



Reality: Movistar Team cyclist Jose Joaquin Rojas sporting Carnac cycling shoes during the Tour of Catalonia race in Barcelona last year.

 Sportgraphic / Shutterstock.com

FOOTWEAR TECHNOLOGY: DIGITAL DESIGN



Shoes go digital

by Sergio Dulio

Virtual reality: Image of a Carnac cycling shoe demonstrating the standard of digital representation that is now possible.

 RTT

The first contacts of the shoe industry with the digital domain date back many years to when personal computers and graphic workstations first appeared. Together with the early generations of software systems, they were aimed at speeding up and simplifying the work of technicians and designers. Since then, the drift from the old analogue world reliant on human control, physical tools and manual operations, has steadily increased the digitalisation of systems, machines and processes up to the level we know today.

The digital world that has become so pervasive that we hardly remember the analogue world that existed before it. Indeed, the so called 'digital natives' of the younger generation cannot envisage this different world.

As bits and digits have become part of daily life, so they have changed the way products are conceived, manufactured and sold. In the footwear industry, 2D CAD systems are widely used for pattern engineering and grading, while 3D CAD software packages allow companies to cover all the steps of shoe design, whether creative or technical, with greater efficiency and consistency and, at the same time, generate a wealth of data to be used in manufacturing by Numerical Controlled (NC) machines. Dedicated software applications calculate material consumption, store and manage project data, plan processes and optimise

resource utilisation. There is now scarcely an area in a modern shoe factory where digital data are not used to document a design, model a process, manage a machine or even the entire manufacturing plant itself.

Production lines have also been transformed by the advent of digital machines equipped with NC capable of executing pre-programmed tasks based on a stream of data generated by upstream processes. This evolution is now complete and is more or less evident in virtually all the machines involved in footwear production. The most obvious is the revolution that transformed the traditional analogue method of cutting upper materials using knives and beam presses into the digital approach of dieless cutting systems. Physical knives are replaced by a digital alternative projected onto the material to guide the cutting process.

Most of all this is well known to shoemakers and has been extensively covered in many articles and publications. There are other examples that are not so widely appreciated but that indicate important future trends for the industry and have the potential to transform it.

Reality and virtuality

Joe Pine, author of 'Mass Customization: The New Frontier in Business Competition' in his most recently published book 'Infinite Possibility', explores several ways to create customer value on the digital frontier. In it, he theorises a sort of

'continuum' between the real world and the digital world. In the extension of the former into the latter, time becomes independent from the actual time of our experiences, atoms are replaced by bits as matter becomes digital, and space is no longer real but virtual. His theoretical 'multiverse' sets the frame for a multitude of different experiences for the consumer in which boundaries between the analogue and the digital worlds seem to fade away. Exploiting the potential of this novel theory offers interesting new business opportunities in ways never previously thought of.

When we see a sample shoe, we note its style, colours and details. In the multiverse, this is the realm of virtuality as exactly opposite to reality. In this other realm objects are made of bits and can take shapes and aspects that go beyond what actually is, or can be, done in the real world.

Returning to more familiar shoemaking terminology, this is the domain of what used to be known as virtual prototyping, or the creation of new shoes, that only exist in the digital world but to an observer look like real ones. The aim of the exercise is clear: making virtual prototypes is, or at least should be, much faster and cheaper than making real shoes. Playing with style, colour or material variants is much easier than doing the same thing to a physical object and offers infinite possibilities to the user.

In the case of footwear, the virtual world must be as real as the real one, such that the realism of the virtual object must be the highest achievable. Every detail of the shoe must be reproduced and the finest textures in its materials modelled so that images taken from the digital world become indistinguishable from the real object. These are the pre-conditions needed for the virtual prototype to replace the real one.

Software modules to generate such high quality rendering with, in addition, the possibility of turning, moving and observing the shoe model from any point of view are now part of the product offering of most vendors of shoe CAD systems. Development work is still not finished and promising new advances are on the way. If we are seeking the utmost, *hyper realistic quality*, however, we need to look elsewhere, such as at the German company RTT whose website images from the automotive world give a clear idea of just how blurred the line between the real and the virtual world has become.

We must not think that shoes in the realm of virtuality are only made for the sake of generating high-quality pictures. A digital model can be in every respect the core representation of the product, from which activities such as product reviews, sales presentations, promotion and advertising can all be derived. The cost in terms of time, tools and resources of creating it must be as low as possible so that gains made in having



Colour, texture and perspective can all be created to such a degree that the virtual image appears to have all the detail and solidity of the real thing.

RTT

no physical prototype are not overtaken by the time needed to create the digital model itself.

A clear example of a more intimate fusion between the real and digital world is Augmented Reality. According to Pine's theory, this is the realm of true time and space, in which digital technologies are employed to enhance our experience of the physical world. So, take the same virtual prototype and now, rather than seeing it in a totally digital world, imagine that you can hold it in your hand and move it freely as if you were handling the real object while, at the same time, seeing a picture of the real you on a computer screen with the virtual shoe in your hands. Or imagine you can see yourself wearing the shoe by looking into a sort of 'magical mirror' that sends back the image of the real you wearing a non-existent pair of shoes. Virtual try-on systems similar to this have been developed in recent years. The Tryon system developed by Italian company SEAC02 is already operating in the Calzoleria Rivolta flagship store on Via della Spiga in Milan.

While such systems are still not totally convincing in terms of appearance and general feel, they do represent a sure attraction to entertain and stimulate the curiosity of customers. Their true potential is, however, still largely underexploited and one step forward would be to enhance the experience with other stimuli besides the visual one by bringing virtuality even closer to reality and thus expanding into a further new realm that Pine calls augmented virtuality. Interest from research centres and software houses suggests we can look forward to interesting future developments.

Social networks and e-commerce

Staying with Pine, surfing the world-wide-web can be regarded as another form of virtuality. The internet is increasingly the place where people meet, communicate, socialise, search and share information and, eventually, buy things.

When they do so, there are no real time limits as to when a purchase is made—a great deal of internet shopping is done during the night—and no limitations as to where buyer and vendor are located. This fits perfectly Pine's definition of the virtuality realm and opens a wide range of opportunities for smart vendors.

A recent Italian study on developing trends in e-commerce stated that the most important motivations to buy online are the possibility to access shops that are open 24 hours a day all year long, the saving of time in buying there and, often, cheaper prices. These considerations offer great business opportunities and the footwear industry has only begun to realise this. Another Italian survey on the highest growth sectors in the e-commerce world reported a 39% growth in web purchases of apparel from 2008 to 2009, putting it in first place; footwear formed a significant part of the total.

There are currently several e-commerce sites dedicated solely to selling footwear including Zappos, Sarenza, Shoes.com and Spartoo. They sell a great variety of brands and styles and their double-digit growth and billions of euros worth of sales indicate that consumers have lost their inhibitions towards buying shoes online. We are witnessing a global trend that would have been barely imaginable only a few years ago.

Last September, the Italian Association of Footwear manufacturers (ANCI) launched its own e-commerce site, iloveitalianshoes.eu, where a growing number of manufacturers of the best-quality shoes in Italy are offering their products to potential customers. The site allows the viewer to search for models, styles, colours and sizes or, if they prefer, individual brands. Separate 'shop in shop' areas allow each brand to present itself and its products with the typical look and feel of its own shops. High resolution images with the possibility of 360-degree rotation of the shoe, give consumers the chance to enjoy every moment of the purchasing experience. Customers will also be able to search for, choose and buy shoes directly from their smart phones wherever they are and whenever they want. This reflects the rapid growth of purchases made from mobile devices.

With Facebook and Twitter, the new internet allows the instantaneous sharing of comments and opinions, news, information on products and product satisfaction (or dissatisfaction) among friends on the net. This offers a further impressive multiplying factor that could have the capacity to catapult the world of virtuality with its bits and digits miles ahead in terms market potential compared to the old world of words and atoms.



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