

The future for virtual sampling?

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Nowadays, there are display engines that provide tools for modelling 3D objects with a high level of control and detail. In the world of footwear, the ICad3D+ system, a design and pattern engineering software developed by INESCOP, works from a base last in a synchronised way in both a virtual 3D environment and a 2D technical one. It offers the possibility of creating virtual shoe prototypes from scratch or transferring manual sketches to a

virtual 3D environment in great detail, quality and realism. Its success lies in its ability to associate the flattened last and 2D patterns with the 3D model with complete accuracy and correlation.

ICad3D+ is put forward as being the best virtual alternative to the traditional process of design and pattern engineering, as it reduces the time spent as well as the material and staff requirement of the company using it. This software accelerates the design process and the development

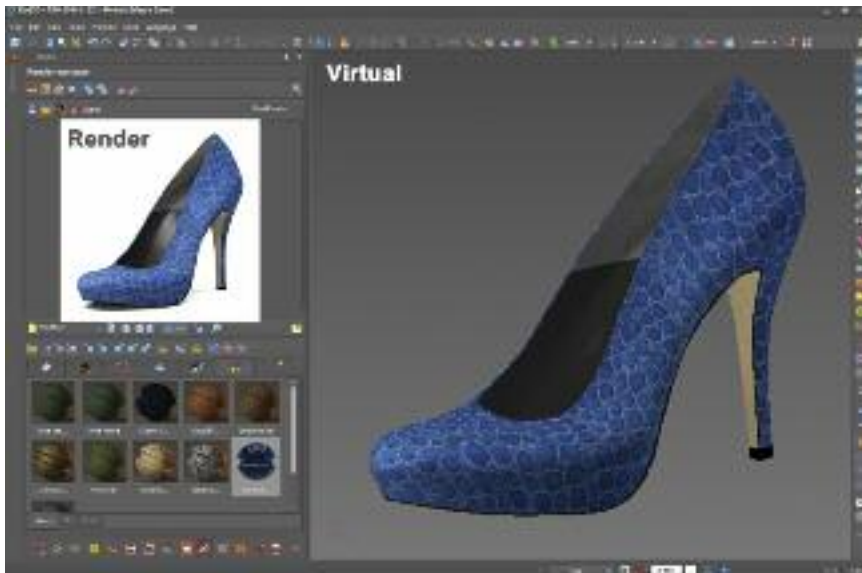
of all types of footwear through the use of the most advanced and innovative CAD/CAM solutions on the market, thus reducing costs, improving quality and increasing the productivity and competitiveness of a business overall.

REALISM

In addition to the editing power and high level of accuracy the system provides, it is particularly important that the display of samples is also

INESCOP's materials scanner.
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ICad3D+ showing Render (Static) and Virtual (Dynamic) Display images.

realistic. To this end, it is therefore necessary to have high quality virtual materials. Traditionally, in the field of 3D modelling, the representation of materials with a high level of realism was affected by the fact that the lighting used in photorealistic scenes was totally different from natural light, so materials behaved technically as regards their appearance in an unrealistic way and tricked the viewer's eyes. As a result, such a scene would only work with the specific lights and materials settings for that specific scene. This created a problem due to the fact that neither could dynamic changes be made nor a scene or material reused if the time of day or the amount of light changed.

In fact, the PBR (physically based rendering) materials and HDR (high dynamic range) environment maps used in the ICad3D+ were developed specifically to avoid these representational problems and to yield realistic results based on the physical properties of materials and light. With the use of PBR-defined materials, it is possible to apply dynamic changes in lighting and to display the materials correctly, without having to reconfigure them or apply 'tricks'. The appearance of PBR materials now represents a paradigm change. Previously, their composition was based on diffuse, specular and displacement channels; now, the PBR mode includes extra channels to

control new properties. Furthermore, PBR has two basic workflows, one based on the metallic component and the other based on the specular component. Both workflows are much faster than traditional static rendering since the representation can be displayed in real time.

MATERIAL MAPS

These materials are not only based on a photographic image, but are also composed of different maps that define the way in which the material reacts to light. Each of these defines a property and a different level of detail. Those with the greatest impact on the final result of the material are as follows:

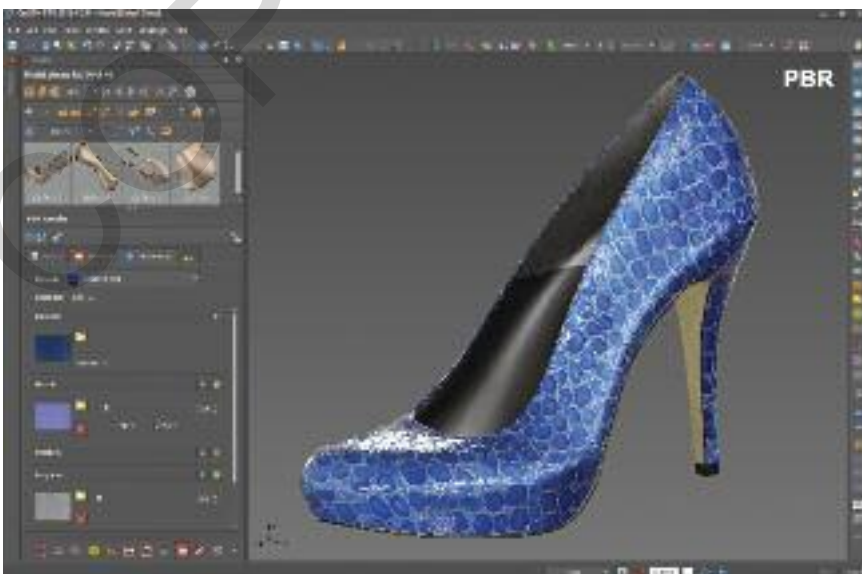
Colour map – this represents the pure colour of the material without shadow or brightness and is also known as 'albedo'. It is represented with the base colour of the texture.

Normal map – this represents the direction in which the light strikes. Only the reliefs of the material should be seen, but not its drawing. This map, which uses three channels, not only provides information about which parts go downwards and which upwards but also indicates how light bounces off the material and, therefore, provides greater detail.

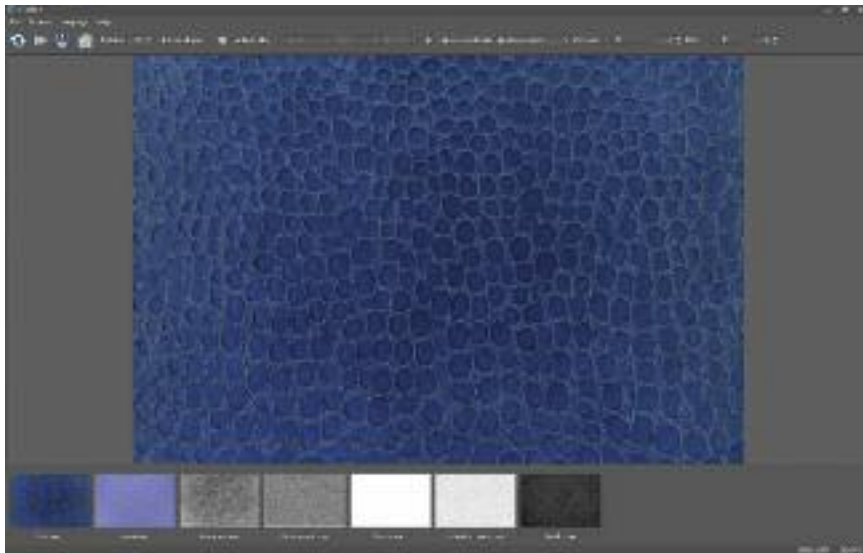
Roughness map – this represents the level of roughness of the material. This map is based on the principle that a rough material is low reflective and a smooth material is highly reflective. It is represented in greyscale – white for very rough (low reflective) and black for very smooth (highly reflective).

Displacement map – this represents a relief of the material's texture. It is similar to a height map but more accurate since it is based on the normal map, so the direction of light incidence in each pixel is taken into account. Greyscale – white for the part with relief and black for no displacement.

Opacity map – this represents the amount of light that passes through the material and is very important for semi-transparent materials. Greyscale – white for the area through which light does not pass and black for the area through which it does.



ICad3D+ advanced display showing PBR materials (Dynamic) image.



ICadTex material scanning and calculation of texture maps.

Ambient occlusion map – this is used to highlight shadowed areas and is considered a detail map. Greyscale – white for the occluding part and black for the occluded part with shadows.

Metallic map – this represents the metallic appearance level of the object and, to do so, the map provides information about the colour of the light reflected on the material. Greyscale – white for metallic objects and black for non-metallics.

CREATING REALISM

In the footwear industry, technicians work with a great variety of materials. It is therefore necessary to have a

device that is able to digitise them while capturing all their properties in order to create virtual materials with a high level of realism in a fast and efficient way. Given the complexity of the creation of these materials, INESCOP has developed a material scanner that obtains digital information from each material and extracts the maps that constitute it. Thus, this device makes it possible to create a digital material from a physical material sample. The scanner, controlled by ICadTEX software, is able to create a controlled lighting environment that allows a number of photographs to be taken in

order to obtain information on how materials react to light in certain situations.

The new version, ICad3D+ v2019, combines image-based lighting and PBR materials with a simple interface so that the user can control the scene, the lighting and the materials. A realistic 3D rendering in real time can be obtained without waiting to calculate a static render for each desired display. Nowadays, the quality of the images obtained with the rendering engine is greater than that of the dynamic representation with PBR materials. However, the little time needed to prepare this real-time preview is a great added value that, in certain contexts, can replace the render entirely in that it makes it possible to save a vast amount of time and to obtain much more than just 'acceptable' realism.

Due to the large number and great variety of materials used each season to design a collection, the process of scanning and integrating them into a CAD system should be fast and accurate in order to streamline the design process. The newly developed material scanner is directly connected to the ICad3D+ design system, so while using the CAD system it is also possible to connect with the scanner, scan the physical material and obtain a high quality PBR virtual material that can be applied to any designed element of the model. 🚀



How the system works.