

Personalization of spectacles

The merits of uniqueness

Article based on work by Indo and IBV
for lens¹ and frame² personalization

Abstract:

For a long time many industries supplied market solutions adapted to customers's particular needs. The automobile industry is one of the most widespread examples. Personal computers is another. This product re-features to end-user specifications is known as **mass customization**. It is based on a number of discrete product functions and features required by buyers during the sales process. Manufacturing production lines and their respective automated planning and control systems have been designed to provide such solutions in many product offerings around the world. The times of Ford's T-model for which you could "choose any color for your car as long as it was black", are gone for good.

However, product **personalization** goes one significant step beyond mass customization. Here, subsequent production lines will need to support the manufacturing of products personalized to end user specifications in **all** their aspects. That is to say, products **only** made for and **uniquely** usable by their individual buyers. Such are exclusively 'personal' items. In the ophthalmics industry this type of personalization is still very rare. Until recently, similar products were only feasible in small production volumes, and were (are) mainly manufactured by craftsmen using tools and manual labor. There are a few known initiatives, where spectacle frames are 'manually' personalized to the bearer's face morphology. However, no production lines are yet known, whereby fully personalized

¹ Work done by Indo and IBV as part of nationally funded Spanish project in 2003

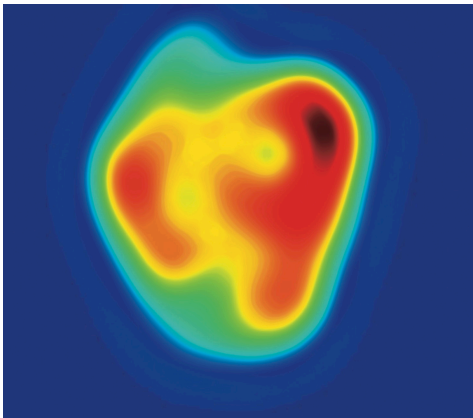
² Project Made4U- FP7 Project Nr: 212002 / 2008-2012

spectacles (frames, lens geometry and treatments) are created with minimal human intervention, and in larger, economically viable, and commercially attractive output production volumes. Notwithstanding, automated production of personalized spectacles in potentially more significant volumes appears quite feasible today, following the work done in the EC funded project Made4U, in which we³ developed the necessary technologies and systems in support of this objective.

But one should still raise the question: Why should personalization of spectacles be of any interest to end users, and what are the selling arguments about the added value these new niche and probably pricey products might offer? In the following we shall answer these questions based on our own project experiences to-date.

Short History

In the early years of the new millennium, the R&D department of Indo SA, in collaboration with IBV (the Institute of Biomechanics in Valencia), have invented a breakthrough technology in lens personalization that was unique in its kind. It has been called **visual strategy mapping (VSM)** and has been successfully employed in a number of personalized lens products⁴ by Indo, in the Iberian peninsula initially, and the rest of Europe a little later.



In a nutshell, a user is tested in a specialized device (Visual Mapper) that defines a unique pattern (equivalent to a fingerprint) of the user's 'visual strategy', that is to say, the special ways he/she looks at the surroundings via coordinated head and eye movement.

Indo developed a method that uses these individualized patterns (visual maps) to determine personalized lens geometries that address multiple human vision deficiencies with multifocal lenses, also known as **progressive**. The lens cutting and polishing technologies that made the manufacturing of VSM progressive lenses possible are known as '**freeform**'.

What really happens in Indo's VSM method is this: A person's visual map will tell a designer in which areas of the lens sharpness should be maximum. Since the user's eyes are most likely to look at the surroundings through these same areas, the user will subsequently experience maximum visual quality. With VSM based designs the resulting user comfort is of a double nature. a) the user will experience much sharper vision than in traditional progressive lens designs, since he/she is unlikely to look through the unavoidable unsharp lens areas, and b) a user of traditional progressive lens spectacles feels (often unbearable) discomfort during the early days (weeks) of adjustment of his/her eyes to the spectacles, often leading to dizziness, headaches, vomiting, stress, and possibly total rejection of the spectacles. These phenomena typically disappear when using VSM progressive lenses.

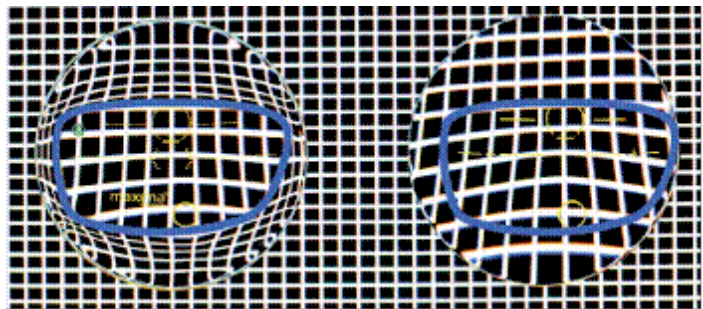
³ The Made4U project (212002) is funded by the FP7 program with a duration of 4 years, 2008 to 2012, and it is executed by a consortium of 13 European Partners under the coordination of Indo SA (Spain). www.made4u.info

⁴ Eyemade™, Lifemade™, Maxima™

Made4U

In 2008 Indo obtained EU support under the FP7 funding scheme for a new project that was conceived to address the personalization of **frames** and of lens **treatments**. Together with the VSM technology discussed above, the project would therefore explore the feasibility of personalization in an entire pair of spectacles. That is, lens geometries, lens coatings and treatments, and frame shapes and decoration. Especially the objectives aimed at the design and manufacturing of personalized frames were quite ambitious. Frame design is traditionally done in 2D, but Made4u focused on using Software Aided 3D design techniques to create models of frames personalized to end-users' face morphologies.

In the process of project development one particular solution was also achieved that was not explicitly described during the project conception stage. Namely, VSM prescription lenses adapted to given frame designs has led to the possibility of creating considerably thinner and lighter lenses than before. This is a major breakthrough



that has produced far more aesthetically attractive and lightweight spectacles for people with heavy visual deficiencies, who were previously obliged to wear unaesthetic goggles. Not only thinner lenses are the benefits of this invention though. In fact, as shown in the figure above right, there is a substantial (40%) improvement of vision quality in terms of image distortion. On the right we depict how a user perceives a horizontal/vertical lines raster under conventional progressive lens designs and left how the same user perceives the same raster thru the new lighter lenses. Indo has already commercialized a family of VSM products under the Brand **Maxima**[™] that take advantage of this invention.

3D frame design

In an article that we published in the spring of 2010^{5,6} we described the 3D frame design method that was developed by Indo under Made4u. Their challenge was the customization of a user-selected frame model to his/her face and head morphology, but at the same time, being able to preserve the look-'n-feel of the model itself. That objective was largely achieved.

Optomorphism

In parallel, in subsequent articles that we published last spring⁷, as well as a few weeks ago⁸, we have described the challenge for a client and his/her optician to select a suitable

⁵ "Using 3D design techniques to create personalized frames"

<http://www.made4u.info/innovation/2010/5/21/using-3d-design-techniques-to-create-personalized-frames.html>

⁶ It was re-published in September 2010 in the Optical World

⁷ <http://www.made4u.info/innovation/2011/3/18/made4u-personalization-a-new-shopping-experience.html>

⁸ <http://www.made4u.info/innovation/2011/9/1/optomorphism-and-automated-assistance-for-optimal-frame-sele.html>

frame model that will support and enhance the former's persona. Frame shape and decoration are fundamental elements of that final choice. We have adopted the Optomorphism™ method of one of our partners (Tipheret), and combined it with automated solutions, which, based on end-user portrait image analysis, define a user's face-shape stereotype, and propose suitable frame models that meet aesthetic and 'persona' enhancement criteria.

Merits of personalization

With personalized spectacles most components of the end product are adaptable to a client's needs and wants. The cost of such eyewear is likely to be much higher than the average cost of similar traditional products. Therefore, the value proposition of personalization, in other words, the resulting benefits (or value-for-money) to the buyer, should be quite substantial to justify the ticket price.

We believe that this is the case indeed. In the 'full-blown' personalization of spectacles there are three basic components that support and improve end-user experience.

1. Substantial performance improvement in terms of corrected vision. As discussed earlier, personalized progressive lenses based on Visual Strategy Maps not only guarantee far better quality of vision, but they also eliminate the heavily disturbing burden of adjusting the users's eyes to the new spectacles. Not to forget, the image distortion improvement achieved via the Maxima™ invention equally adds to the visual comfort benefits.
2. Although opticians will often adjust the position and feel of nose pads, and will bend the temples and earpieces to fit a user's head morphology, most people with spectacles will admit it is not uncommon to suffer deep skin marks, skin irritation and injuries caused by nose pads and metal frames, and by pressure exercised by the temples and earpieces on a bearer's temporal areas and behind the ears. Personalized frame designs promptly relieve users from such troubles by means of 3D head scan measurements, which are then used to create personalized frame designs and therefore avoid the symptoms mentioned above.
3. By consistently applying the rules of optomorphism during the frame selection process, frame personalization can be effectively used to balance, hide or boost certain morphological elements of a user's face (size, shape, skin color, nose, etc...). In so doing, frame personalization and optomorphism become effective strategies that can achieve quite positive results on the 'perception' of a user's persona.

In conclusion, a personalized pair of frames with VSM based progressive lenses will provide better vision, eliminate initial wearing burdens (dizziness, headaches, etc), will offer injuries-free wearing comfort, improve a person's aesthetic appearance and, last but not least, will potentially enhance a user's persona.