

RESUME

Donald C. Dilworth
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Education: MIT, SB in physics, 1961.

Experience:

Mr. Dilworth is president of Optical Systems Design, Inc., and has since 1961 been intensively involved in development and application of computer software for optical design. He has extensive experience in most areas of lens design, particularly in thermal infrared systems, and is the author of the well-known SYNOPSIS™ lens design program, which is widely used by lens designers worldwide.

- He has an active consulting business in lens design, with customers in many countries, and has taught many short courses dealing with lens design and the unique capabilities of SYNOPSIS in the US and abroad. He has presented Colloquium lectures at the University of Arizona, in St. Petersburg Russia, and elsewhere.
- As author of SYNOPSIS, Mr. Dilworth has advanced the state of the art in the areas of artificial intelligence (AI) and with the development of the popular PSD (Pseudo Second Derivative) optimization method.
- He is a senior member of the Optical Society of America and SPIE.
- He was senior principal development engineer at the Honeywell Radiation Center, where he was responsible for conceptual and detailed design, tolerancing, and analysis of numerous IR and visible-light systems, including startrackers, periscope optics, and FLIRs.
- He was director of the optical design department at Baus Optics, Inc., where he developed and implemented techniques for the design of geometric and thin-film optics.
- Prior to joining Baus Optics, Mr. Dilworth was employed by Itek Corporation as Senior Optical Physicist. In this capacity, he was responsible for designing a variety of advanced optical systems, including aerial photographic lenses used on the recently declassified Corona project, aspheric systems, multilayer dielectric coatings, and a submarine periscope.
- At the Massachusetts Institute of Technology, he developed computational techniques for optical and thin-film design, which were applied to the design of the optical navigation equipment for the Apollo project.

Patents:

US Patent number	Name	Issue date
5742421	Split lens video display system	21/04/1998
4116537	Thermal compensation apparatus	26/09/1978
4720183	Extreme wide angle eyepiece with minimal aberrations	18/06/1978
3565511	Telecentric lens system for providing an image with the principal rays...	23/02/1971

Publications:

1. D.C. Dilworth; "SYNOPSIS: a State-of-the-art Package for Lens Design", SPIE Vol. 766, 264, (1987).
2. D.C. Dilworth; "New Tools for the Lens Designer", SPIE 7060, pp. 70600B-70600B-11. (2008)
3. D.C. Dilworth; "Lens tolerances: Software eliminates the guesswork", LaserFocusWorld. (2007)
4. D.C. Dilworth; "Optical design using the SYNOPSIS software package", 3d International Conference on optics-photonics design & fabrication "ODF 2002", Tokyo. (2002)
5. D.C. Dilworth; "Expert systems in lens design", SPIE 1354, 357, (1990)
6. D.C. Dilworth; "Fast MTF Calculation in the Presence of Diffraction", Appl. Opt. 11, 1101, (1972).
7. D.C. Dilworth; Synopsys: A State-Of-The-Art Package For Lens Design, SPIE 0766, Recent Trends in Optical Systems Design and Computer Lens Design Workshop, (10 June 1987);
8. D.C. Dilworth; "Pseudo-second-derivative Matrix and its Application to Automatic Lens Design", Appl. Opt., 17, 3372, (1978). http://www.osdoptics.com/PSD_II.pdf
9. D.C. Dilworth; "Improved convergence with the pseudo-second-derivative (PSD) Optimization Method", SPIE Vol. 399, 159, (1983). http://www.osdoptics.com/PSD_III.pdf
10. D.C. Dilworth; Current Status Of The Synthesis Of Optical Systems (SYNOPSIS) Lens Design Program, SPIE 0237, 1980 International Lens Design Conference, (16 September 1980)
11. D.C. Dilworth; "An Infrared Alignment Telescope", SPIE Vol. 483, 45, (1984).
12. D.C. Dilworth; All the world's lenses: a database of over 20,000 lenses from the patent literature, SPIE 2537, Novel Optical Systems Design and Optimization, (11 August 1995)
13. D.C. Dilworth; "Automatic Lens Optimization: Recent Improvements", SPIE Vol. 554, 191, (1986).
14. D.C. Dilworth; "A Multilevel Approach to User-friendly Lens Design", SPIE Vol. 655, 6, (1986).
15. D.C. Dilworth; "Applications of Artificial Intelligence to Computer-aided Lens Design", SPIE Vol. 766, 91, (1987).
16. D.C. Dilworth; and David Shafer; "Man versus Machine; a Lens Design Challenge", SPIE Vol. 8841, 88410G-1, (2013)

17. D.C. Dilworth; Novel global optimization algorithms: binary construction and the saddle-point method, SPIE 8486, Current Developments in Lens Design and Optical Engineering XIII, 84860A (11 October 2012)
18. Donald C. Dilworth, SYNOPSIS Supplement to Joseph M. Geary's "Introduction to Lens Design," Willmann-Bell, Richmond (2013).
19. D.C. Dilworth; "A zoom lens from scratch: the case for number crunching," D.C. Dilworth, Proc. SPIE, 9947, Current Developments in Lens Design and Optical Engineering XVII, 994702 (27 September 2016)
20. D.C. Dilworth; New tools for the design of freeform mirrors, SPIE 10375, Current Developments in Lens Design and Optical Engineering XVIII, 1037502 (23 August 2017);
21. D.C. Dilworth; **Lens Design: Automatic and Quasi-Autonomous Computational Methods and Techniques (IPH001)**, Iop Publishing Ltd (October 31, 2018)
22. Livshits, I, and Dilworth, DC; Trends in optical design from 1988 to 2018... where to from here? <https://doi.org/10.1515/aot-2018-0025>
23. Livshits, I, and Dilworth, DC; Practical tutorial: A simple strategy to start a pinhole lens design; <https://doi.org/10.1515/aot-2015-0024>

SYNERGISTIC ACTIVITIES

Mr. Dilworth has developed software algorithms that improve the performance and convergence rate for lens design tasks by several orders of magnitude. His PSD algorithm remains the gold standard for lens design software and has not been matched by any other commercial program.

With the software tools and source code for the SYNOPSIS™ program, Mr. Dilworth has frequently and quickly added unique features to the code, often in response to a user's request. A typical feature of this kind is the ability to characterize and raytrace a variety of DOE surface types.

COLLABORATORS AND OTHER AFFILIATIONS

Collaborators: D. C. Dilworth and David Shafer; David Shafer Optical Design

Mr. Dilworth has collaborated with the distinguished lens design expert David Shafer on a friendly lens design competition. This involved the design of a difficult lens while relying on extensive experience and deep knowledge of aberration theory, and then comparing those results with those obtained by running the most powerful lens optimization and global search routine in the world, with little user input other than a description of the design goals. The algorithm emerged as a clear winner, equaling and often surpassing the best results from a human expert. The algorithm was written by Mr. Dilworth.

