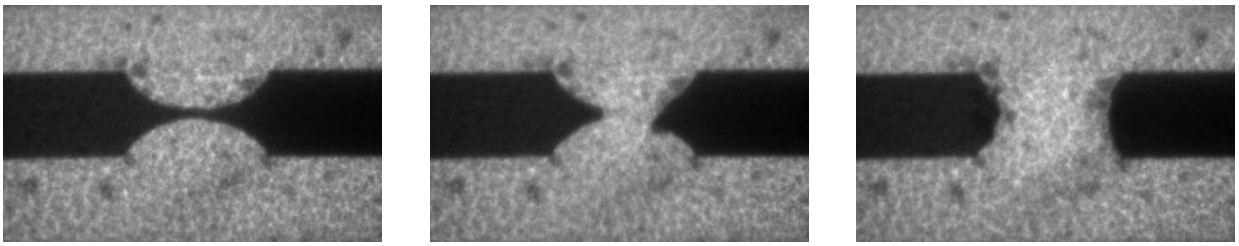
Note

- All printed documents allowed.
- No internet connexion is allowed, except to campus website.
- Send your matlab code via the campus website (zip files if several files are to be sent). It must contain one file named main.m that starts all your code.
- A video file "Camera_15_04_58.avi" and a template file main.m are available for download in the campus website (click in the sending form - Formulaire d'envoi).

1 Segmentation

A company specialized in High Rupturing Capacity fuses (fusibles industriels) contacts you in order to evaluate the efficiency of their products. The fuse element (in black in Fig.1) blows when activated (an electric arc is generated and the sand melts in the neighborhood), and the distance d between the two opposite black parts (images 30 and 75. In image 1, it is still in one part) is a function of the voltage.



(a) Image 1. (b) Image 30. (c) Image 75.

Figure 1: Different frames extracted from the video, which are 2D X-ray radiography acquired at ESRF (Grenoble, France) at 10^6 frames per second.

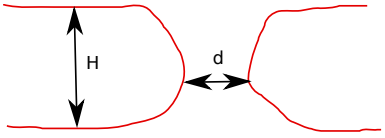


Figure 2: Schematic of the device. Values d and H have to be determined according to the frame number. The value H is 2mm, and has to be determined by image processing in order to calibration the observation system.

A high speed camera acquisition has been performed. Code a matlab function that gives H (constant value) and d (varies according to the frame number).

The following code is used to store all the frames of the video in one structure. In order to access to the frame k, you then have to use: `I = s(k).cdata;`.

```
% read video
vidObj = VideoReader('Camera_15_04_58.avi');
vidHeight = vidObj.Height;
vidWidth  = vidObj.Width;

% store all frames in struct
s = struct('I',zeros(vidHeight,vidWidth,'uint8'));

k=1; % index of frame
while hasFrame(vidObj)
    s(k).cdata = readFrame(vidObj);
    k=k+1;
end
```

A result is presented in Fig.3. This gives an idea of the overall shape. You do not have enough informations to convert the length into meters.

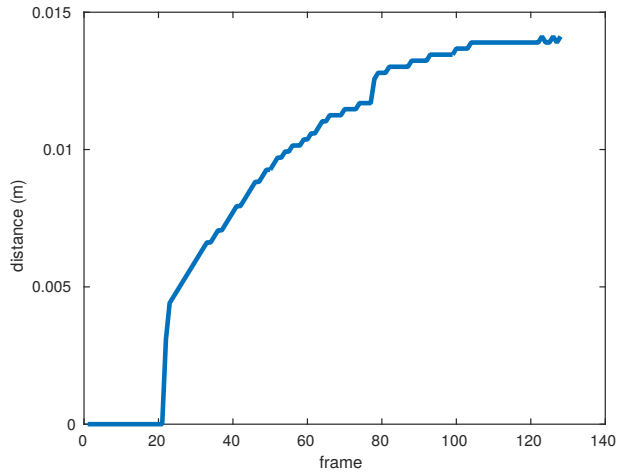


Figure 3: Value of d according to the frame index.