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% Les Eaux Mortes - Projet Scientifique en Equipe - ESPCI ParisTech -
  Mai 2016

close all;
clear all;
clc;

% Temps d#but et fin en secondes (modifiable)
tmin=1
tmax=20

flag=input('Changer les temps de d#but et de fin de la vid#o? (Non =
  0, Oui = 1) \n');
if flag==1
    tmin=input('Td#but = ');
    tmax=input('Tfin = ');
end

% Chemin du dossier (modifiable)
workingDir = 'C:\Users\PSE\Google Drive\PSE\exp 23 octobre';
% mkdir(workingDir,'images')

% Nom du fichier (modifiable)
shuttleVideo=VideoReader('5.MOV');

shuttleVideo.CurrentTime=tmin;
fps=shuttleVideo.FrameRate;

img = readFrame(shuttleVideo);
figure(1);
imagesc(img);
title('Cliquer en haut # gauche puis en bas # droite de la zone #
  consid#rer, puis appuyer sur ENTREE')
[X,Y]=getpts(1);
X=floor(X);
Y=floor(Y);
title('PROCESSING ')
vidHeight = shuttleVideo.Height;
vidWidth = shuttleVideo.Width;

s = struct('cdata',zeros(vidHeight,vidWidth,3,'uint8'));

k = 1;
while shuttleVideo.CurrentTime <= tmax/4
    s(k).cdata = readFrame(shuttleVideo);
    s(k).cdata = s(k).cdata(Y(1):Y(2),X(1):X(2));
    k = k+1;
end

title('PROCESSING -- 25%')

while shuttleVideo.CurrentTime <= tmax*(2/4)

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        s(k).cdata = readFrame(shuttleVideo);
        s(k).cdata = s(k).cdata(Y(1):Y(2),X(1):X(2));
        k = k+1;
    end

    title('PROCESSING ----- 50%')

    while shuttleVideo.CurrentTime <= tmax*(3/4)
        s(k).cdata = readFrame(shuttleVideo);
        s(k).cdata = s(k).cdata(Y(1):Y(2),X(1):X(2));
        k = k+1;
    end

    title('PROCESSING ----- 75%')
    while shuttleVideo.CurrentTime <= tmax
        s(k).cdata = readFrame(shuttleVideo);
        s(k).cdata = s(k).cdata(Y(1):Y(2),X(1):X(2));
        k = k+1;
    end

    colormap gray
    imagesc(s(1).cdata);
    title('Cliquer sur le premier point # consid#rer')
    [Xd,Yd]=getpts;
    imagesc(s(k-1).cdata);
    title('Cliquer sur le dernier point # consid#rer')
    [Xf,Yf]=getpts;

    x=improfile(s(1).cdata,[floor(Xf),floor(Xd)],[floor(Yf),floor(Yd)]);
    for j=2:k-1
        x=[x impfile(s(j).cdata,[floor(Xf),floor(Xd)],[floor(Yf),floor(Yd)]);
    end

    colormap gray;
    hold on;
    imagesc(s(k-1).cdata);
    title('Axe du reslice')
    line([floor(Xf),floor(Xd)],[floor(Yf),floor(Yd)],'Color','r','LineWidth',2)
    hold off;
    pause(2);

    % Modifiable
    Seuil=0;
    ratio=14.5;

    imagesc(x);
    title('Cliquer en bas # gauche et en haut # droite de la zone #
        consid#rer')
    [Xx,Yx]=getpts(1);
    Xx=floor(Xx);

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Yx=floor(Yx);

newX = x(Yx(2):Yx(1),Xx(1):Xx(2));

subplot(2,2,1);
imagesc(newX)
axis image
colormap gray
[nl,nc]=size(newX);
vecx= reshape(newX,1,nl*nc);
vecx=double(vecx);

t=SeuilOtsu(vecx);

subplot(2,2,2);

xseuil=(newX>t+Seuil);

% Lissage de la courbe
se = strel('disk',2);
xseuil = imdilate(imerode(xseuil,se),se);
xseuil = imdilate(imerode(xseuil,se),se);

imagesc(xseuil);
axis image;
colormap gray;

flag=0;
while flag==0;
    Seuil=input('xseuil = ');
    xseuil=(newX>t+Seuil);

    % Lissage de la courbe
    se = strel('disk',2);
    xseuil = imdilate(imerode(xseuil,se),se);
    xseuil = imdilate(imerode(xseuil,se),se);

    imagesc(xseuil)
    axis image
    colormap gray
    flag=input('C'est bon ? ');
end

t=(0:1/fps:nc/fps);
t=t(1,1:size(t,2)-1);
[n1,n2]=size(t);
x1=zeros(1,n2);
x2=zeros(1,n2);
xmin=0;
xmax=0;

for j=1:n2
    f=0;

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fx=0;
for i=1:nl;
    switch fx
        case 0
            if xseuil(i,j)==0;
                if f==0;
                    f=1;
                    if j==1 || x1(j-1)==0;
                        xmin=i;
                        xmax=i;
                    else if abs(i-x1(j-1))>200;
                        x1(j)=x1(j-1);
                        f=0;
                        fx=1;
                    else xmin=i;
                        xmax=i;
                    end
                end
            else xmax=i;
            end

        else if f==1;
            f=0;
            x1(j)=abs(xmin-xmax)/2+xmin;
            fx=1;
        end
    end

    case 1
        if xseuil(i,j)==0;
            if f==0;
                f=1;
                if j==1 || x2(j-1)==0;
                    xmin=i;
                    xmax=i;
                else if abs(i-x2(j-1))>50;
                    f=0;
                else xmin=i;
                    xmax=i;
                end
            end
        else xmax=i;
        end

        else if f==1;
            f=0;
            x2(j)=abs(xmin-xmax)/2+xmin;
            fx=2;
        end
    end
end
end

switch fx
    case 0

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        if j==1;
            x1(j)=0;
            x2(j)=0;
        else
            x1(j)=x1(j-1);
            x2(j)=x2(j-1);
        end
        fx=0;

        case 1
            if j==1;
                x2(j)=0;
            else x2(j)=x2(j-1);
            end
            fx=0;

        case 2
            fx=0;
        end
    end

end

subplot(2,2,3);
x1=x1/ratio;
x2=x2/ratio;
plot(t,x1,'-b',t,x2,'-r');
xlabel('t(s)');
ylabel('x(cm)');
axis tight;

subplot(2,2,4);

newTmin = input('Tmin = ');
newTmax = input('Tmax = ');

newTmin = floor(newTmin*fps);
newTmax = floor(newTmax*fps);

newT = t(newTmin:newTmax);
newX1 = x1(newTmin-1:newTmax);
newX2 = x2(newTmin-1:newTmax);

v1=smooth(smooth(abs(diff(newX1))*fps));
v2=smooth(smooth(abs(diff(newX2))*fps));
plot(newT,v1,'-b',newT,v2,'-r');
xlabel('t(s)');
ylabel('v(cm/s)');
axis tight;

% v=(v1+v2)/2;
% error=(v2-v1)/mean((v1+v2)/2)*100;

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% error=abs(error-mean(error));
% max_error=max(error);
% mean_error=mean(error);
%
% figure(6)
% plot(newT,error);

figure(3);
imagesc(s(floor(k/2)).cdata);
title('Cliquer sur l''origine du reslice de la vague');
[Xeau,Yeau]=getpts;
Ydecalage=Yeau-Yd;

xeau=improfile(s(1).cdata,[floor(Xf),floor(Xd)],[floor(Yf
+Ydecalage),floor(Yeau)]);
for j=2:k-1
    xeau=[xeau improfile(s(j).cdata,[floor(Xf),floor(Xd)],[floor(Yf
+Ydecalage),floor(Yeau)])];
end

hold on;
imagesc(s(floor(k/2)).cdata);
line([floor(Xf),floor(Xd)],[floor(Yf
+Ydecalage),floor(Yeau)], 'Color', 'r', 'LineWidth', 2);
hold off;
title('Axe du Reslice');
pause(2);

Newxeau=(xeau(Yx(2):Yx(1),newTmin:newTmax));

imagesc(newT,0:ratio:-(Yx(2)-Yx(1))/ratio,Newxeau);
hold on;
plot(t,x1, '-b', t,x2, '-r');
hold off;

sauver=input('Enregistrer le fichier? (Oui=1) \n');
if sauver==1;
    filename=input('Nom du fichier? (NE PAS OUBLIER .mat) \n', 's');
    save(filename, 't', 'x1', 'x2', 'newT', 'v1', 'v2', 'Newxeau')
end

tmin =

    1

tmax =

    20

Error using input

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Cannot call INPUT from EVALC.

Error in EauxMortes (line 11)

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flag=input('Changer les temps de d#but et de fin de la vid#o? (Non =  
0, Oui = 1) \n');
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