/\*This document contains the program and explanation for object detection and tracking motion and sending a video of it via email.One can use this program as it is totally free.the different steps of the program is:\*/

#include <iostream>

#include <opencv2/highgui/highgui.hpp>

#include <opencv2/imgproc/imgproc.hpp>

#include <opencv2/core/core.hpp>

#include <stdio.h>

using namespace std;

using namespace cv;

int main(int argc,char\*\* argv)

{

Mat src,src2,dst,thresh,img;

int f=0,flag=0,t=0,a=0,s=0;

vector<vector<Point> >contours;

vector<Vec4i>hierarchy;

RNG rng(12345);

namedWindow("out",CV\_WINDOW\_AUTOSIZE);

//input object to capture images from webcam

CvCapture\* cap;

cap = cvCaptureFromCAM(0);

//output writer that writes the frames to the output video

VideoWriter outputVideo;

Size S = Size((int)cvGetCaptureProperty(cap,CV\_CAP\_PROP\_FRAME\_WIDTH),

(int)cvGetCaptureProperty(cap,CV\_CAP\_PROP\_FRAME\_HEIGHT));

//then you open the output video where to write with given parmeters

outputVideo.open("motion.avi",CV\_FOURCC('X','V','I','D'),1,S,true);

/\*Here,”motion.avi” is the name of your final file,CV\_FOURCC is a four letter codec that is used for different images and videos,1 is the frame rate of output video,S is the size,true is for color video(if false-it will be grayscale)\*/

if(!outputVideo.isOpened())

{

cout<<"could not open file to write"<<endl;

return -1;

}

//this loop will track motion forever until someone presses the Esc key

while(true)

{

img = cvQueryFrame(cap);

cvtColor(img,src,CV\_BGR2GRAY); /\*convert the source image to gray as we want to detect image in 1-D only\*/

/\*next step is to remove noise,so you apply filter to remove it.I have used Gaussian one with kernel 7 standarddeviations 0,0 in both directions,you can apply different blurs with different kernels as per your use\*/

GaussianBlur(src,src,Size(7,7),0,0);

/\*as we have to compare two consecutive frames for tracking motion,we have to copy image from cam to src2 to initialize it(as it was empty)\*/

if(f==0)

src.copyTo(src2);

//frame comparison starts from second frame

if(f>0)

{

absdiff(src,src2,dst);

/\*this is the function which will find the absolute differences of each pixel in the two consecutive frames and store the result in dst\*/

dst = dst.mul(dst);

//to remove negative pixels we have squared the dst

int s = sum(dst)[0];

/\*then sum up whole pixels in the dst which will work for the threshold value,as for my case I had taken 90000 but you change it as your requirement\*/

if(s>90000)

{

t++;

/\*this is the variable that will iterates,if its values goes above 5 the detected motion will be send via email\*/

threshold(dst,thresh,254,255,THRESH\_BINARY);

//I had applied threshold to get only the white regions of an image dst

findContours(thresh,contours,hierarchy,CV\_RETR\_EXTERNAL,CV\_CHAIN\_APPROX\_TC89\_KCOS,Point(0,0));

/\*This is the function which is used to find the contours of an grayscale image

And will store the result in a Mat object contours\*/

vector<Rect>boundRect(contours.size());

//vector for bounding Rectangles in an image

vector<vector<Point> >hull( contours.size() );

//2D vector for convex hull

for( int i = 0; i < contours.size(); i++ )

{

convexHull( Mat(contours[i]), hull[i], false );

boundRect[i] = boundingRect(hull[i]);

}

//draw the convex hull for each object in an image

Mat drawing = Mat::zeros(thresh.size(),CV\_8UC3);

for(int i= 0;i<contours.size();i++)

if(boundRect[i].width>=20 || boundRect[i].height>=30) rectangle(drawing,r[i].tl(),r[i].br(),Scalar(0,0,255),2,8,0);

//to draw the bounding boxes across the hulls

addWeighted(img,0.5,drawing,0.5,0.0,img);

/\*as we have made the bounding boxes in an grayscale image,and we have to show it in color image(RGB one) so we blend both the images\*/

outputVideo.write(img);

//finally we write the frames to the output video file

}

else

t=0;

//this will put the tick to track motion to zero if the motion is less than 5 frames

if(t>=5)

{

system("echo 'this is the test' | mutt -s Testing -a motion.avi -- akansh\_agrawal25@yahoo.com");

t=0;

/\*the system call will send the email to the specific email address given with the video

t again is set to zero,so that after 5 frames again it will send the email\*/

}

}

src.copyTo(src2);

f++;

waitKey(5);

}

return 0;

}