Report on the outcomes of a Short-Term Scientific Mission[1]

Action number: CA17107

Grantee name: Victoria Bocancea

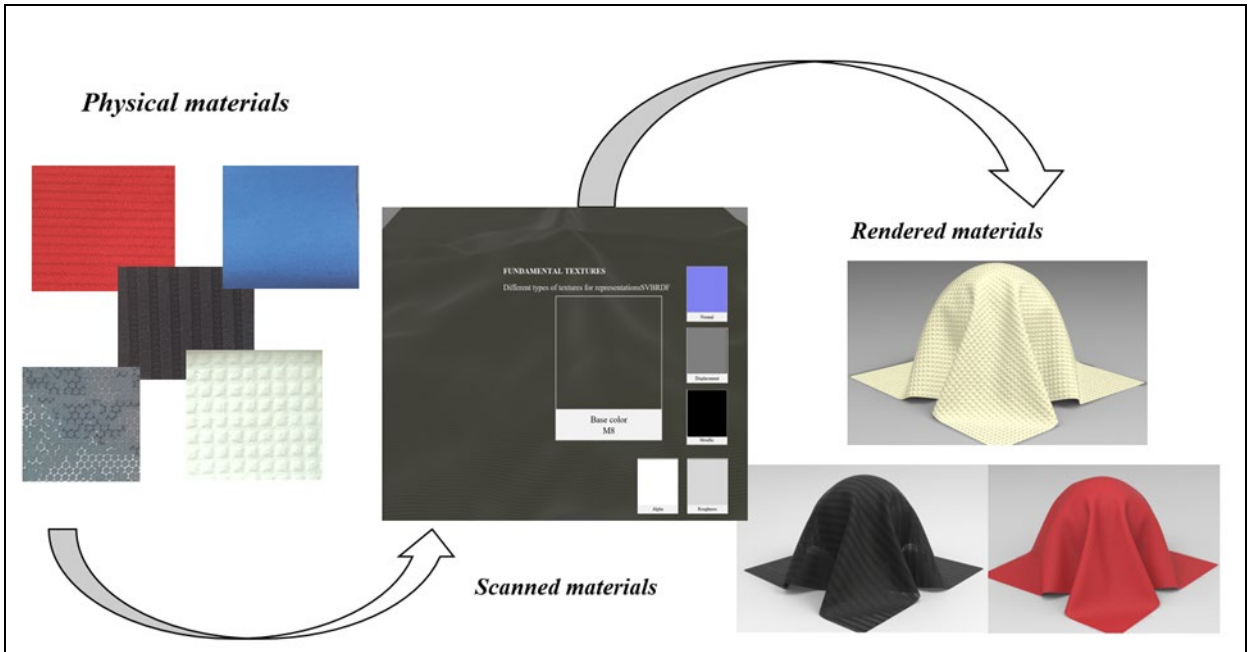
Details of the STSM

Title: Digitization of protective materials

Start and end date: 10/10/2022 to 14/10/2022

Description of the work carried out during the STSM

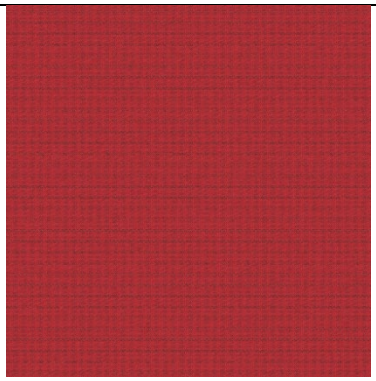
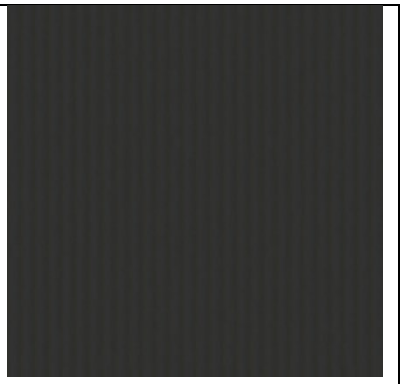
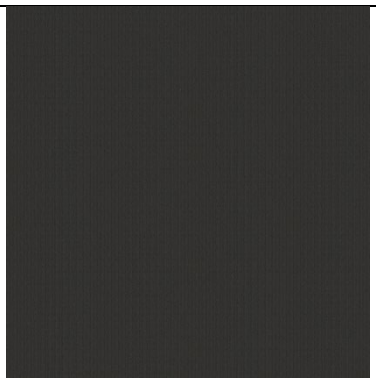
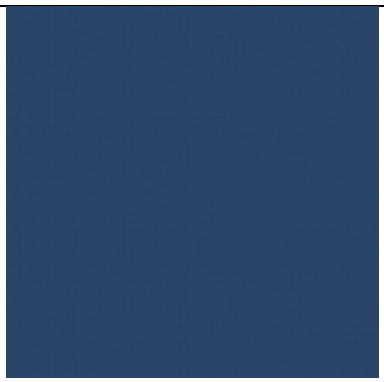
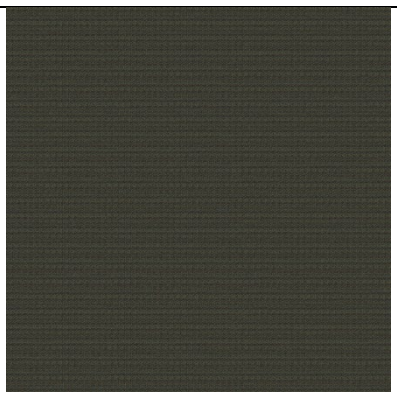
During the STSM at the Vizoo Company, like was proposed I followed the process of obtaining a digital protective material with x-Tex scanner and rendering of obtained digital material. This process can be viewed below:

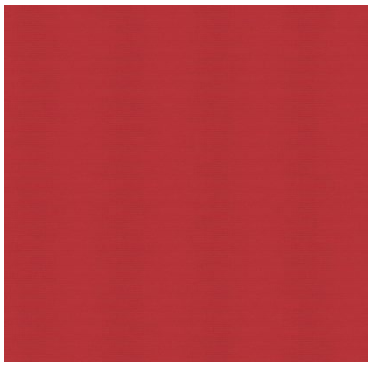
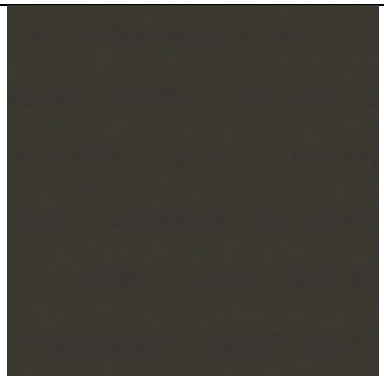
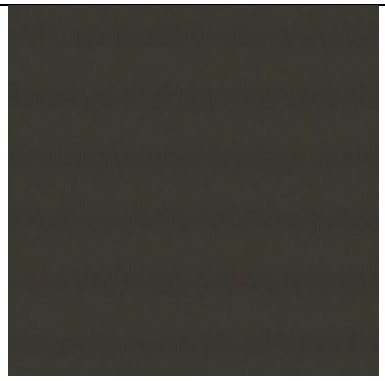


The process of obtaining digital material

[1] This report is submitted by the grantee to the Action MC for approval and for claiming payment of the awarded grant. The Grant Awarding Coordinator coordinates the evaluation of this report on behalf of the Action MC and instructs the GH for payment of the Grant.

In first phase I selected 22 textile materials that are used to make protective equipment for different divisions. These materials have been classified into 2 distinct groups, according to the standard of industrial products made of special fabrics according to European and National legislation (EIP). The first group includes 14 protective textile materials that are used as waterproof equipment (for example, rain or snow) they comply with the ISO EN 343 standard. In group 2, a total of 8 textile materials were selected, from which 2 materials used for ballistic protection equipment, found in the European Regulations Standard EN166, 5 materials used to make protective equipment for the 'SIP Protection' division, these being found in the manufacture of products for forestry, the standards respected by the products: EN 381, EN ISO 20471, EN 343, and 1 textile material used in the manufacture of products for the army. These materials were prepared for scanning, because these materials should be flat, without creases and must have the size 29,7x 21 cm, to fit in the tray of the x-Tex scanning device. Below are showed selected materials from first group:

Colour			
Code	M1	M2	M3
Colour			
Code	M4	M5	M6
Colour			
Code	M7	M8	M9

Colour			
Code	M10	M11	M12
Colour			
Code	M13	M14	

Description of the STSM main achievements and planned follow-up activities

Before starting the scan process, I checked all software parameters to make sure that the file is to be saved in the correct format. For this step, I check from the button located at the top of the program "EDIT", "Preferences". These settings are made according to the rendering program to be used for material processing (Figure 1).

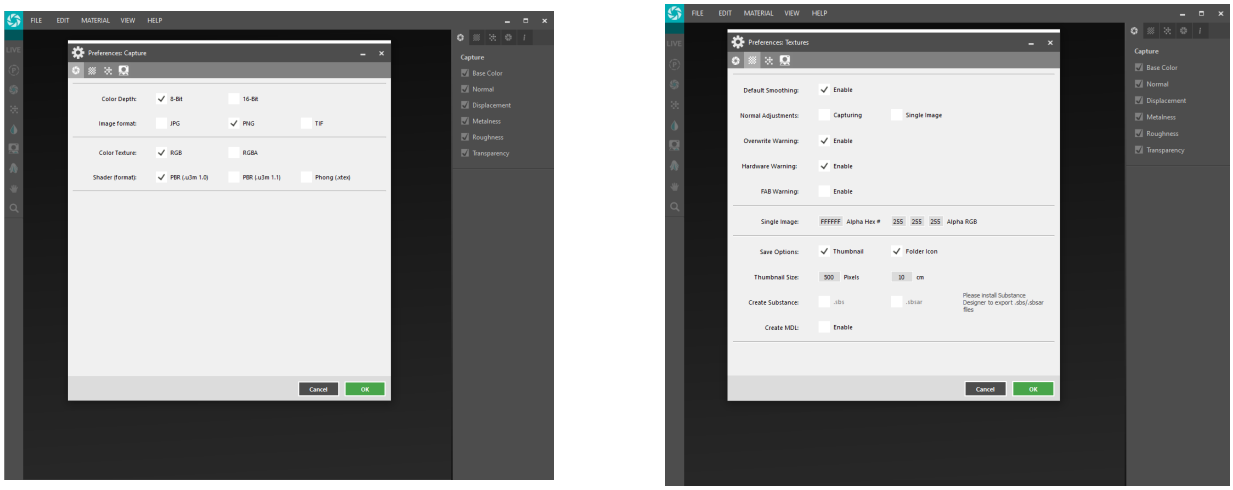
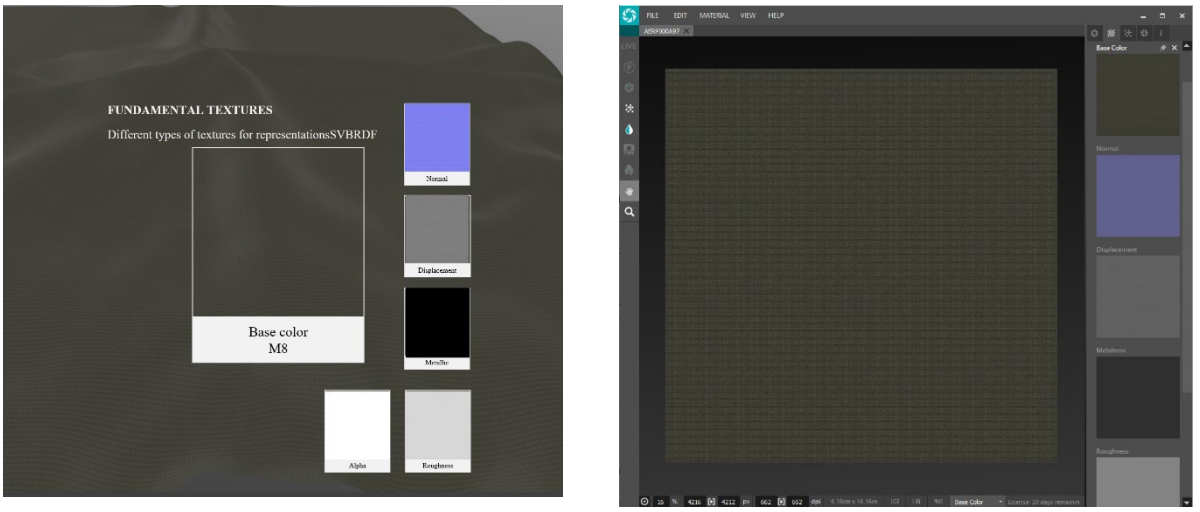


Figure.1 Representation of required settings before scanning

Should be noted that the same scanning process was used for all 22 materials. Next, as an example, the scanning process for the material M8 is described. First the textile material is positioned in the tray inside the scanner, the “live” button is activated and the texture components (Base Color, Normal, Displacement, Metalness, Roughness, Transparency) can be visualized as is illustrated in Figure 2.a. In step 2, the "preview" button is activated, which allows to fine-tune the scanned material, such as to remove reflections from the surface of the material and provide a complete picture of the material. Next, only a part of the total surface of the scanned sample is cut, to render a more accurate structure of the model pattern, then the “capture” button is pressed, thus processing the image. In Figure 2.b, on the right side of the image, the final texture map is obtained, and at the bottom of the same image are described the technical details about the picture obtained after the scan, for example the image resolution is 662 dpi, and contains 4212 pixels.



a b

Figure 2. Representation of the basic types of materials obtained after scanning with the x-Tex scanner

To check if the structure pattern does not require other settings to improve the obtained image, the x-Tex program makes it possible to assign the selected scanned material to 3 different types of surfaces: sphere, flat surface, and corrugated surface, as illustrated in Figure 3.

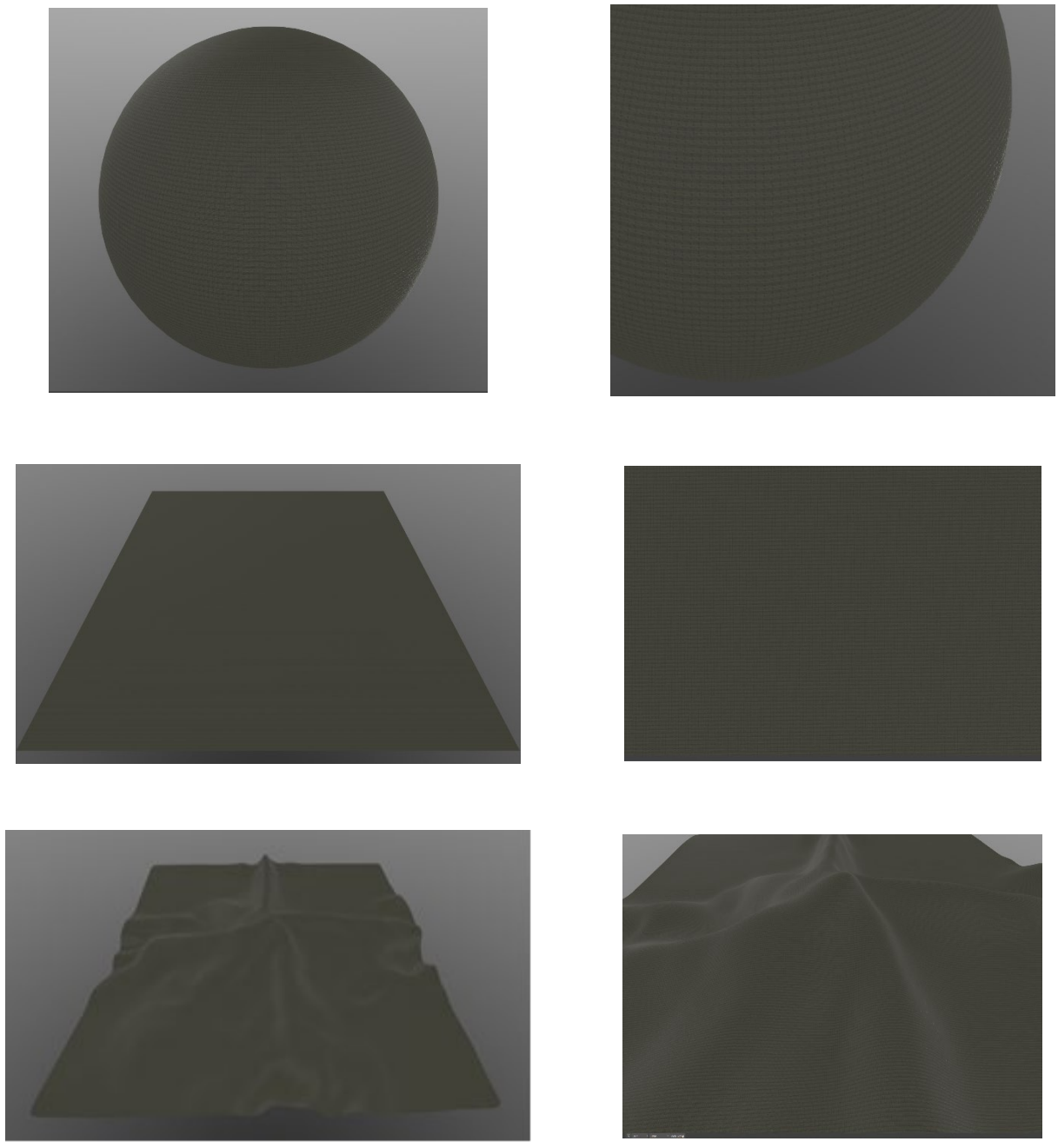
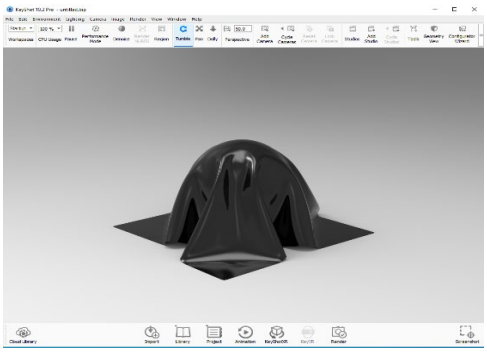


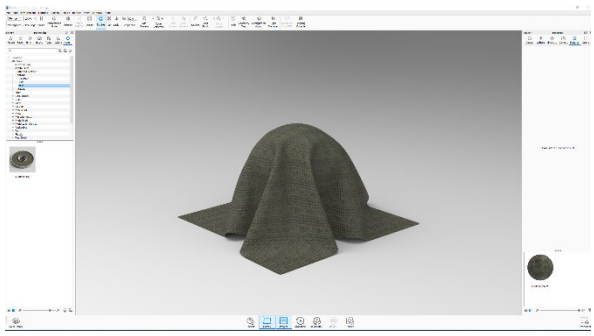
Figure 3. Preview of digital material on a sphere, on a flat surface, and on a corrugated surface assimilated to a garment.

After obtaining the digital materials using the x-Tex scanner, the next step was to render these materials in Keyshot program. Next, as an example, the rendering process for the material M8 is described. The first step in rendering the material in the Keyshot program is to import the 3D shape on which the material is to be processed (Figure 4.a), then from the top of the tab select the 'Tools-Material Import' button to import the previously scanned material containing 6 maps textures and is assigned to the previously loaded 3D shape (Figure 4.b). To view the pattern of the scanned material it is necessary to choose from the right side of the program ‘mapping type UV’ it defines the exact contour of the pattern (Figure 4.c). For editing the pattern print, the size of the pattern print has been reduced to be as close as possible to the physical version of the material (Figure 4.d). To change the external properties of the material, changes can be made to the ‘Material Graph’ directory (Figure 4.e). After all the settings for the rendered materials were done, images with the fallowing

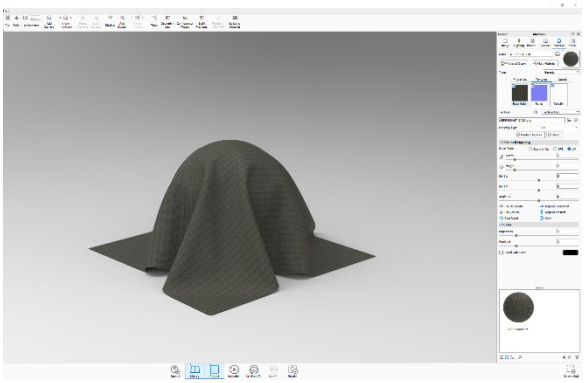
parameters was obtained: the save format is jpeg quality 99, image resolution: 1920 pixels wide, 1277 pixels high (Figure 4.n).



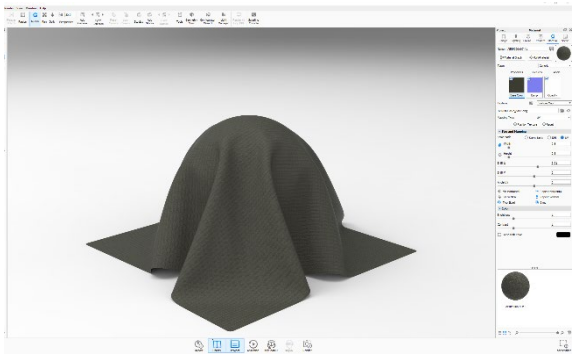
Import the 3d shape into the Keyshot program (a)



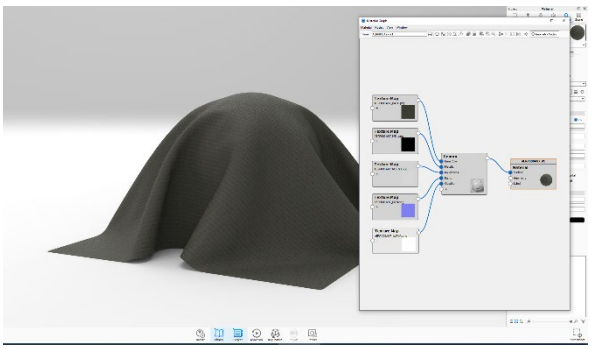
Assigning the previously scanned material to the 3D shape (b)



Selection of UV reference parameters (c)



Changing parameters by reducing the print pattern (d)



Checking the textures of the scanned material (e)

Obtaining rendered material (n)

Figure 4. Editing process for rendering scanned material

Obtained results during the mobility at Vizoo company:

- Established strong cooperation with Vizoo Company
- Learned the process of obtaining digital materials using the x-Tex system
- Scanned and digitalized a total number of 22 physical textile materials
- Learned the process of rendering using Keyshot software
- As a bonus I learned the process of analysing the physical proprieties of textile materials using Browser Fabric Analyser

Planned follow-up activities:

- Continue the collaboration with Vizoo to analyse the physical proprieties of all 22 materials and use the results to virtual simulate the behaviour of the materials in a 3D environment
- Render using Keyshot software all 22 material in three different formats: image, video and 3D interactive object
- Subjective evaluation of the physical and visual perception of the rendered digital materials using questionnaire and interviews
- Statistical analyses of questionnaire results
- Publish the results in a journal with high impact

To some up, further collaboration with Vizoo Company regarding the evaluation of textile materials physical proprieties will be done, the STSM helped me to expend my theoretical and practical knowledge regarding textile materials digitization and rendering, the obtained results will have a great contribution in my Ph.D thesis and also will be used by Vizoo to further develop their technologies.