From Plows to Pixels: A Photogrammetry AR Experiment

The article discusses a photogrammetry experiment that originated from an idea discussed by Darryl Wines, Simcoe County Museum/Georgian College, and Steve Benoit, Georgian College. The objective was to capture photographs of two plows, create accurate 3D digital models, and produce scaled-down 3D printed replicas. The digital models would also be converted into usdz and glb formats for viewing in virtual (VR) and augmented reality (AR) on iPhone and Android devices. Travel to an upcoming conference would be far easier with these scale and digital models than travelling with the full size plows.

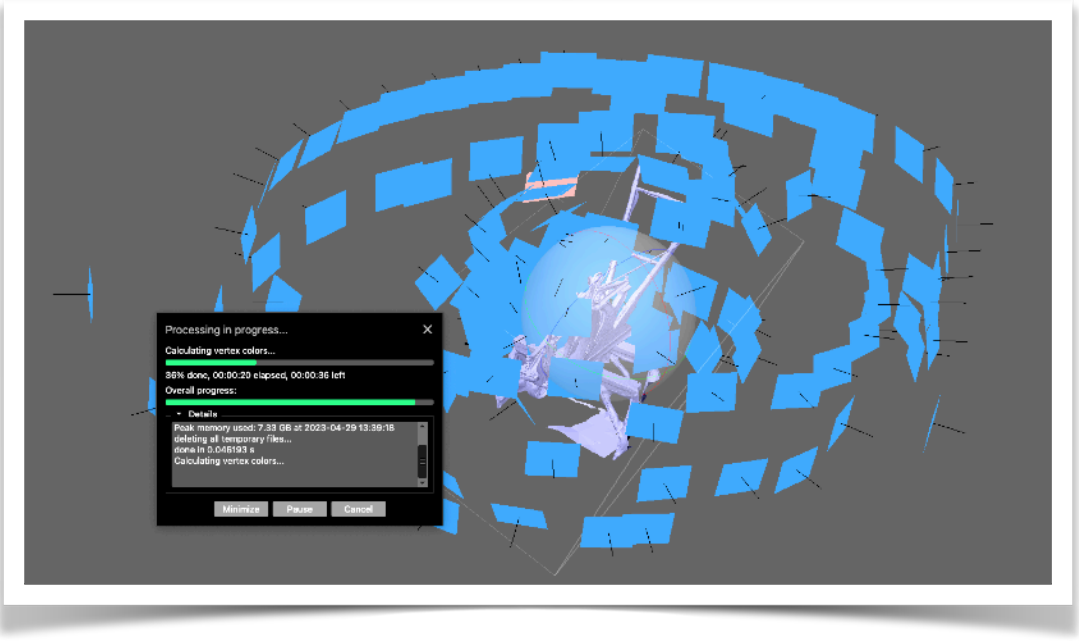
In February 2023, the photography session took place indoors at the Simcoe County Museum. High-resolution photographs were captured from various angles using prosumer-grade equipment.

A Cockshutt Junior plow manufactured in Brantford Ontario was one of the two plows selected for the project. The second plow was the Scotch-Canadian wooden plow.

Cockshutt Junior plow in the museum for a photography session; February 2023

Scotch-Canadian wooden beam plow photography session; February 2023

The experiment utilized PhotoCatch and Metashape photogrammetry software under the guidance of Steve Benoit from Georgian College to process the collected images to generate detailed 3D models of the plows. The software

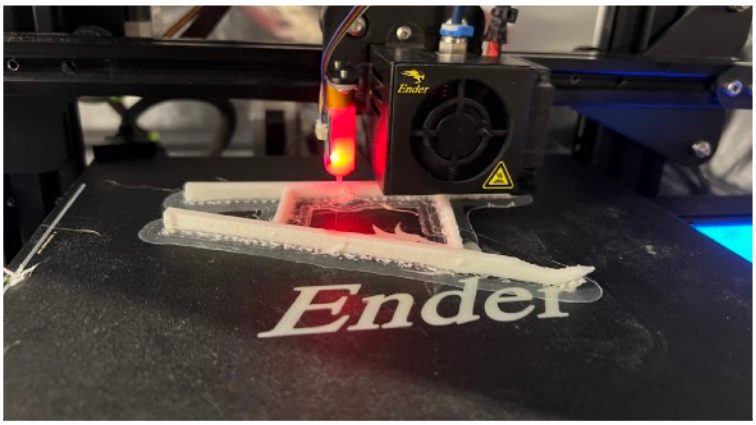


Images of Cockshutt Junior plow processing in Metashape

analyzed the visual data, identified common features, and reconstructed the geometry and texture of the plows into 3D digital models.

The 3D models were further refined and cleaned up using Blender software. All image and model processing occurred on an Apple MacStudio computer, ensuring a powerful and efficient workflow.

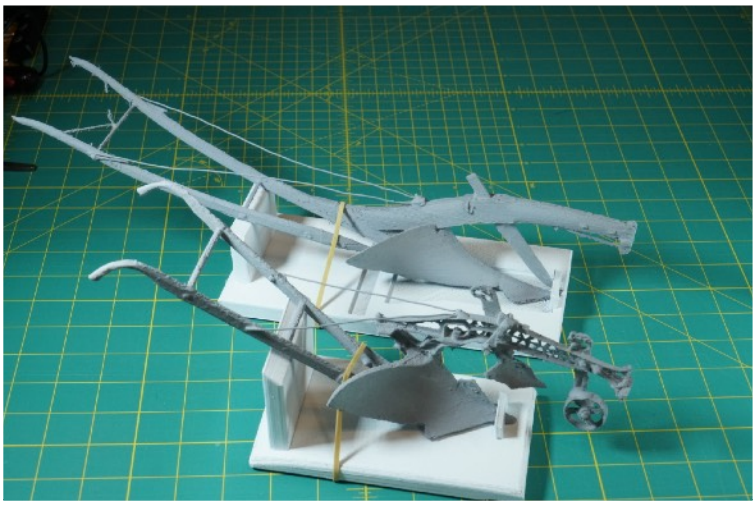
In the spring of 2023, the 3D models were divided into suitable sections for printing and produced using a Creality Ender 3 printer. This allowed for the creation of scaled-down physical replicas of the plows while maintaining accuracy and proportions.



3D Printing scaled handle section of Cockshutt Junior plow

The project concluded with the display of the 3D printed and AR models at the annual Association for Living History, Farm, and Agricultural Museums (ALHFAM at https://alhfam.org) conference in Ohio in late June 2023. The tangible 3D printed models provided a hands-on experience for conference attendees to examine the plows' details.

Furthermore, the photogrammetry project made the plows accessible to the public as well as the attendees. The 3D models are shared on Sketchfab, enabling a wider audience to view and explore them. The plow models can be accessed at the following links:



Both plows printed and ready for transport

- Plow 1, J.G. Cockshutt Junior: https://skfb.ly/oI9CN
- Plow 2, Scotch-Canadian wooden beam: https://skfb.ly/oI9EX

This extended the project's reach and awareness of photogrammetry for museum activities.

Conference attendee posing with augmented reality (AR) plows

In summary, the photogrammetry experiment, driven by Darryl Wines from Simcoe County Museum and Steve Benoit from Georgian College, involved photographing the plows at the Simcoe County Museum, creating 3D digital models using PhotoCatch and Metashape software, then cleaning up the models in Blender. The models were then 3D printed and showcased at the ALHFAM conference along with AR virtual models. Additionally, sharing the plow models on Sketchfab provides an opportunity to engage people beyond ALHFAM, Georgian College, and Simcoe County Museum.

Object References:

Scotch-Canadian Beam Plow
Accession number: 964.2198
Simcoe County Museum
1151 Highway 26, Minesing, Ontario L9X 0Z7

Cockshutt Junior Plow
Accession number: 966.3351
Simcoe County Museum
1151 Highway 26, Minesing, Ontario L9X 0Z7

Software/Hardware References:
PhotoCatch software, utilized free Mac based option
https://www.photocatch.app/

Agisoft MetaShape, utilized standard edition paid license
https://www.agisoft.com/

Blender, free/opensource
https://www.blender.org/

Apple MacStudio, base model employed
https://www.apple.com/ca/mac-studio/

Sony a7RII camera
https://www.sony.ca/en/electronics/interchangeable-lens-cameras/ilce-7m2-body-kit

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