

## CV of Klaus Grue

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Born January 28, 1958  
Civilian-condition Married, four children

### 1 Education

- 1992** Dr.scient. in “Map theory” from the Faculty of Natural Sciences at the University of Copenhagen.
- 1985** Ph.D. in man-machine interfaces from the Department of Computer Science at the University of Copenhagen (DIKU). Financed by Risø National Laboratory.
- 1982** M.Sc. in Electrical and Electronics Engineering from the Danish Technical University (DTU).

### 2 Affiliations

- 2012-now** System Developer at Edlund A/S.
- 2007-2012** Senior Software Engineer at Rovsing A/S.
- 1988-2007** Associate Professor at DIKU.
- 1997-2000** Consultant at National Survey and Cadastre Denmark (“Kort- og Matrikelstyrelsen”)
- 1988-1999** Consultant at Computer Resources International A/S (CRI), now bought by TERMA A/S.
- 1987-1988** Systems analyst and project manager at CRI.
- 1985-1987** Assistant Professor at DIKU.
- 1982-1985** Ph.D. student at Risø National Laboratory.
- 1976-1982** Programmer at Risø National Laboratory. Teaching assistant at DTU in linear algebra, elementary digital electronics, elementary analogue electronics, and computer science.

### 3 Non-academic research and development

2012-now: Edlund A/S.

- Participated in the Actulus project funded by the Danish National Advanced Technology Foundation (“Højteknologifonden”).
- Developed a language for expressing actuarial payment streams for inclusion in the Actuarial Modelling Language (AML).
- Developed a compiler for converting payment streams into differential equations for computing reserve and cash flow.
- Developed a differential equation for cash flow computations to accompany the well known Thiele differential equation for reserve computations.
- Developed efficient methods for handling policy holder options (e.g. free policy and surrender options) as required by the Solvency II legislation.
- Analysed and implemented efficient computational models for collective spouse insurances.

2007-2012: Rovsing A/S.

- Project Manager for the construction of a Visual Inertial Navigation System (VINS) for the Danish Defence. VINS allows navigation in situations where the Global Positioning System (GPS) is unavailable.
- Project Manager for Rovsings part of test of a combined Helicon Plasma / Hydrazine rocket engine.
- Project Manager for Rovsings part of the Crew Space Transportation System (CSTS) project. CSTS is a transportation system for bringing twelve people to the Moon per year based on cooperation between the Russian space agency Roscosmos and the European Space Agency (ESA).
- Participated in establishing guidelines for Independent Software Verification and Validation (ISVV) for code generated by Auto Code Generation for ESA.
- Participated in ISVV of software in a train door controller for Danish Rail.

1997-2000: Consultant at National Survey and Cadastre Denmark.

- Developed software for verification of the consistency of human digitized geodesic maps.

1988-1999: Consultant at CRI / TERMA.

- Designed and implemented algorithms for fast recognition of stellar constellations from CCD images for coarse attitude determination of satellites in space.

- Designed and implemented fast algorithms for fine attitude determination from CCD images of stars with interpolation to subpixel accuracy.
- Designed and implemented a graphical, aspect oriented programming language (SIMAID) for development and integration of satellite simulators for the European Space Operations Center (ESOC).
- Project Manager for development for ESOC of the expert system “Expert Operators Associate” for support of satellite operators.
- Architectural design of “Crew Procedure Execution Support” (CPES) for in-space support of astronauts for ESA. CPES was written in Lisp. A port to Visual Basic as flown on MIR.

1987-1988: Full time at CRI.

- Program Manager for CRI’s participation in the definition of the Hierarchical Object Oriented Design (HOOD) method for ESA.
- Member of the HOOD steering committee.
- Participated in establishing a HOOD design for ESA for the “Columbus Polar Platform and Resource Module” (part of ESA’s space station program “Columbus”).
- Program Manager for CRI’s participation in and Task 2 leader of the Esprit project Replay for software reuse. Developed a graphical programming language called Library Interconnection Language inspired by work of J.Goguen.
- Program Manager for the “Hermes Ada Retargeting” project for Aerospatiale under ESA’s space shuttle program “Hermes”.

1976-1982: M.Sc. Student at DTU.

- Worked on partially undefined numbers in the residue number system.
- Worked on analysis of transients of musical instruments.
- Investigated the applicability and limitations of zero sampling (i.e. reconstruction of signals from their zeros).
- Worked on the foundations of signal analysis.
- Designed a bit slice computer with 256 bits per word for number theoretic applications.
- Received a Philips Young Scientists price for design of a 7 mips computer.

Before 1976.

- Developed an equational theory of explicit substitution, an equational theory of first order predicate calculus, and an equational theory of Peano arithmetic. This work eventually lead to [6].
- Received Philips Young Scientists price for a digital instrument for tuning of musical instruments.

## 4 Teaching experience

Has supervised four Ph.D.-students. Took the initiative to and organized the Copenhagen Logic Summer School '97 for Nordic Ph.D.-students with the aim to strengthen mathematical logic in Denmark. Wrote the Lecture Notes “Mathematics and Computation” <http://www.diku.dk/~grue/papers/mac0102/> for teaching Logic in Computer Science.

## 5 Publications

- [1] K. Grue. Optimal reconstruction of bandlimited bounded signals. *IEEE Transactions on Information Theory*, IT-31(5):594–601, September 1985.
- [2] P. Johansen, S. Skelboe, K. Grue, and J.D. Andersen. Representing signals by their topoints in scale space. In *Proceedings of the Eight International Conference on Signal Processing*, pages 215–217, 1986.
- [3] K. Grue. Arrays in pure functional programming languages. *Lisp and Symbolic Computation*, 1(2):105–113, 1989.
- [4] M. Nielsen, K. Grue, and F. Lecouat. Expert operator’s associate: A knowledge based system for spacecraft control. In *Proceedings from the 1991 Goddard Conference on Space Applications of Artificial Intelligence, Maryland*, May 1991.
- [5] K. Grue. The importance of cardinality, separability, and compactness in computer science with an example from numerical signal analysis. In *Proceedings of the Symposium on General Topology and Applications, Oxford*, pages 257–272, 1991.
- [6] K. Grue. Map theory. *Theoretical Computer Science*, 102(1):1–133, July 1992.
- [7] C. Berline and K. Grue. A  $\kappa$ -denotational semantics for Map Theory in ZFC+SI. *Theoretical Computer Science*, 179(1–2):137–202, June 1997.

- [8] K. Grue. Dedekind completion as a method for constructing new Scott domains. In James Harland, editor, *CATS'02, Computing: the Australasian Theory Symposium*, volume 61 of *Electronic Notes in Theoretical Computer Science*, pages 1–14. Elsevier Science, 2002.
- [9] K. Grue. Lambda-calculus as a foundation for mathematics. In C. Anthony Anderson and Michael Zeleny, editors, *Logic, Meaning and Computation : Essays in Memory of Alonzo Church*, volume 305 of *Synthese Library*, pages 289–314, Dordrecht, 2002. Kluwer Academic Publishers.
- [10] K. Grue. Logiweb. In Fairouz Kamareddine, editor, *Mathematical Knowledge Management Symposium 2003*, volume 93 of *Electronic Notes in Theoretical Computer Science*, pages 70–101. Elsevier, 2004.
- [11] K. Grue. Logiweb - a system for web publication of mathematics. In *Mathematical Software - ICMS 2006*, volume 4151/2006 of *Lecture Notes in Computer Science*, pages 343–353. Springer Berlin / Heidelberg, 2006.
- [12] Klaus E. Grue and Artur Kornilowicz. Basic operations on preordered coherent spaces. *Formalized Mathematics*, 15(4):201–229, 2007.
- [13] Klaus Grue. A Gentle Introduction to Map Theory. In Klaus Robering, editor, *New Approaches to Classes and Concepts*, volume 14 of *Studies in Logic*, pages 87–110. College Publications, London, November 2008.
- [14] D. Pavarin, F. Ferri, M. Manente, D. Curreli, Y. Güçlü, D. Rondini, M. Mariutto, L. Tasinato, J. Carlsson, R. De Angelis, D. Pakan, K. Grue, P. Van Put, R. Tijsterman, A.Selmo, A.Loyan, and K.Katsonis. Experimental set-up to test a 50 W helicon plasma thruster IEPC-2009-204. In *Proceedings of the 31st IEPC*, September 2009.
- [15] C. Berline and K. Grue. A synthetic axiomatization of map theory. *Theoretical Computer Science*, 2016. DOI: 10.1016/j.tcs.2015.11.028, url: <http://www.sciencedirect.com/science/article/pii/S0304397515011135>, 62 pages.