

In projective geometry, restitution is the process that uses one, two or more two-dimensional projections of an object, usually one, two or more photograms, to determine the shape, size and position of that object in space, according to a pre-established reference system.

Restitution is often applied in engineering, architecture, archaeology and cartography.

More and more sophisticated instruments are available to perform restitution, such as phototheodolites, bicameras and monocameras to make photograms, and others like analogue or analytical stereo plotters and stereoscopes for stereoscopic restitution.

In stereoscopic restitution, two photograms are used to recreate a scale optical model similar to a photography shot, and the operator identifies in this model the point  $P$  recreated by the projection rays from the two photograms images  $P'$  and  $P''$  of  $P$ , allowing the instrument to fix the spatial coordinates of  $P$ .

In restitution from only one photogram there is obviously no need for a stereo plotter, but rather the work is done graphically, constructing geometrical figures using set squares and compass.

Graphic restitution from two or more photograms is used in very difficult cases.

There are various methods of graphic restitution.

I have carried out a lot of work on graphic restitution and I have created new methods of restitution from two photograms in cases where the shooting position of the cameras and type of camera used is unknown.

Restitution from one photogram can be performed in many particular cases where we know the shape and size of an element of the photographed object.

Restitution can be done on a normal photogram, that is, on a central projection, or on a parallel projection.

The image on the Shroud, or rather, the *images* on the Shroud are examples of the latter. Some objects of known shape, like the tefillin box, the belt, belt buckle, chain rings and nails are impressed on the cloth in many different positions.

We have not one but *all* these objects to make restitution possible. Restitution shows that in every different position object  $X'$  is the same shape and size  $X$ , the same projection pattern, confirming each time that the identification and restitution are correct and that projection is parallel and orthogonal to the projection plane.

This can be repeated for each object and part of the object detected.

Restitution, that provides shapes and sizes for engineering and architecture, different-scale maps of cities, continents or celestial objects, is a sound base on which we continue to work.

Restitution performed on the Shroud is even more sound because it offers dozens of images of each object and just as many possibilities for their restitution.

It is important that this is clear. Restitution, like all scientific techniques, can be repeated always obtaining the same result.

GRAPHIC RESTITUTION BY MEANS OF TWO FREELY ORIENTED PHOTOGRAMS, 1988

SURVEY AT A DISTANCE OF A BODY BY MEANS OF TWO PHOTOGRAMS, 1988

TWO METHODS GRAPHIC RESTITUTION BY MEANS OF TWO FREELY ORIENTED PHOTOGRAMS, 1989