Computer Generated Binary Fraunhofer Holograms[1] TERESA JEFFREY, MARIAN SHIH, Saginaw Valley State University — A computer algorithm is useful when generating mathematical representations of physical objects. In this case, this research project demonstrated the accuracy and viability of computer generated holograms using the Fraunhofer diffraction formula. This was done by way of mathematically representing a physical object as a matrix, generating the Binary Fraunhofer Hologram, and computing said hologram. The holograms generated by computer were printed and photographically reduced onto film, then successfully reconstructed optically to view the preconceived virtual object. The algorithm was written using Matlab. The algorithm contained a computational stage, followed by a representational stage. The computational stage calculated the complex scalar field by means of a 2-dimensional Discrete Fourier Transform, which was the numerical equivalent of the process of recording a hologram using an analog optical method. The representational stage created a binary pattern using information from the computed complex scalar field, by encoding cells using the detour-phase method invented by Brown and Lohmann & Lohmann and Paris.

Teresa Jeffrey
Saginaw Valley State University

Date submitted: 25 Sep 2019

Electronic form version 1.4