

CLAIMS

What is claimed is:

1. A system for generating a 3D model of a real world object comprising:
 - a camera modeler comprising:
 - a first input receiving camera parameters;
 - a second input receiving first and second point sets corresponding to points on respective first and second images of a first object,
 - the camera modeler providing projections of the first and second point sets into a 3D space in accordance with the camera parameters;
 - an object modeler comprising:
 - an input receiving the projections;
 - a first output providing a 3D model of the first object based on the projections;
 - a second output providing an estimate of projection error;
 - the system adjusting at least one camera parameter in accordance with the estimate of projection error,
 - the camera modeling unit projecting the first and second point sets based upon the at least one adjusted camera model parameter, thereby enabling the object modeler to provide an error corrected 3D model of the first object.
2. The system of claim 1 further comprising a rendering unit including an input for receiving the error corrected 3D model, the rendering unit providing a 2D representation of the first object based on the error corrected 3D model.
3. The system of claim 2 further comprising:
 - a 2D display device including an input receiving the 2D representation of the error corrected 3D model, the display device displaying the 2D representation of the first object;
 - an operator control device coupled to the display device to enable the operator to interact with the 2D representation of the first object to measure dimensions of the object.
4. The system of claim 1 further including:
 - a display device configured to display first and second 2D images of the real world 3D object;
 - an operator input device coupled to the display device to enable an operator to interact with the displayed 2D images to define the first and second point sets.
5. The system of claim 4 wherein the 2D display device is configured to further display at least one image of a second object and wherein the operator control device is configured to enable

the operator to position the image of the second object within one of: the displayed first image, the displayed second image, a displayed rendered image based on the error corrected 3D model.

5. A method for generating a 3D model of an object comprising:
 - initializing a camera modeler with first and second initial camera parameters;
 - receiving by the camera modeler first and second 2D point sets corresponding to points on the object appearing in first and second 2D images of the object;
 - projecting by the camera modeler the first and second 2D points sets into a 3D model space;
 - determining 3D coordinates to comprise a 3D model of the object based on the projections;
 - determining an error associated with the projected first and second 2D point sets;
 - adjusting at least one of the initial camera parameters in accordance with the error, such that the first and second 2D point sets are re-projected in accordance with a corrected camera parameter;
 - determining 3D coordinates to comprise the 3D model of the object based on the re-projected first and second 2D point sets.
6. The method of claim 5 wherein the steps of generating projections, determining 3D coordinates, determining an error and adjusting a camera parameter are repeated until the determined error is less than or equal to a predetermined error.
7. The method of claim 6 wherein the steps repeating and determining error are carried out by evolving at least one camera parameter to optimize time to converge on the predetermined error.
8. The method of claim 5 including a further step of rendering the error corrected 3D model for display on a display device.
9. The method of claim 5 including further steps of :
 - receiving a third set of points representing a second object appearing in a third image;
 - adjusting the scale and orientation of the represented second object to match the scale and orientation of the first object by operating on the third set of points in the 3D model space;
 - displaying the second object with the displayed first object.

CLAIMS

What is claimed is:

1. A system for generating a 3D model of a real world first object, comprising:
 - a camera modeler comprising:
 - a first input receiving camera parameters;
 - a second input receiving first and second point sets corresponding to points on respective first and second images of the first object,
 - the camera modeler providing projections of the first and second point sets into a 3D space in accordance with the received camera parameters;
 - a 3D model generator comprising:
 - an input receiving the projections;
 - a first output providing a 3D model of the first object based on the projections;
 - and
 - a second output providing an estimate of projection error, wherein the error indicates a deviation between a point of the 3D model and a corresponding point of the 3D space projections;
 - the system adjusting at least one camera parameter in accordance with the estimate of projection error,
 - the camera modeler projecting the first and second point sets based upon the at least one adjusted camera model parameter, thereby enabling the 3D model generator to provide an error-corrected 3D model of the first object.
2. The system of claim 1, further comprising a rendering unit including an input for receiving the error-corrected 3D model, the rendering unit providing a 2D representation of the first object based on the error-corrected 3D model.
3. The system of claim 2, further comprising:
 - a 2D display device including an input receiving the 2D representation of the error-corrected 3D model, the display device displaying the 2D representation of the first object; and

an operator input device coupled to the display device to enable an operator to interact with the 2D representation of the first object to measure dimensions of the first object.

4. The system of claim, 1 further including:

a display device configured to display first and second 2D images of the real world first object; and

an operator input device coupled to the display device to enable an operator to interact with the displayed 2D images to define the first and second point sets.

5. The system of claim 4, wherein the display device is configured to further display at least one image of a second object, and

wherein the operator input device is configured to enable the operator to position the at least one image of the second object within one of: the displayed first image, the displayed second image, and a displayed rendered image based on the error-corrected 3D model.

6. A method for generating a 3D model of a first object, comprising:

initializing a camera modeler with first and second initial camera parameters;

receiving by the camera modeler first and second 2D point sets corresponding to points on the first object appearing in first and second 2D images of the first object;

projecting by the camera modeler the first and second 2D points sets into a 3D model space;

determining 3D coordinates to comprise a 3D model of the first object based on the projections;

determining an error associated with the projected first and second 2D point sets, wherein the error indicates a deviation between a point of the determined 3D coordinates and a corresponding point of the 3D space projections;

adjusting at least one of the initial camera parameters in accordance with the error, such that the first and second 2D point sets are re-projected in accordance with an adjusted camera parameter ; and

determining 3D coordinates to comprise the 3D model of the first object based on the re-projected first and second 2D point sets.

7. The method of claim 6, wherein the steps of projecting, determining 3D coordinates, determining the error and adjusting a camera parameter are repeated until the determined error is less than or equal to a predetermined error.
8. The method of claim 7, wherein the steps repeating and determining the error are carried out by evolving at least one camera parameter to optimize time to converge on the predetermined error.
9. The method of claim 6, including a further step of rendering the 3D model for display on a display device.
10. The method of claim 6, including further steps of :
 - receiving a third set of points representing a second object appearing in a third image;
 - adjusting a scale and an orientation of the represented second object to match the scale and the orientation of the first object by operating on the third set of points in the 3D model space; and
 - displaying the second object with the first object.
11. The system of claim 1, wherein the corresponding point is of a line of the 3D space projections.
12. The method of claim 6, wherein the corresponding point is of a line of the 3D space projections.