ARIUS 3D
IMAGING THE REAL WORLD

Customer Case Study
Replication

McCord Museum
Champlain Bust

Arius3D model of Samuel de Champlain

Scanning of Samuel de Champlain bust

The McCord museum in Montreal Canada, wished to create a number of bronze statues based upon the plaster bust of the French explorer Samuel de Champlain created by Alfred Laliberte 1930-1950. Traditional foundary methods that require molding directly on the surface of the artifact where not considered due to the risk to the artifact.

The Arius3D three dimensional laser scanner provided a conservation friendly solution of replicating the bust. High resolution scanning of the object produced a nearly identical digital copy that is compatible with commercially available methods of industrial fabrication.

The artifact was transported from the museum to the office of Arius3D where a complete three dimensional documentation was performed. The documentation included the measurement of spatial (x,y,z) and color (rgb).

The Arius3D non-contact measurement system consists of a laser scanner and a motion control system for moving the scanner. The laser system cannot damage fine objects or fabrics in any way. The total light exposure is about 3.5 mW total (three one-thousandths of a watt) in a circle about the size of a period in this document. This is roughly equivalent to shining a flashlight on the object. Also, because the laser light is in constant motion (it moves at about 300 mm/sec across the surface of the object), the amount of light exposed to the surface is extremely small.

The Arius3D system collects color and geometry using the same sampling beam. This technology provides perfect registration of color and geometry with a single xyzrgb point. Ambient light is not used in the scanning process to illuminate the object. Therefore, none of the effects of ambient lighting are visible in the images.

The final digital object is constructed from 100,885,459 xyzrgb points. Measurement data is collected in a regular grid pattern with a lateral resolution of 100um (10 measurement points per milimeter). The Z axis resolution, the smallest feature that the scanner can measure, is 25um (~.001in). The scanner is capable of collecting 3,000 measurement points every second.

With dimension of 56cm X 45cm X 30cm this is one the largest objects ever digitized at such high resolution. Data processing of the 100 million points, equivalent to 200 million triangles, is made possible by efficient memory utilization and data management of the Pointstream software.

The goal of the museum was to create a limited number of reproductions in bronze. The measurement data was used to produce a physical replica in both full size 1:1 and larger 1:1.5 scale. The patterns were created using a rapid prototyping system from 3DSystem Inc.

Stereolithography models created from Arius3D digital data

These plastic reproductions where then used as a permanent pattern for traditional foundary methods. To fit within the volume capacity of the rapid prototyping system the part was divided into five sections. After all of the parts were produced the five pieces were assembled and bonded together.

A process of moulding and duplicating is used to create the final casting. The first mold is made of silicon and is created directly on the plastic patterns as they would have been on the actual artifact. Once reinforced, casting wax is poured into the silicon mould to create a single use "positive" pattern. A ceramic slury is formed over the wax pattern to form the "negative" mould used to form the molten bronze. The ceramic mould and wax is placed in an autoclave and heated to remove the wax pattern in preparation for the molten bronze.

Final bronze statue replica

The casting and finishing of the replicas was carried out by Fonderie D'Art D'Inverness (www.fonderieart.com).