Robert Remembers: the VW Bug

By Robert McDermott

The year-1972, the teacher-Ivan Sutherland, the objective-create a rendered model that would achieve

instant recognition of a physical icon.

In the infancy of computer graphics, and in my first year of study, a University of Utah graduate course began a project that resulted in a computational benchmark and a small piece of computer graphics history.

Sutherland challenged his students to choose something iconic to realistically render. We selected the Volkswagen Beetle—as a symbol of global culture, because it was large enough to measure as a group, and because Ivan's wife, Marsha, owned one.

The rendering method was a points and polygon description. We divided the car into parts, such as the roof, hood and trunk. Jim Clark (PhD '72) and I were taller so we arranged to have the higher points of the car. Bui Tuong Phong (PhD '73) and Raphael Rom (PhD '75) were shorter so they measured the lower sections.

Each auto part shared a set of points and lines that were painted on the surface of the Beetle to describe a set of mostly flat polygons. A volleyball stanchion and joints in the pavement formed a three-dimensional reference system. We used yardsticks to measure the x, y, and z coordinates of the painted points on the car surface. The Beetle was assumed to have left to right symmetry so we measured only half of the car. The process was slow and tedious, taking many class sessions to complete. Marsha was a wonderful sport as she drove the car around town festooned with our markings.

After each measure-ment session, we entered by hand the lists of point coordinates into text data files. The lists of polygons were also entered as lists of integer indices referencing the sets of points. The system used to render the files included hardware developed by Gary Watkins (BS '67, PhD '70) to imprint shaded images onto a direct film recorder, taking several minutes per photographic image. Polaroid film was used to get pictures as quickly as possible for the assignment and later 4x5 sheet negatives were produced to get higher quality images. Mike Milochek developed the sheet film and printed photographic images over stretches of days at a time.

At this time, the software to render 3D models was limited to flat polygonal shading or smooth shading of a polygon model developed by Henri Gouraud (PhD '71) while at the University of Utah. Each student proudly produced photos of his particular part–on time– during the ten week class. However, pictures of parts do not a picture of a VW make. Dennis Ting (BS '71), a department computer staffer, decided that it would not be too hard to make a picture of the entire car. Well, it was not so easy. Measuring point coordinates with yardsticks introduced more than a small amount of error. No two parts connected very well, and when the supposed symmetric parts were reflected again there were sizable gaps, resulting in many hours of digital fiddling. Relating the separately created parts file into one coherent model introduced additional complexities of transformations for translation, scaling, and rotation. Not only did calendar time pass but many computer cycles were expended. When Dennis succeeded in the fall, we were grateful to him for doing so much work.

Ting also compared the human time cost vs. the computer time cost and revealed that the image of the VW cost more than its street value. At the time, we didn't anticipate that the image would endure many years longer than the Sutherlands' Beetle. As a computer graphics icon, it still crops up in highly respected journals and animated features.

For me, it symbolizes something else as well: Ivan's generosity as a teacher and mentor. One of his "tricks" was that he would pose problems that seemed reasonable, but were in fact more difficult than first understood. We were all proud when we succeeded in meeting his standards; I continue to be proud of my part in creating a first computer graphics generated picture looks like its physical model.

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