



MARINELINK

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Photogrammetry Accelerates Creation of Marine Enclosures

By Jerry Fireman August 7, 2017

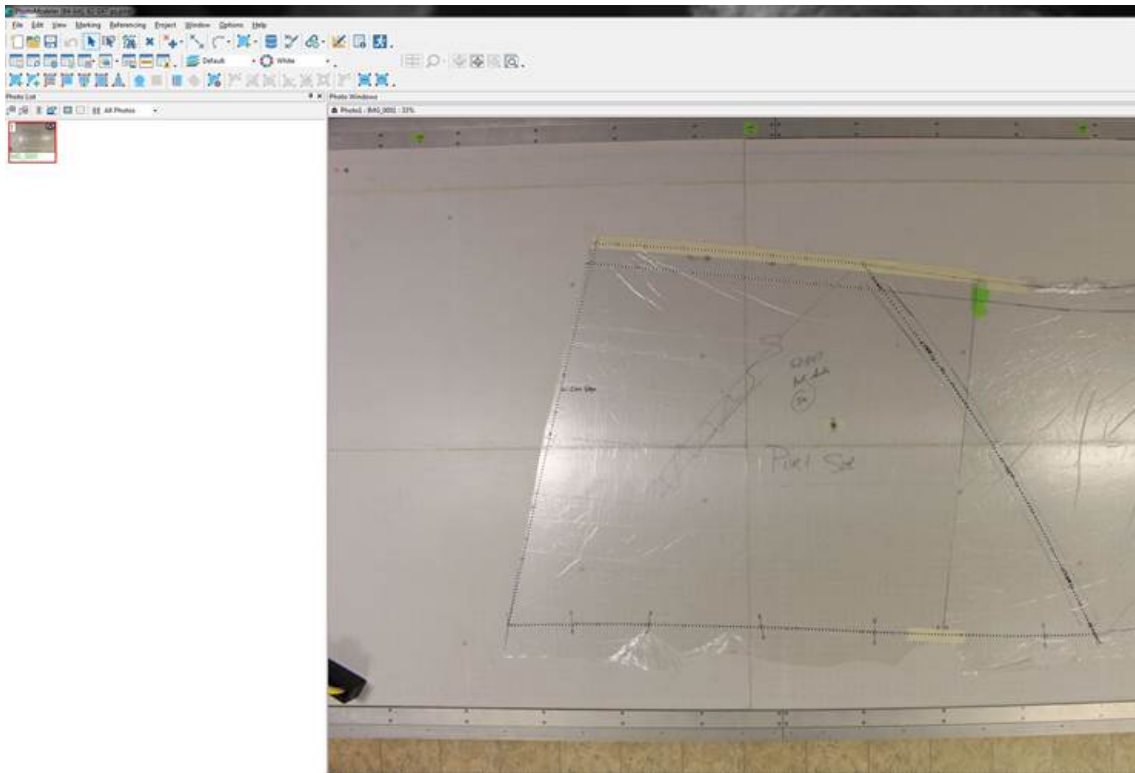


Photo of pattern imported into PhotoModeler

Photogrammetry helps reduce time to create marine enclosures and covers from 3 days to 4 hours

Costa Marine Canvas specializes in producing high end, custom marine furniture, soft goods, enclosures and covers. One of the most difficult of those tasks is creating windscreen enclosures for large and complex fly-bridge structures. A typical flybridge enclosure might have five 5-foot tall panels, ranging in various lengths, and combined to be 20 feet or more. While basic in appearance, each panel consists of 20 or more complex pieces of various materials fastened together by adhesives and sewing to fit and fasten to the bridge structure. When complete, the enclosure provides features such as ventilation, protection from the elements and easy removability for open-air cruising.

Traditional approach

The traditional approach to designing and building an enclosure begins with sending a patterning crew out to the boat. The crew spreads flat patterning materials over the openings that the enclosure will cover. The pattern is carefully marked to indicate points of attachment and other features. The crew brings the patterns and additional measurements back to the

marine fabricator where they are laid out on a table for further processing. The designer then carefully processes each pattern, using formulas that have been developed through decades of experience, to determine the complex characteristics, which the individual pieces will each require. The result is an enclosure that fits like a glove, is visually striking, is fully functional and will stand up to the harsh marine environment. Once this processing is done, [templates](#) are made, parts are traced, marked, cut by hand, sewn, glued and then connected to produce the completed 3D enclosure. The patterns are cataloged, organized and stored in a large and protected location.

Enclosure manufacturers have long been interested in [applying digital technology](#) to the design of enclosures and covers by taking photographs of the panel patterns and digitizing the photos to create computer aided design (CAD) models. But accurate digitization with a camera requires the ability to define exactly how long each dimension on the photo is in real world units. Furthermore, slight variations in the view and misalignments in the camera image chip with the pattern will cause distortions that must be eliminated in the final model. Camera lenses also warp the view, causing straight lines to look like curves, and these distortions must be eliminated in the final model to obtain the required accuracy.

Moving to photogrammetry

“Realizing that simply photographing the patterns and digitizing the photographs was not going to work, we did some research and discovered an inexpensive and easy-to-use photogrammetry package that understands and encapsulates these complex mathematics,” said Jim Vuocolo of Costa Marine Canvas.

The new approach to designing and building an enclosure similarly begins with sending a patterning crew out to the boat, and patterning the openings that the enclosure will cover. The pattern is marked to indicate points of attachment and that’s where the similarity ends. Now the patterns are brought to the Imaging Technician who loads multiple digital photos of the patterns into [PhotoModeler](#) photogrammetry software from Eos Systems Inc. The designer marks features that appear across multiple photographs, such as corners or marks. The software accurately determines the camera’s parameters, including focal length, lens distortion, image aspect ratio and the position and angle of the camera for each photograph. The software then determines an accurate scale, accounts for perspective and eliminates distortion in the process of creating an accurate 2D CAD model of the pattern.

Once the photograph is opened in CAD, then all the complex formulas, repetitive tasks and precision markings are resolved with a few mouse clicks. The patterns are now thrown away and thousands of giant enclosures can be stored on a USB thumb-drive. “Once PhotoModeler gives me a CAD file, the sky becomes the limit,” Vuocolo said. “The average household computer has the processing power to easily allow me infinite manipulation of our files. Now I can see how our products will look, and how big they’ll be, to within thousandths of an inch, all before we even cut them out. Changes in formulas or customer orders, which would normally cause an employee to scrap a project and start all over, now simply require a few clicks.”

Designing enclosures in the digital world

The CAD model of the pattern makes it possible to design and edit the enclosure in the digital world, faster and more accurately than was ever possible using a pencil and paper. It eliminates the tedious process of making manual measurements and cutting out templates. By switching to the new method, Costa Marine Canvas has dramatically reduced design and manufacturing times, all while increasing accuracy and possibility. The CAD files can easily be sent to a cutting machine, which cuts the pattern and draws all the reference lines in a [flash](#). Tasks which previously took several workers a few days to complete, now can be completed by a single worker in as little as four hours.

Costa Marine, as well as other manufacturers, see the potential for even greater time savings in the future by using photogrammetry to streamline the measurement process. This new technique is called 3D templating. Instead of manually measuring and fitting patterns to the bridge, the measuring crew will set up reference markers and take pictures from different angles in the field. Then the photogrammetry software will convert the pictures into a 3D CAD model of the structure that can be used to quickly generate 2D models of the pieces required to build the enclosure.

“What I really like about photogrammetry is that there are no rules,” Vuocolo said. “Photogrammetry doesn’t make me do anything with my patterns, it allows me to do whatever I [can dream](#) up. I’m only limited by my imagination, and as a fabricator, imagination is everything. Photogrammetry allows us to get things done that we could only dream of before, and the time and space that it saves us are immeasurable. My only regret is that we didn’t start using it sooner.”