Leveraging Technology to Maximize Cutting Yield from Wild Alligator Hides for Crafters or Small Business Owners

Casey R Stannard and Lauren Lansdell, Louisiana State University, USA

In the Southern US, there are numerous industries devoted to maintaining the American alligator as an agricultural product, both for food and leather. However, a severe price slump has occurred in the marketplace for wild alligator hides, which could threaten the entire alligator industry (Fannin et al., 2021). The low prices have led to an overabundance of wild alligator leather in the market that must be corrected to help stabilize the industry. One potential solution is to encourage more small craft business owners and hobby leathercrafters to utilize alligator leather.

Cutting alligator leather is challenging due to the hide shape and scale arrangements (Belleau et al., 2004), and as hides are expensive, many crafters are terrified to cut into the hides. One potential method of alleviating this fear would be to digitize alligator hides into CAD patternmaking software. Once the hides are digitized, the leathercrafter can arrange digital pattern pieces for their products to determine a maximum cutting yield for the hide. There is growing support in the fashion industry to utilize digital technologies for product visualization before cutting the physical material (Lee & Park, 2017; McQuillian, 2020). Specialized CAD systems are already used in the furniture industry to optimize cutting yield for cow leather by determining the best arrangement of patterns on individual hides (Elamvazuthi et al., 2008). The use of a similar digitizing system would help to alleviate the fear of cutting as leathercrafters could be confident in their pattern layout for each hide. Additionally, this approach would allow for more of each alligator hide to effectively be used for products, which has sustainable implications. Therefore, the purpose of this research was to determine how to leverage technology to maximize cutting yield from alligator hides. A secondary goal was to find a free technology alternative that could easily be employed by crafters or small business owners.

Methods and Procedures

To begin, the researchers started this inquiry by developing a digitization process for alligator hides that employed proprietary software (Adobe Illustrator) and a cell phone camera. The digitization process was accomplished by taking a digital photo of the alligator hide and a piece of paper next to the hide with a 4” x 4” rectangle drawn on it. The picture had to be taken perpendicular to the hide so that there was no distortion of the photo dimensions.

The photo was brought into Illustrator. Next, on a new layer, a 4" x 4" digital rectangle was drawn and locked. Then, the original photo was manually scaled up so that the 4" x 4" rectangle in the photo matched the digital rectangle.

Finally, the pattern pieces were arranged on top of the digital alligator hide. Rectangular patterns could be drafted directly into Illustrator using the "Rectangle Tool." More complex patterns for items like handbags could also be photographed using the same method outlined above and then traced in the software with the "Pen Tool". Once the patterns were prepared, it was possible to move the shapes around the hide to optimize the cutting yield and achieve the maximum aesthetic outcome. Using this method, users can accurately align patterns to each specific hide. Patterns can be printed with a plotter and cut by hand. Or a laser cutter can be used to cut the alligator once the cutting yield was determined.

Using the developed method of digitizing alligator hides, the researchers next investigated free vector software that crafters or small business owners could use to achieve the same outcome. A total of eight software programs (both Windows-based and Mac) were investigated for inclusion in the initial sample. Requirements for the initial sample were that the program had up to an 8-foot artboard, allowed users to upload and scale an image, allowed users to create layers, draw a square, and save files as an SVG (in case users wish to print or use a laser cutter after determining their final layout).

A photo was taken of an alligator hide with a 4" x 4" rectangle for scale. The hide had three small stickers randomly placed on its surface to test the accuracy of the programs. Next, this image was brought into each program, and scaled to the proper size. The "drawing" tool in each program was then used to trace the three randomly placed points on the hide. Each program's drawing was printed on a plotter and compared to the actual alligator hide to determine the accuracy of point placement and overall image size. Any discrepancies between point placements were recorded using a coordinate system.

Results

Based on the required parameters, four programs (Draw Pad Graphic Designer, Inkscape, Vectr, and Vector Q) were able to advance to testing. When testing for accuracy, only Draw Pad's printout correctly lined up the three randomly placed points between the printout and physical hide. All others were slightly off in matching. It is possible with multiple trials that a user could correct the slight shift between point locations (see Table 1).

Table 1. *Programs with Test Point Location Variations*

Program	Point A	Point B	Point C
Draw Pad Graphic Designer Editor (Windows)	(0,0)	(0,0)	(0,0)
Inkscape (Windows)	(0,0)	(0, -1/16”)	(-1/16”, -1/4”)
Vectr (Online)	(0, 1/8”)	(1/8”, 0)	(-1/8”, -1/16”)
Vector Q (Mac)	(0,0)	(1/16”, 1/8”)	(1/4”,0)

In the second stage of inquiry, the programs were further tested to determine if stitching holes could be digitally added to each pattern piece. Stitching holes are often punched by hand using tools like an awl but they can also be laser cut. Stitching holes must be located a standard distance (e.g. 1/8”) from the pattern cut edge and must maintain an equal distance between them (SPI) which can make tight corners and curves tricky to calculate in software.

None of the free programs performed as well as Illustrator in placing stitching holes. Each stitch hole had to be placed individually. Keeping the spacing between stitch holes consistent was difficult, especially going around curves.

Conclusions

This work has positive implications by creating an easy, free method for crafters and small craft business owners to test their cutting yields for alligator leather. Many of today’s crafters and small craft business owners are very comfortable with technology and use platforms such as Etsy and Ravelry to connect (Church & Oakley, 2018; Jakob, 2013). Thus, the digital cutting method is appropriate for crafters. Using this method will help crafters to precisely plan and maximize cutting yield for alligator hides. According to Belleau et al., (2004), “Exact and precise planning was essential to the success of the finished (alligator) product” (p. 59). Draw Pad Graphic was the most accurate program. However, no program performed well at adding stitch holes. Future research should investigate whether the upgraded (small fee) versions of these programs would perform better when adding stitching holes.

References

Belleau, B., Marquette, Y., & Summers, T. (2004). Practical techniques for designing with exotic leather: American alligator and emu. *Clothing and Textiles Research Journal, 22*(1/2), 53-60. https://doi.org/10.1177/0887302X04022001

Church, E.M. & Oakley, R. (2018). Etsy and the long-tail: How microenterprises use hyper-differentiation in online handicraft marketplaces. *Electronic Commerce Research, 18*(4), 883-898. DOI: 10.1007/s10660-018-9300-4

Elamvazuthi, I., Kamaruddin, S., & Azmi, M. S. (2008). Automation of nesting and cutting processes of leather furniture production: A case study. *International Journal of Mechanical & Mechatronics Engineering, 9*(10), 25-29.

Fannin, J. M., Penn, J., & Stannard, C. (2021). *Identifying value-added markets for Louisiana's wild and farm-raised alligator industry* [Grant]. Louisiana Sea Grant Competitive Research Program (Project ID: R/A-63). NOAA Award # NA22OAR4170105

Jakob, D. (2013). Crafting your way out of the recession? New craft entrepreneurs and the global economic downturn. *Cambridge Journal of Regions, Economy and Society, 6*(1), 127-140. https://doi.org/10.1093/cjres/rss022

Lee, E., & Park, H. (2017). 3D virtual fit simulation technology: Strengths and areas of improvement for increased industry adoption. *International Journal of Fashion Design, Technology and Education, 10*(1), 59–70. DOI: 10.1080/17543266.2016.1194483

McQuillan, H. (2020). Digital 3D design as a tool for augmenting zero-waste fashion design practice. *International Journal of Fashion Design, Technology and Education, 13*(1), 89-100, DOI: 10.1080/17543266.2020.1737248

Acknowledgement

This work was supported by: Louisiana Sea Grant Competitive Research Program (Project ID: R/A-63). NOAA Award # NA22OAR4170105