Research outline

For a paper I am submitting to Precision Engineering, I need to conduct a user study. The purpose of our research is to automatically analyse the content of an image. The paper is entitled (for now) "Synchrotron microtomography to CAD models of fibre composite objects using optimisation and fast X-ray simulation on GPU".

The result of this analysis will be the position, size and orientation of all the identifiable structures in the image. However, to demonstrate the benefit of our method, we must compare the result of our algorithm with results obtained manually by a cohort of volunteers. This is where we need your contribution.

If you know how to use ImageJ, or equivalent, I would be grateful if you could perform a few measurements in an image. It is a slice from a synchrotron microtomography scan of a Ti/SiC fibre composite where the reconstructed images suffered from strong streak artefacts and phase contrast.

All the data you submit will be anonymous.

* Required

Requirements

To contribute to this user study, you must

1. Be familiar with ImageJ. You can download it at https://imagej.net/software/fiji/ (https://imagej.net/software/fiji/). If you are more familiar with another image analysis software that is equivalent, you may use it.

2. Download the image from http://gvirtualxray.sourceforge.net/img/reference_CT.tif (http://gvirtualxray.sourceforge.net/img/reference_CT.tif) (alternative links: http://www.fpvidal.net/reference_CT.tif (http://www.fpvidal.net/reference_CT.tif), https://ibsim.co.uk/media/images/reference_CT.tif (https://ibsim.co.uk/media/images/reference_CT.tif))   (if the links do not work, contact f.vidal@bangor.ac.uk)

In a nutshell

You will:

- Download http://gvirtualxray.sourceforge.net/img/reference_CT.tif (http://gvirtualxray.sourceforge.net/img/reference_CT.tif) (alternative links: http://www.fpvidal.net/reference_CT.tif (http://www.fpvidal.net/reference_CT.tif), https://ibsim.co.uk/media/images/reference_CT.tif (https://ibsim.co.uk/media/images/reference_CT.tif))
- Open "reference_CT.tif" using ImageJ or equivalent.

1. Make sure you record the time when you started the experiment.
2. In the image opened in ImageJ or equivalent, when instructed find the structure that corresponds to Ti90Al6V4 matrix. In the form, you'll report its
   1. width,
   2. height,
   3. centre of this structure, and
   4. rotation angle.
3. Find in the image the structure that corresponds to a given fibre. In the form, you'll report its
   1. its centre,
   2. the diameter of its inner white circle,
   3. the diameter of its outer dark circle.
4. Repeat the previous steps for another fibre.
5. Repeat the previous steps for another fibre.
6. Record the time when you stopped the experiment.

1

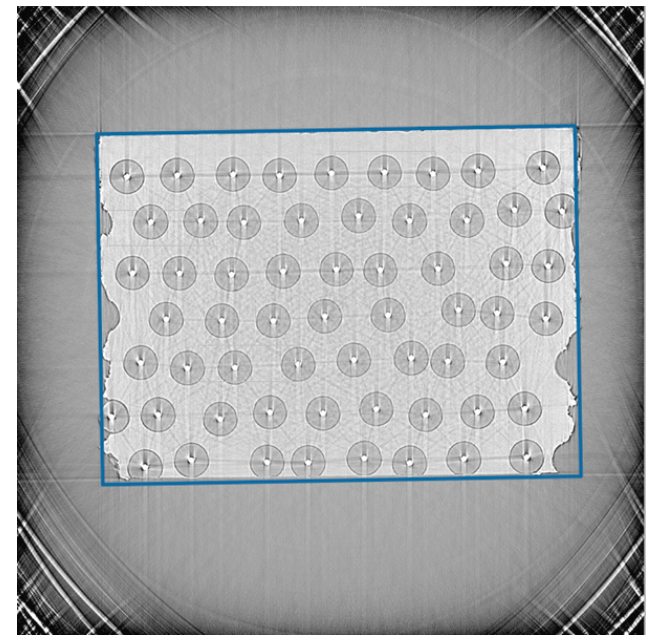Which software will you use to manually perform the measurements? *

Data usage

The data you send will be used in a statistical analysis that we will include in our paper. Once your data is received, it will be integrated in a spreadsheet. No personal data will be used. The data will remain anonymous.

2

When did you start the experiment? (i.e. what time is it?) *

Ti90/Al6/V4 matrix

Open the Identify the image (reference_CT.tif) with your favourite image analysis tool such as ImageJ. You must identify parameters of the structure highlighted with a blue rectangle.

3

What is the width of this structure (in number of pixels) *

4

What is the height of this structure (in number of pixels) *

5

What is the pixel coordinate of the centre of this structure along the horizontal axis? *

6

What is the pixel coordinate of the centre of this structure along the vertical axis? *

7

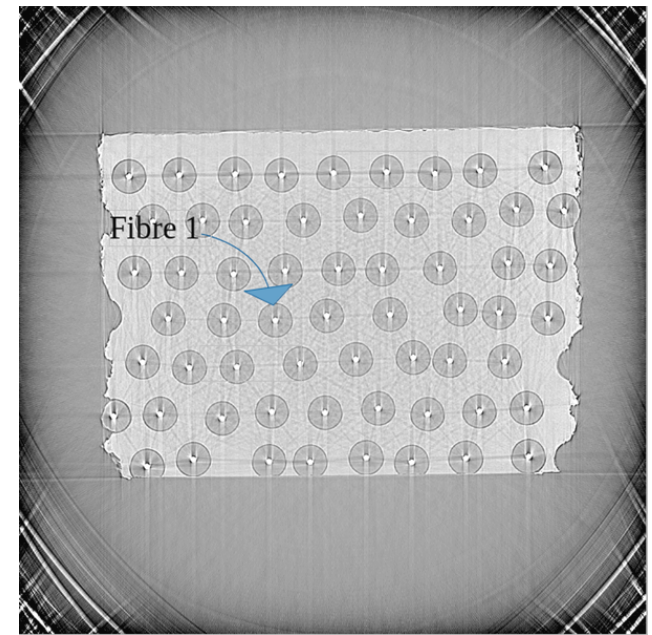What is its rotation angle (in degrees)? *

8

Were the measurements for the matrix easy to perform? (1: very hard, 5: very easy) *

1	2	3	4	5
○	○	○	○	○

Fibre 1

Fibre 1

Still using your favourite image analysis software, you must identify parameters of the structure highlighted with a blue arrow. This structure is made of two components. The darker circle is a silicon carbide fibre. In its centre we can see a small white circle. It is a tungsten core. We want to know the position of the structure as well as the size of the tungsten core and the size of the silicon carbide fibre.

9

What is the pixel coordinate of the centre of this structure along the horizontal axis? *

10

What is the pixel coordinate of the centre of this structure along the vertical axis? *
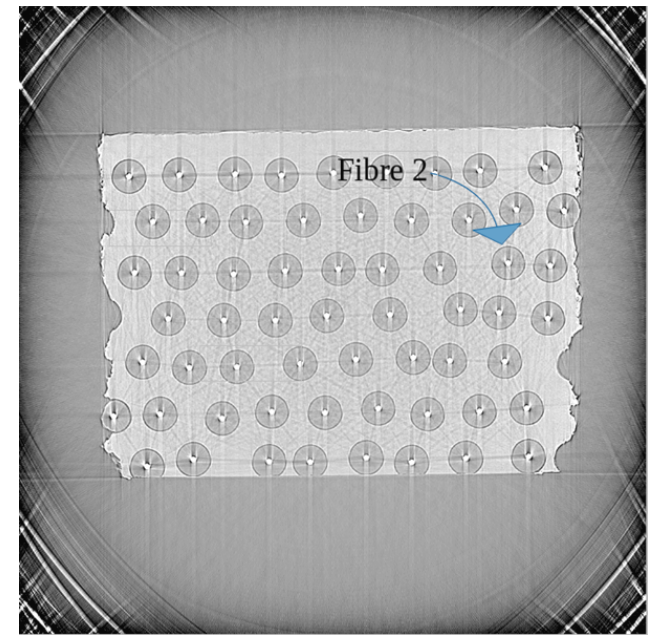
11

What is the size of the diameter of the white circle (tungsten core)? (in number of pixels) *

12

What is the diameter of the outer circle (silicon carbide fibre)? (in number of pixels) *

Fibre 2

Same again, but with this one.

13

What is the pixel coordinate of the centre of this structure along the horizontal axis? *

14

What is the pixel coordinate of the centre of this structure along the vertical axis? *
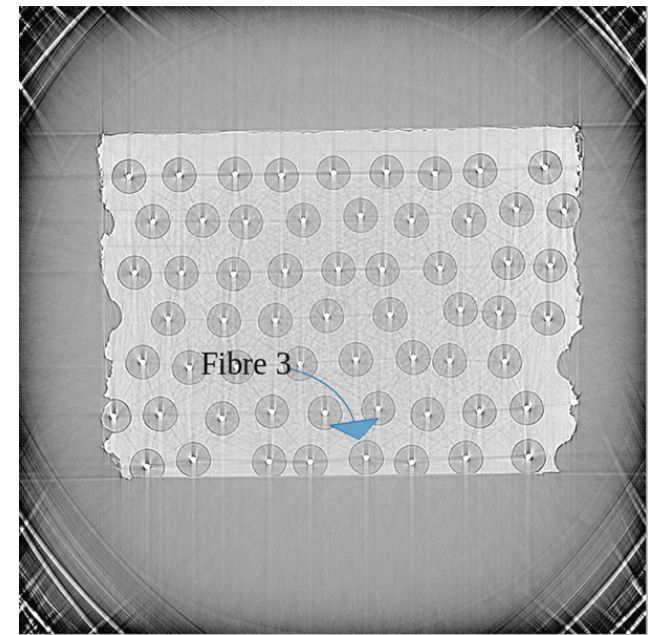
15

What is the size of the diameter of the white circle (tungsten core)? (in number of pixels) *

16

What is the diameter of the outer circle (silicon carbide fibre)? (in number of pixels) *

Fibre 3

Same again, but with this one.

17

What is the pixel coordinate of the centre of this structure along the horizontal axis? *

18

What is the pixel coordinate of the centre of this structure along the vertical axis? *

19

What is the size of the diameter of the white circle (tungsten core)? (in number of pixels) *

20

What is the diameter of the outer circle (silicon carbide fibre)? (in number of pixels) *

21

Were the measurements for the fibres and their cores easy to perform? (1: very hard, 5: very easy) *

1   2   3   4   5
○   ○   ○   ○   ○

When did you complete the experiment? (i.e. what time is it?) *

That's all for now

Thanks for your help.

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Any feedback? (you may write here any relevant comments you have)

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If you want me to keep in touch about the paper, you may write your email address below

Microsoft Forms