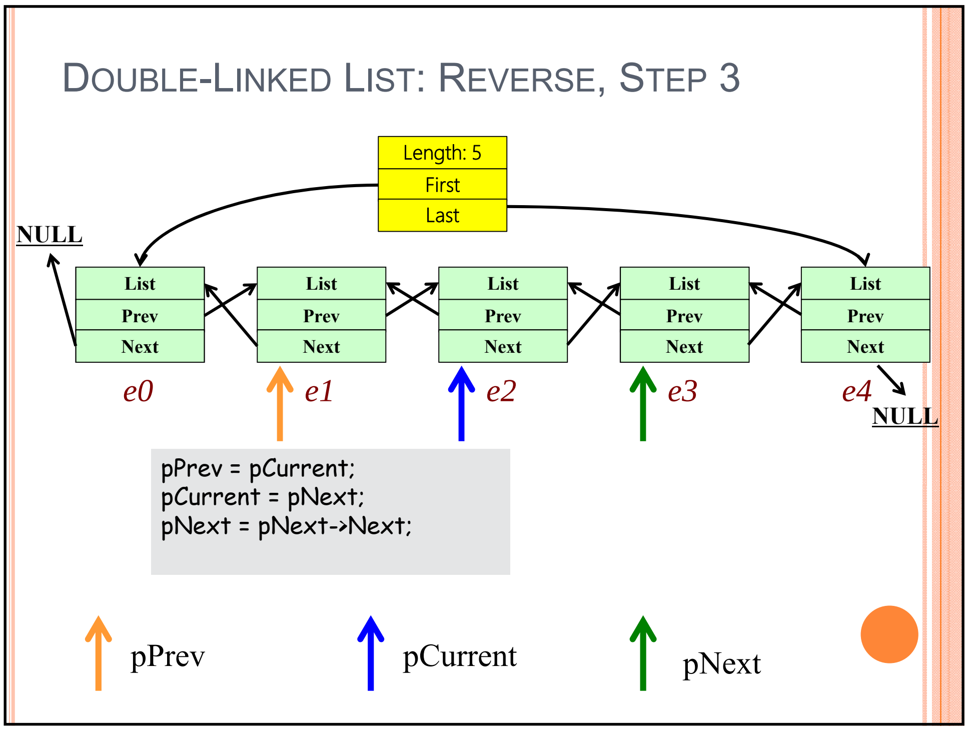
Double-Linked List: Reverse, Step 2

```
pPrev = pCurrent;
pCurrent = pNext;
pNext = pNext->Next;
```



Double-Linked List: Reverse, Step 2

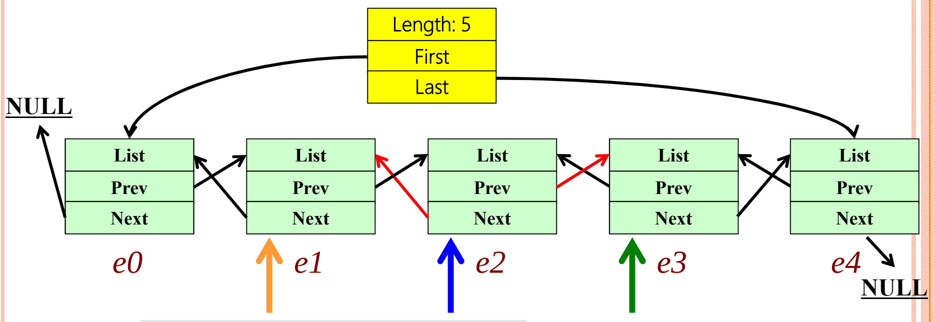
```
pCurrent->Next = pPrev;
pCurrent->Prev = pNext;
```



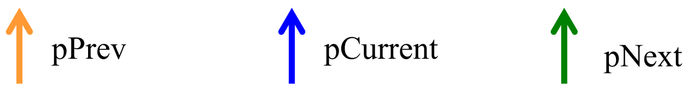
Double-Linked List: Reverse, Step 3

```
pPrev = pCurrent;
pCurrent = pNext;
pNext = pNext->Next;
```

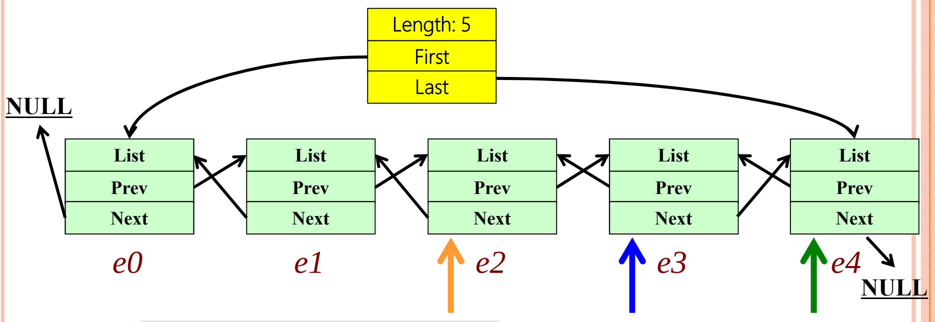
Double-Linked List: Reverse, Step 3



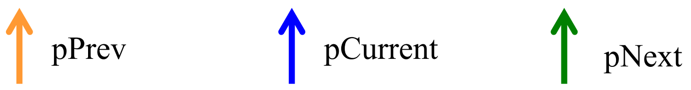
```
pCurrent->Next = pPrev;
pCurrent->Prev = pNext;
```

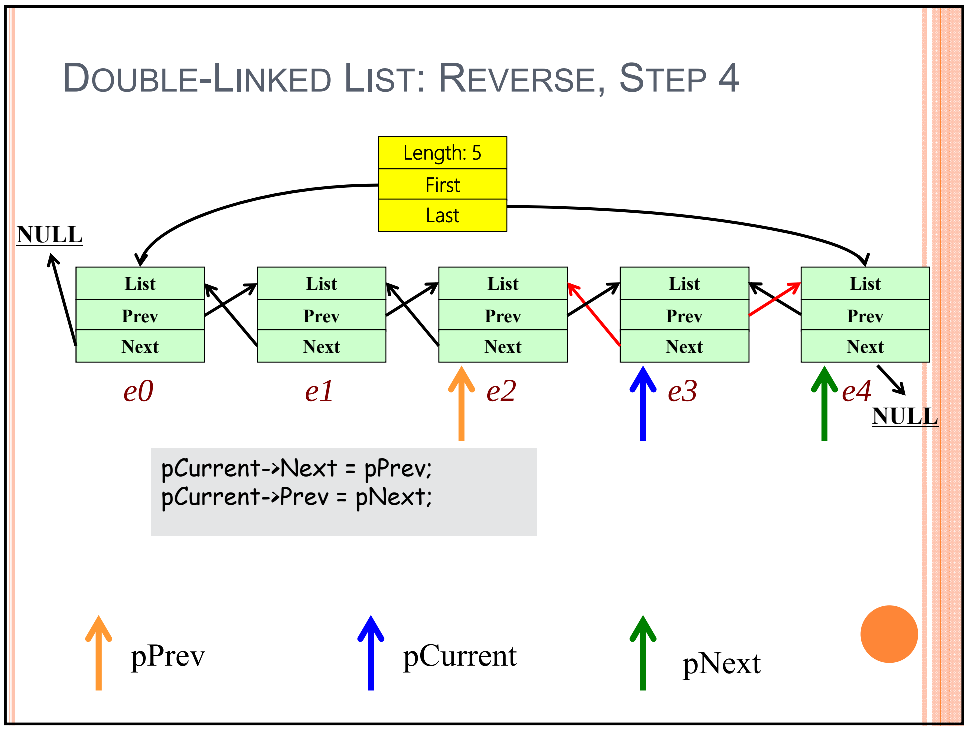


Double-Linked List: Reverse, Step 4

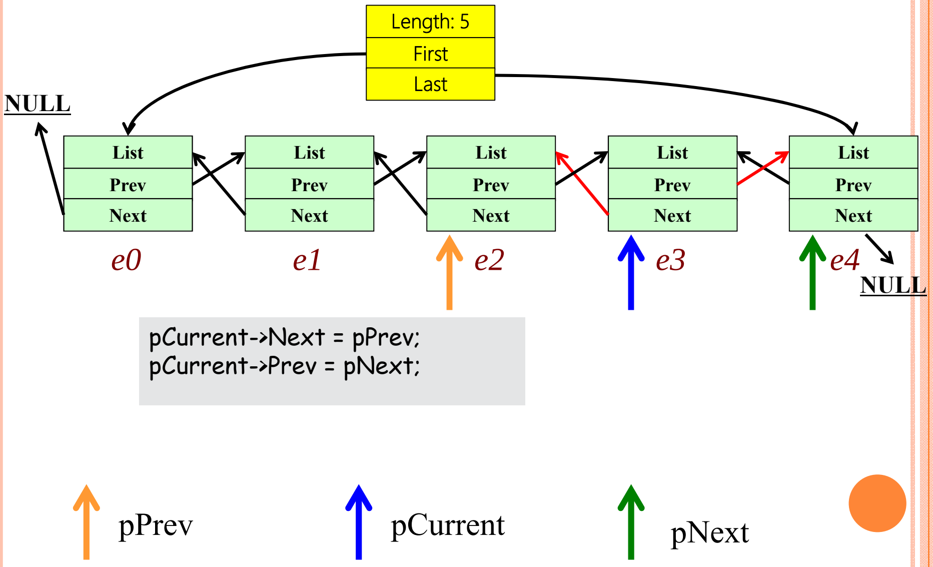


```
pPrev = pCurrent;
pCurrent = pNext;
pNext = pNext->Next;
```

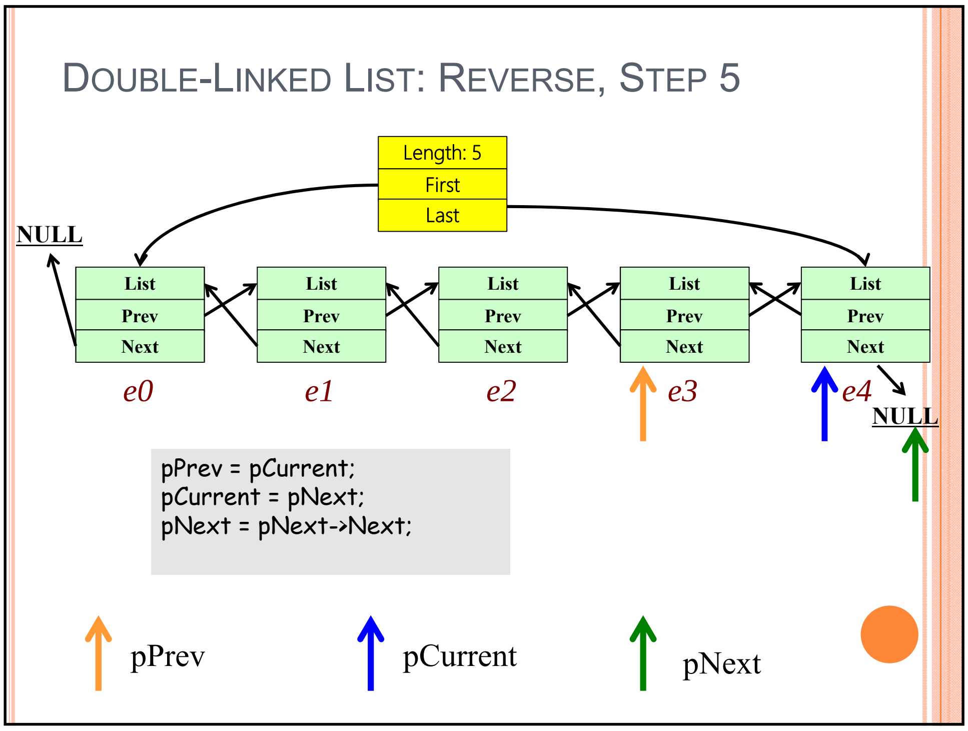




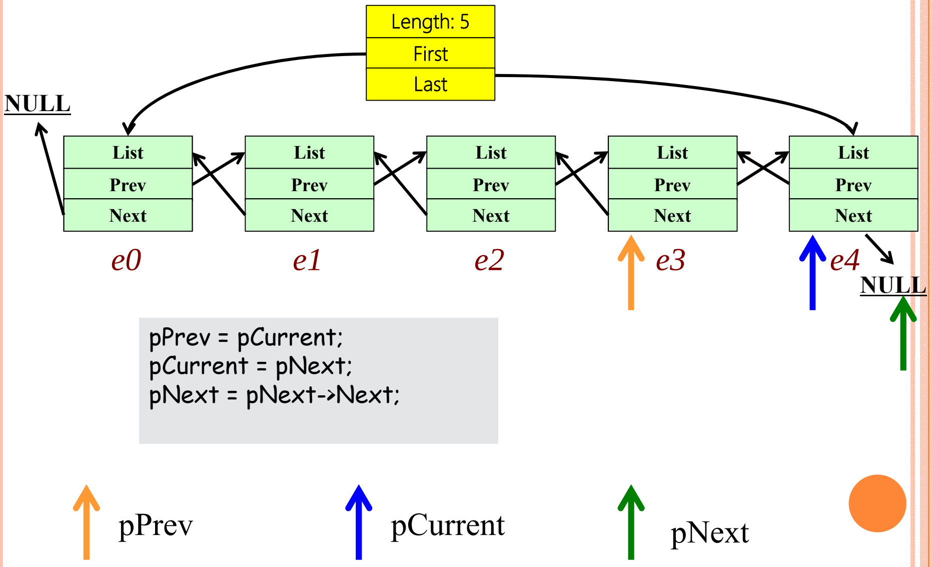
Double-Linked List: Reverse, Step 4



```
pCurrent->Next = pPrev;
pCurrent->Prev = pNext;
```

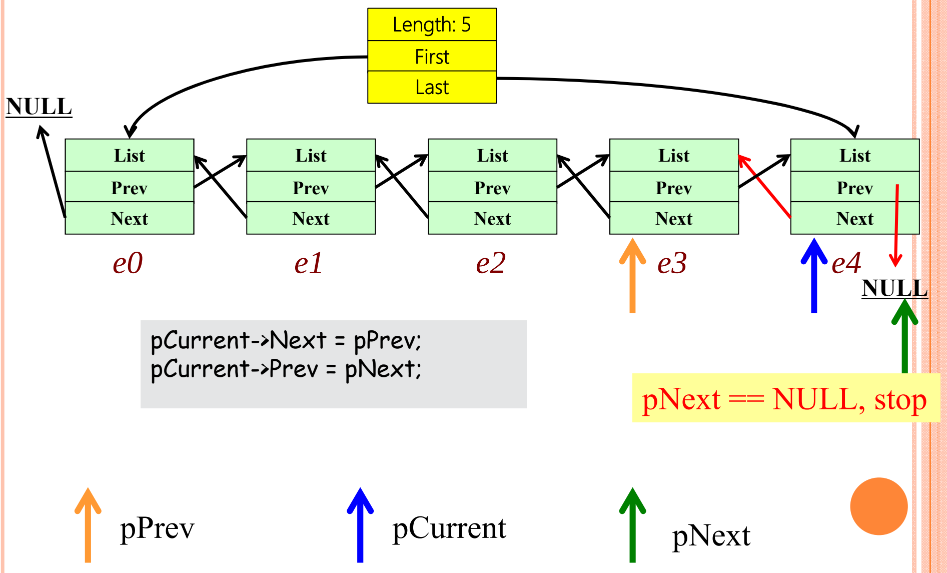


Double-Linked List: Reverse, Step 5



```
pPrev = pCurrent;
pCurrent = pNext;
pNext = pNext->Next;
```

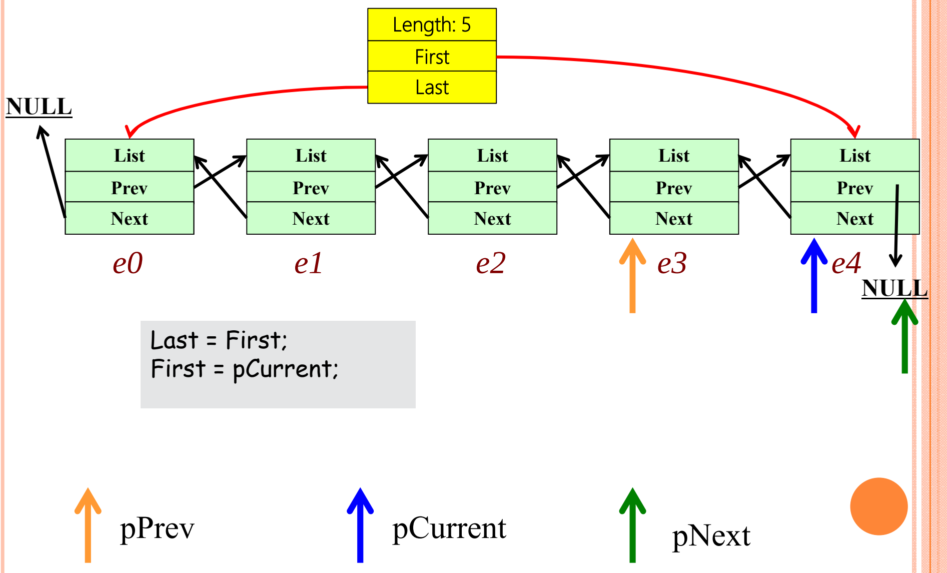
Double-Linked List: Reverse, Step 5



```
pCurrent->Next = pPrev;
pCurrent->Prev = pNext;
```

pNext == NULL, stop

Double-Linked List: Reverse, Final Step



```
Last = First;
First = pCurrent;
```