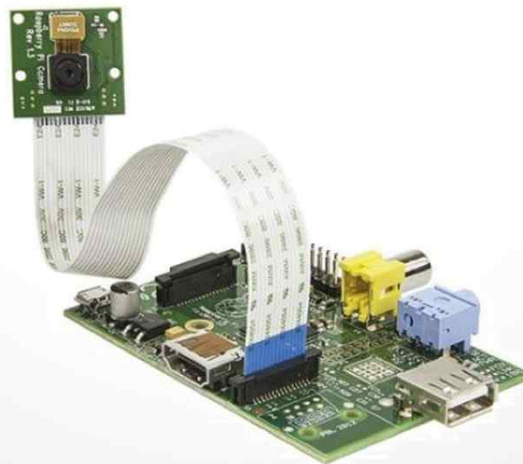


가시광선과 적외선 영역에서 영상처리를 이용한 화재 감지



Raspberry pi

김윤관 교수님
김영수
권지현
한지웅
홍단비

Contents

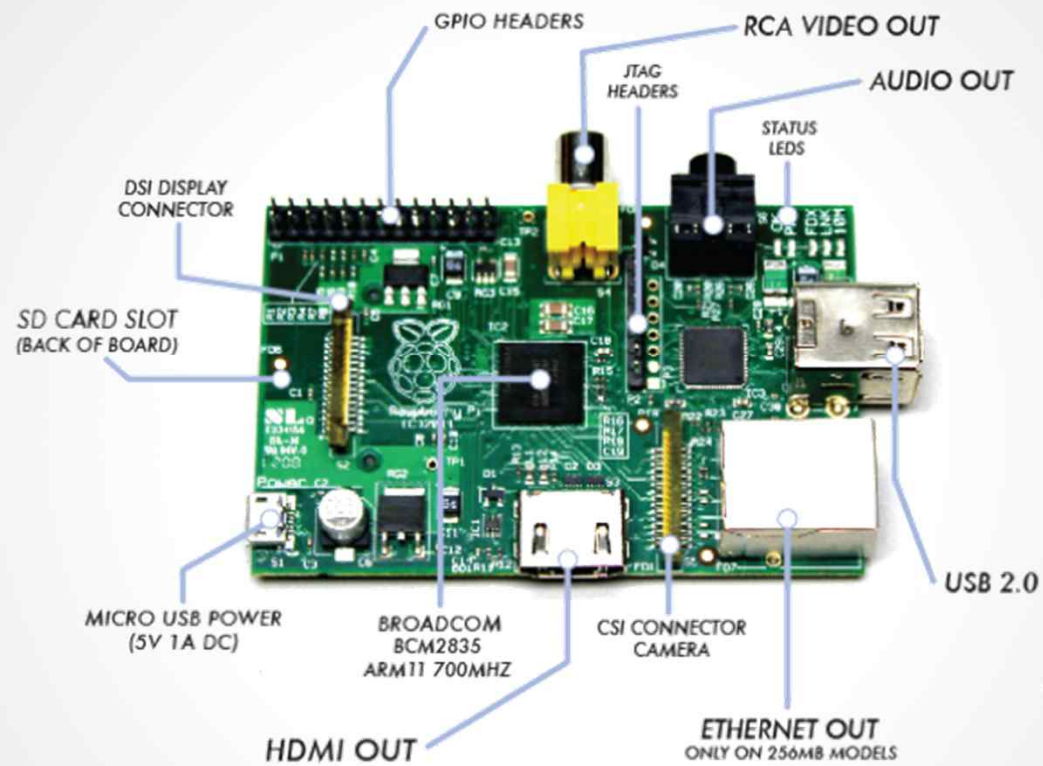


Motive
Platform
Proposal
Architecture
Flow Chart
Detail
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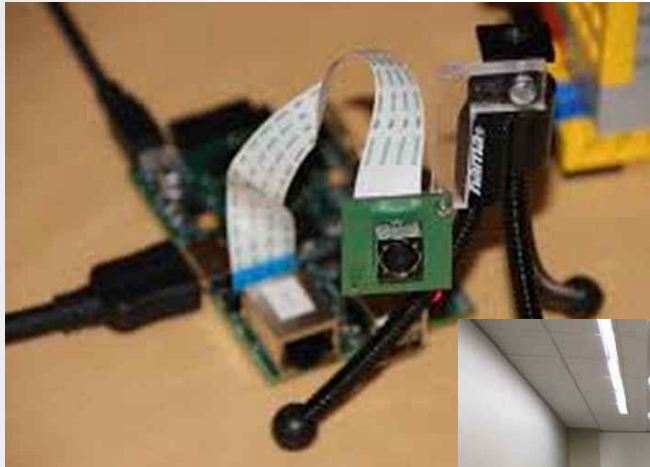
| Motive



Platform



| Proposal



| Proposal | idea



Fire Detection System

| Proposal | idea



일반



적외선

Architecture

Client



Color Board

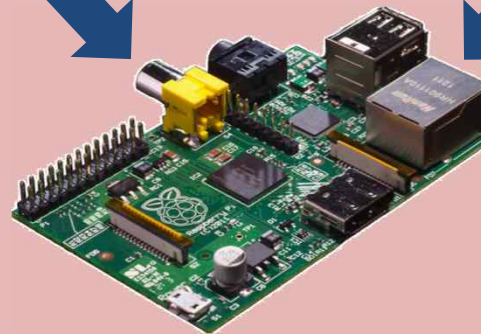


Red Board



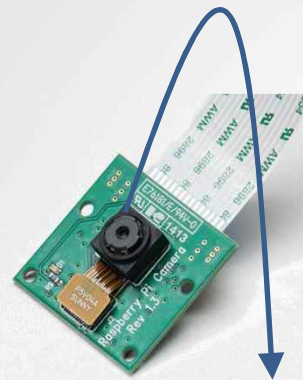
Socket

Server



Server Board

Flow Chart



R G B

Blurring

**R G B
Thresholding**



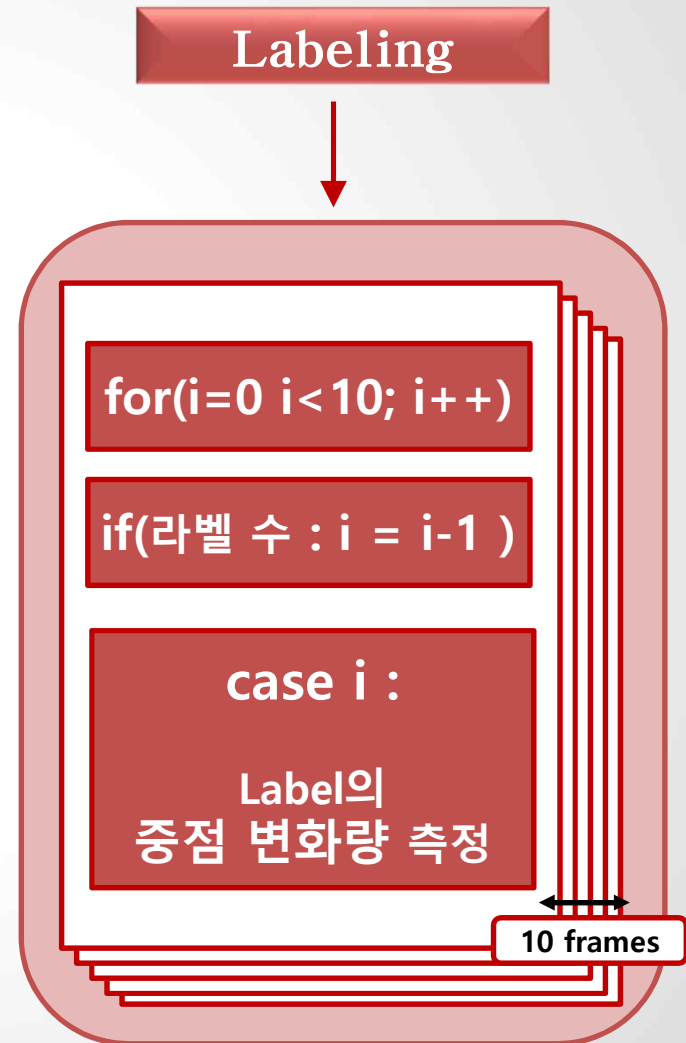
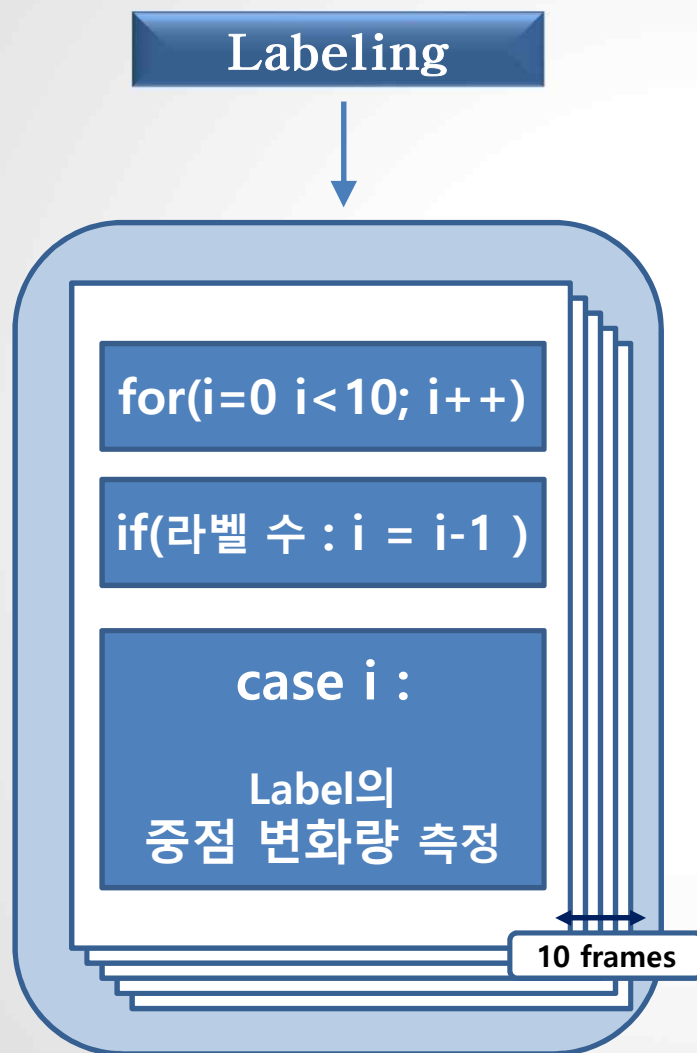
Y Cb Cr

Blurring

**Y
Thresholding**

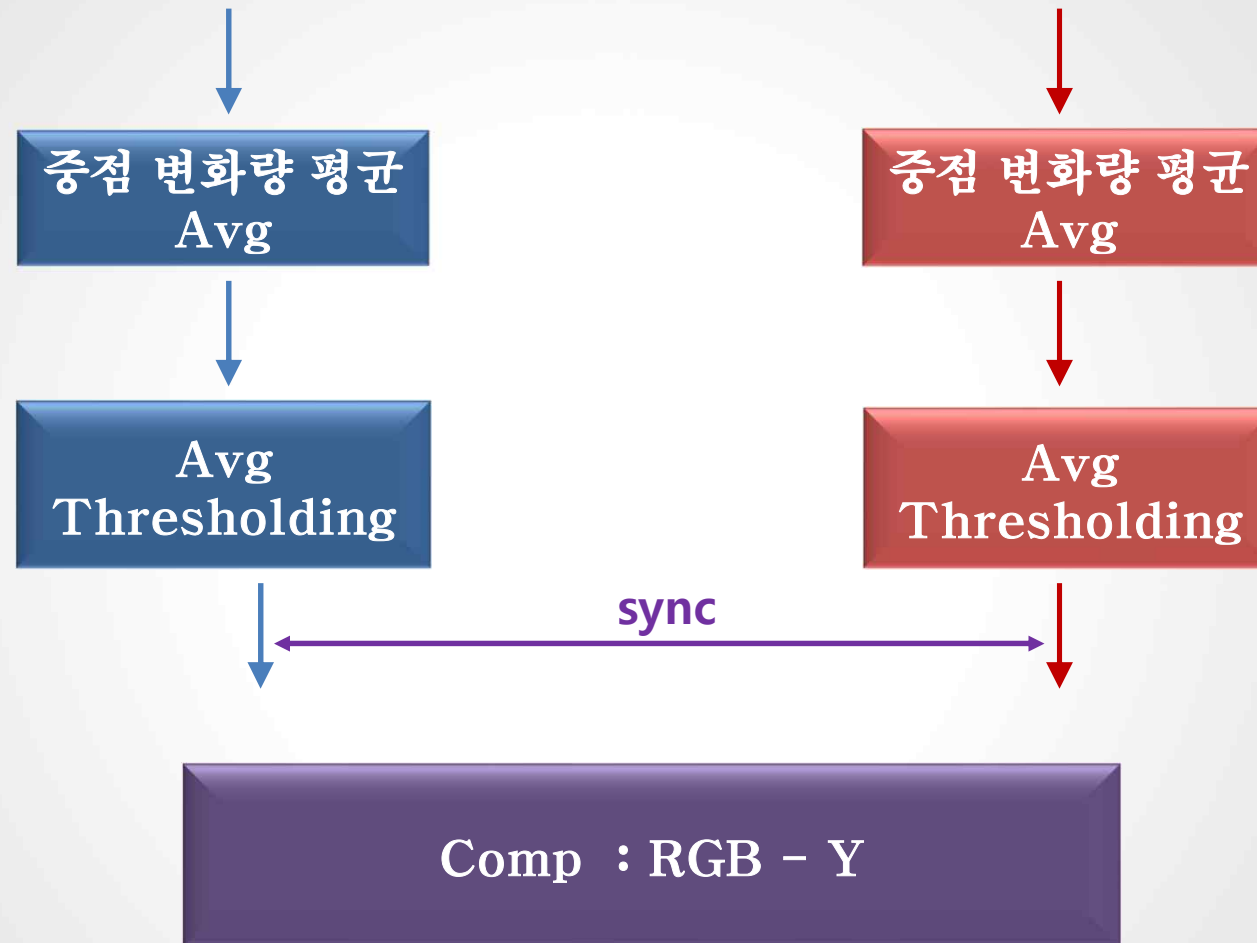
Static image filter ↓

Flow Chart



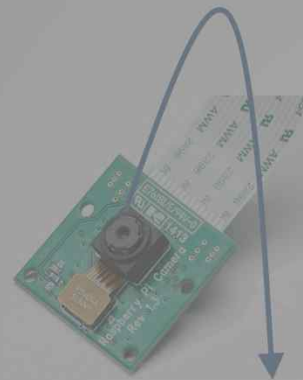
Dynamic image filter ↓

Flow Chart



Static + Dynamic image filter ↓

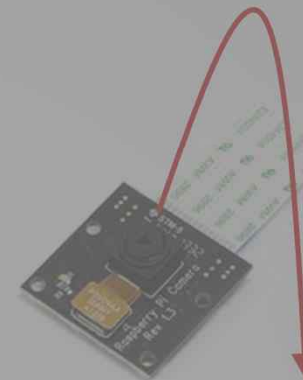
Flow Chart



R G B

Blurring

**R G B
Thresholding**



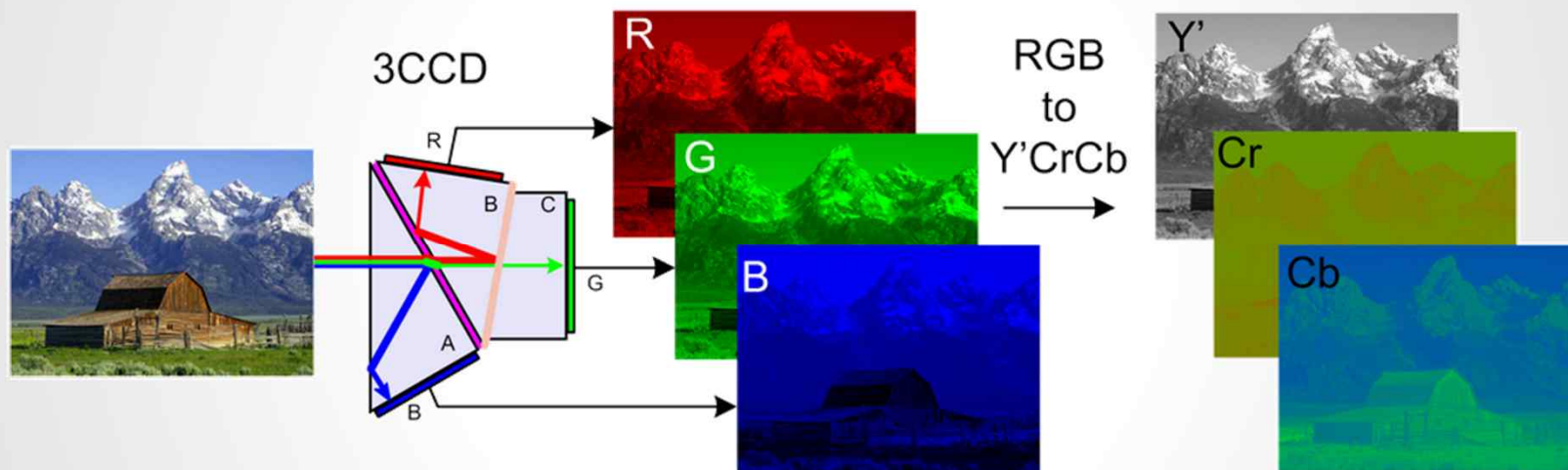
Y Cb Cr

Blurring

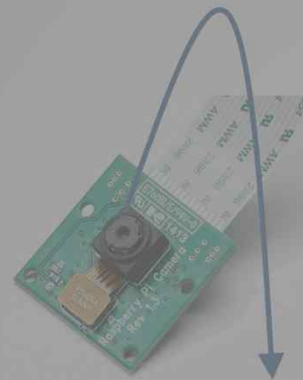
**Y
Thresholding**

Static image filter ↓

| Detail | Image Format



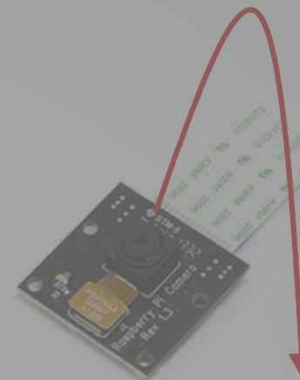
Flow Chart



R G B

Blurring

**R G B
Thresholding**



Y Cb Cr

Blurring

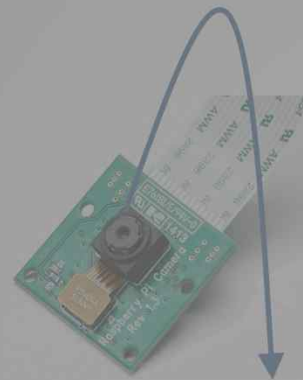
**Y
Thresholding**

Static image filter ↓

| Detail | Blurring



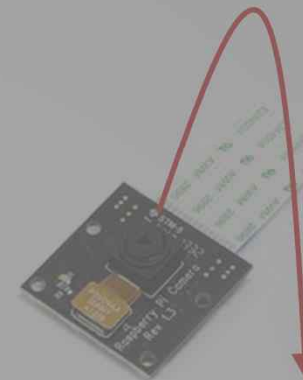
Flow Chart



R G B

Blurring

**R G B
Thresholding**



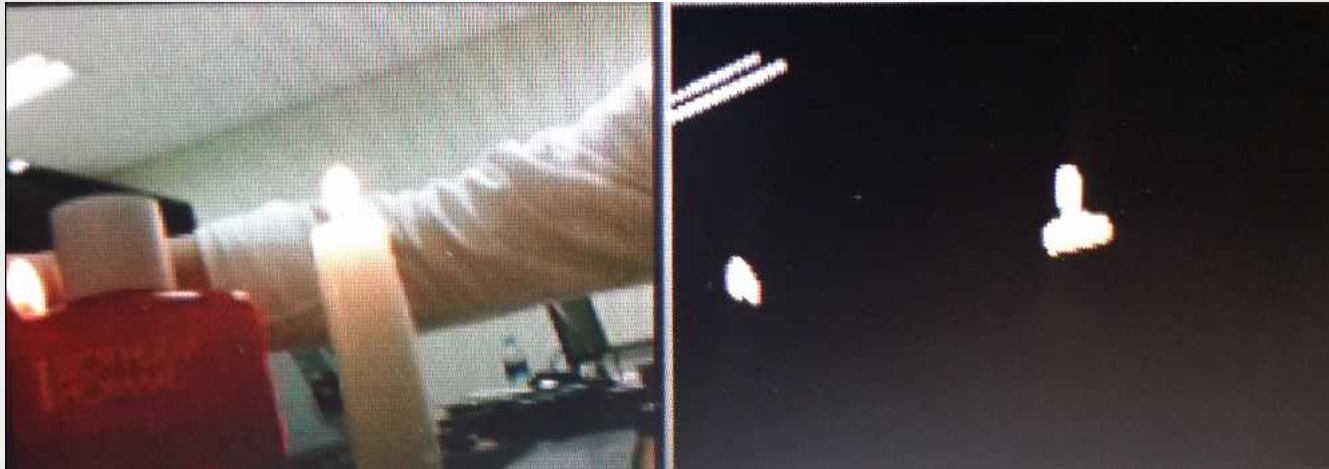
Y Cb Cr

Blurring

**Y
Thresholding**

Static image filter ↓

| Detail | Thresholding

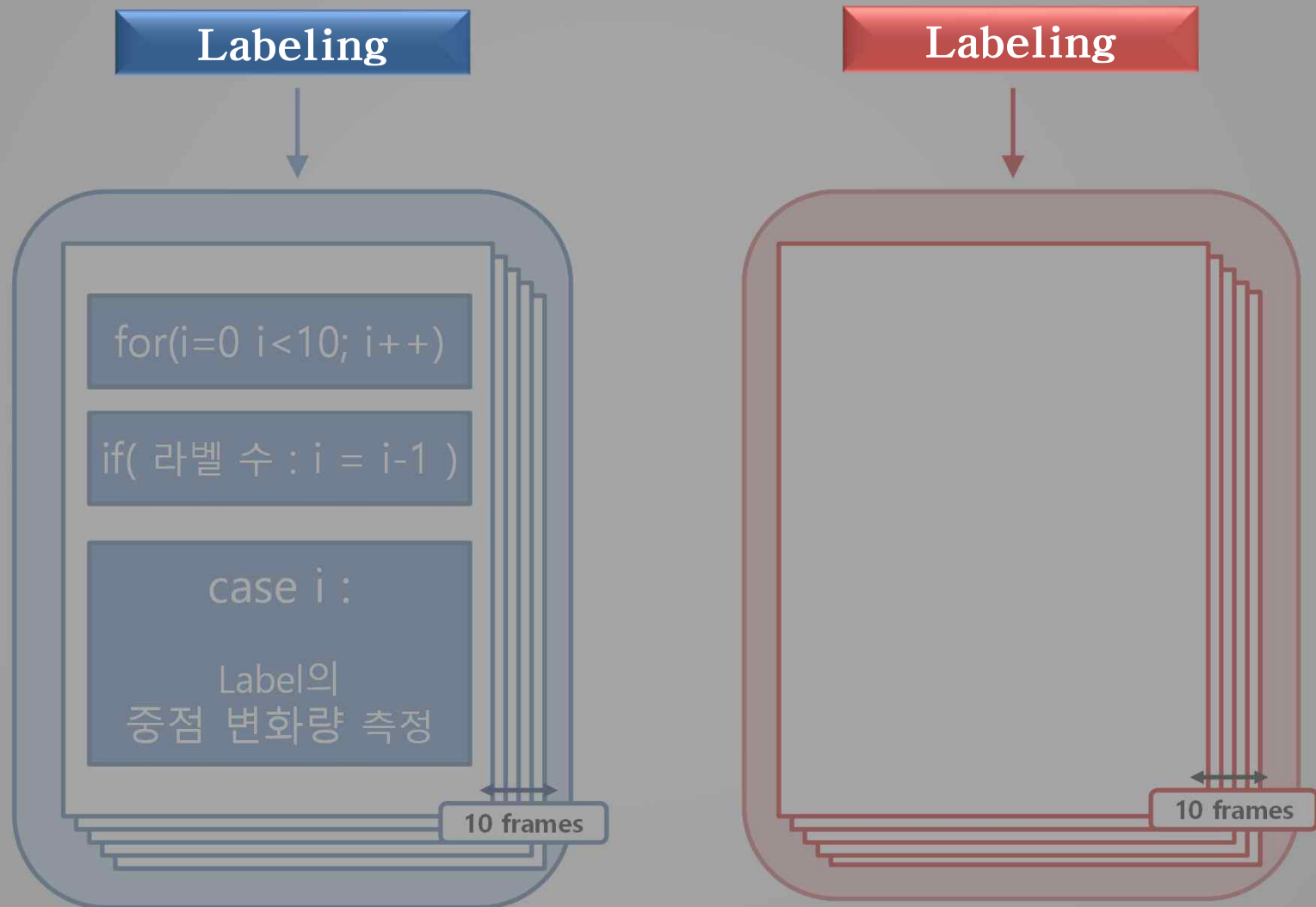


Color



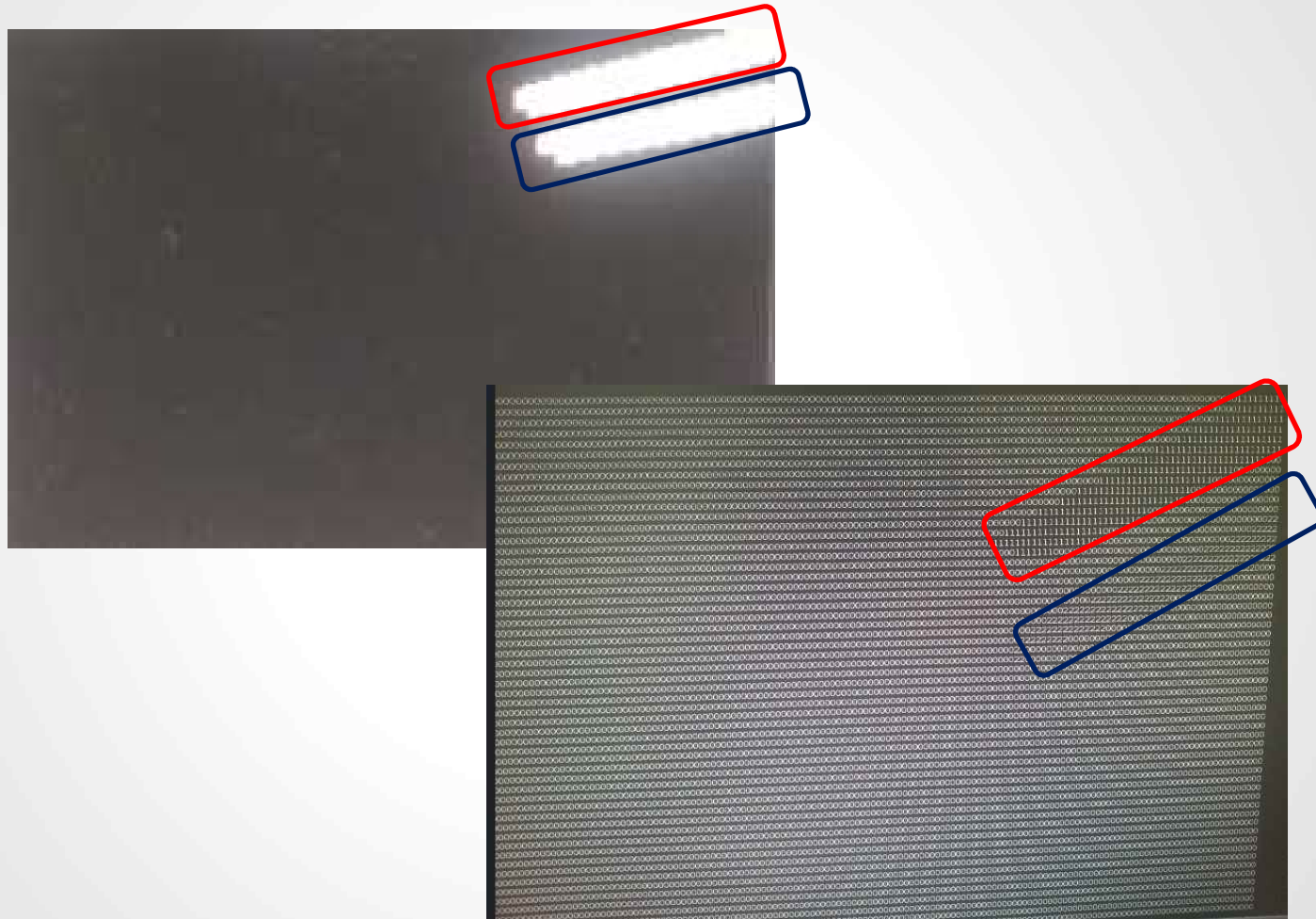
Infrared

Flow Chart



Dynamic image filter ↓

| Detail | Labeling



Detail | Labeling

```
// Labeling Start : X, Y axis data store...

for(int i=0; i< height; i++)
{
    for(int j=0; j< width; j++)
    {
        offset = j*nchannels;

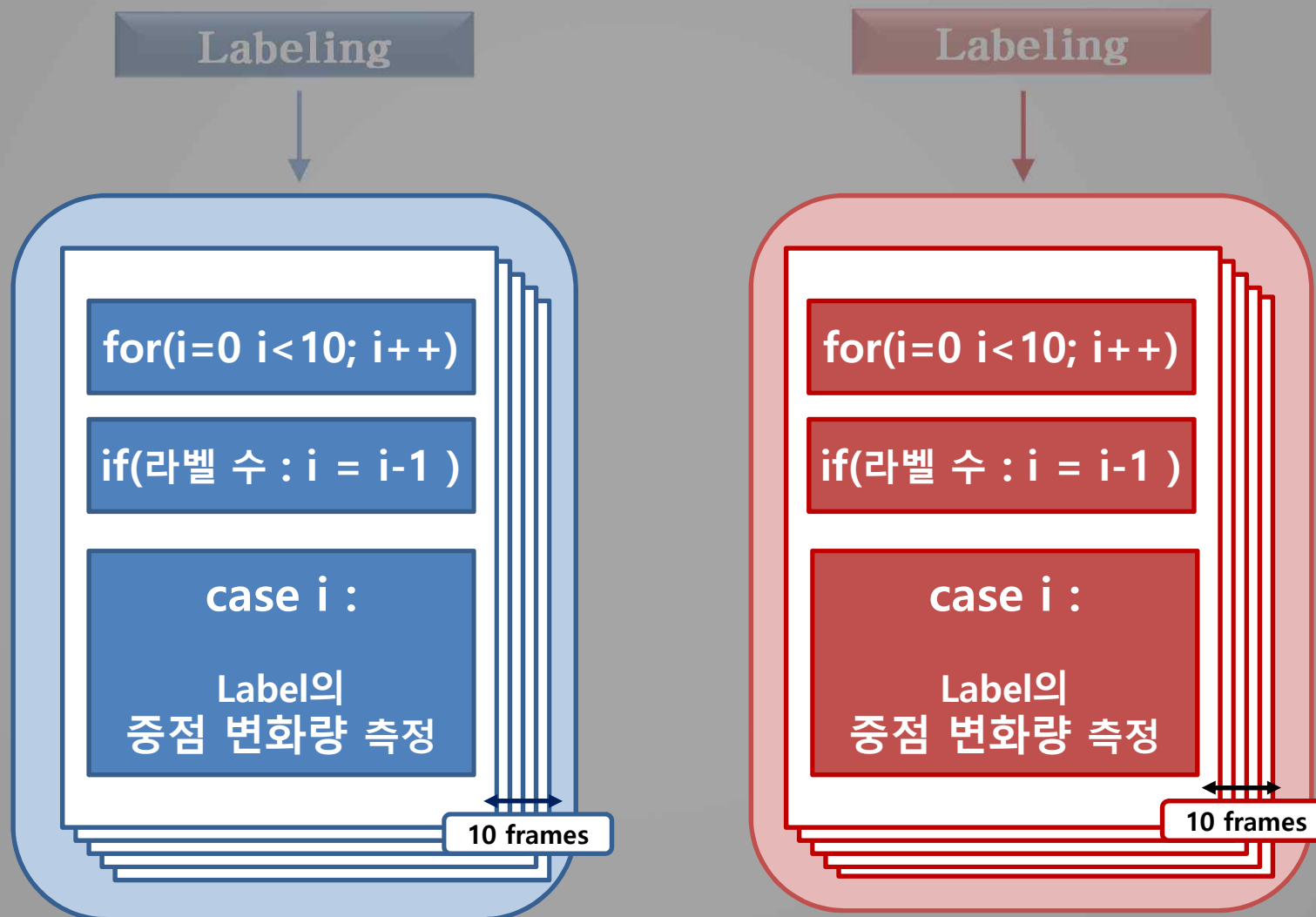
        // Labeling Start
        if(img->imageData[i*step+offset+0] >= TH_B &&
            img->imageData[i*step+offset+1] >= TH_G &&
            img->imageData[i*step+offset+2] >= TH_R)
        {
            if(i==0 && j==0)    // Case 1 : (0,0)
            {
                label++;
                ptr[i][j] = label;
                eq_tbl[label-1][0] = label;
                eq_tbl[label-1][1] = label;
            }
            else if(i==0)    // Case 2 : (0,y)
            {
                if(ptr[i][j-1] != 0)
                    ptr[i][j] = ptr[i][j-1];
                else
                {
                    label++;
                    ptr[i][j] = label;
                    eq_tbl[label-1][0] = label;
                    eq_tbl[label-1][1] = label;
                }
            }
            else    // Case 4 : Others...
            {
                if( (ptr[i-1][j] !=0) && (ptr[i][j-1] !=0) )
                {
                    if(ptr[i-1][j] == ptr[i][j-1]) // if i-1 equal j-1
                    {
                        ptr[i][j] = ptr[i-1][j];
                    }
                    else // if i-1 not_equal j-1
                    {
                        maxL = MAXX(ptr[i-1][j], ptr[i][j-1]);
                        minL = MINN(ptr[i-1][j], ptr[i][j-1]);

                        ptr[i][j] = minL;

                        min_eq = MINN(eq_tbl[maxL-1][1], eq_tbl[minL-1][1]);

                        eq_tbl[(eq_tbl[maxL-1][1])-1][1] = min_eq;
                        eq_tbl[maxL-1][1] = min_eq;
                        eq_tbl[minL-1][1] = min_eq;
                    }
                }
                else if( ptr[i-1][j] !=0 )
                {
                    ptr[i][j] = ptr[i-1][j];
                }
                else if( ptr[i][j-1] !=0 ) else
                {
                    ptr[i][j] = ptr[i][j-1];    label++;
                }
                else
                {
                    label++;
                    ptr[i][j] = label;
                    eq_tbl[label-1][0] = label;
                    eq_tbl[label-1][1] = label;
                }
            }
        }
    }
}
```

Flow Chart



Dynamic image filter ↓

Detail | Inter Frame

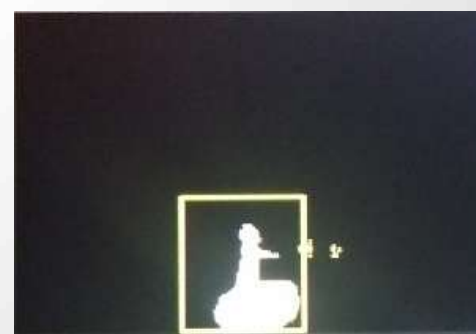
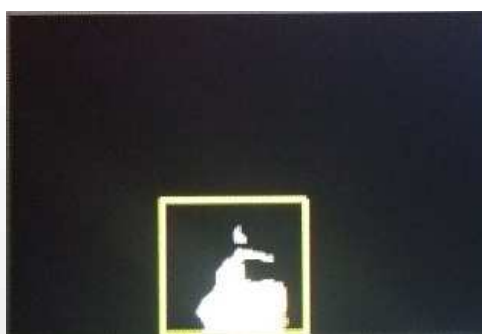
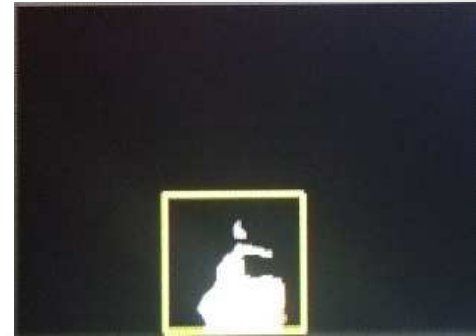
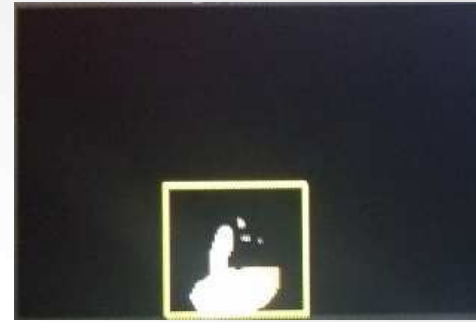
```
// Step 4 : change of rate for void inter_frame_comp(void)
{
    if(cnt!=pre_cnt)    base_frame
    if(base_frame_set) // if any
    {
        inter_frame_comp(); // com
        inter_frame_count++;
        if(inter_frame_count == 10
            saved_10frame = 1;
    }
    if(saved_10frame)
    {
        // processing comp..
        // Average , rate of chang
        for(int i=inter_frame_cour
            for(int c=0;c<cnt;c++)
                for(int j=0;j<4;j+
                    total_avg[j] +
    }
}

int temp_min_X, temp_min_Y, temp_max_X, temp_max_Y;

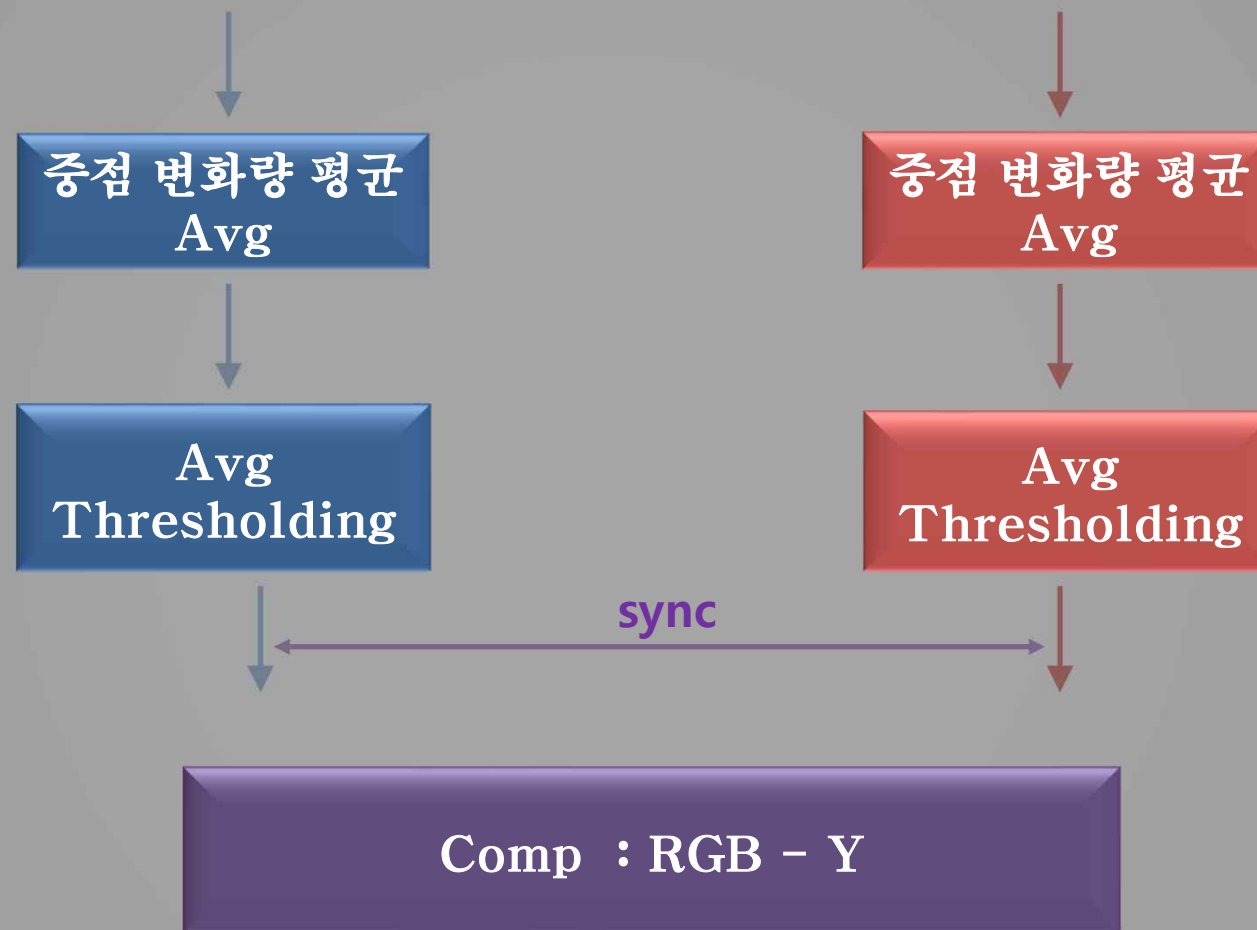
for(int c;c<cnt;c++)    // cnts (pre and now) are always the same
{
    temp_min_X = pre_min_XY[cnt][0] - min_XY[cnt][0];
    if(temp_min_X < 0)    temp_min_X*(-1);
    temp_min_Y = pre_min_XY[cnt][1] - min_XY[cnt][1];
    if(temp_min_Y < 0)    temp_min_Y*(-1);
    temp_max_X = pre_max_XY[cnt][0] - max_XY[cnt][0];
    if(temp_max_X<0)    temp_max_X*(-1);
    temp_max_Y = pre_max_XY[cnt][1] - max_XY[cnt][1];
    if(temp_max_Y < 0)    temp_max_Y*(-1);

    change_rate[inter_frame_count][cnt][0] = temp_min_X;
    change_rate[inter_frame_count][cnt][1] = temp_min_Y;
    change_rate[inter_frame_count][cnt][2] = temp_max_X;
    change_rate[inter_frame_count][cnt][3] = temp_max_Y;
}
```

| Detail | Inter Frame



Flow Chart



Static + Dynamic image filter ↓

| Detail | Server



R G B



Y Cb Cr



Fire Color Model

R : 190 ~ 255

G : 190 ~ 255

B : 170 ~ 255

Y : 200 ~ 255

| Issue

Critical Labeling Algorithm

Auto Exposure Problem

Limited Hardware Platform

| Q & A

THANK YOU
Q & A