SHORT CURRICULUM

ALBERTO PAOLUZZI

Professor Alberto Paoluzzi crossed, in his academic activity, the boundaries of several scientific domains (Architecture and Building Design, Computer Engineering, Computer Science, Mathematics and Physics, Bioinformatics), often remaining borderline between two or three of them, which is not the best in Italy to build an academic career.

Alberto started working in Engineering School at La Sapienza in 1977 as system manager of CABD Lab (Computer-Aided Building Design Laboratory), managing a HP1000 minicomputer with several i/o devices, where he wrote in Fortran77 all application software, to make research on automated design with "Building Objects". In 1983 he was appointed associated professor of Building Design, and started teaching the first Computer Graphics (Informatica Grafica) course of this kind at Engineering and Architecture Schools in Italy. (95–120)

After moving to Department of Informatics and Automatica at La Sapienza, Alberto was invited by J.E. Hopcroft in 1986 to join his Robotics Group as visiting scientist, with grants by NATO and Mathematical Institute of Cornell. In the same period he started the development of "Minerva", the first full fledged solid modeler written in Pascal on PC IBM and Apple. In the 90's, after moving to Roma Tre University, Alberto Paoluzzi and his students extended the Backus' FL in the geometric domain, producing the language PLaSM for dimension/independent algebraic calculus of shapes, still in use as the Python package pyplasm. (53–94)

In 2000 he became full professor of CAD at Department of Engineering of Roma Tre. In 2003 Alberto authored the book "Geometric Programming for Computer-Aided Design" by Wiley, and received from IBM a SUR award, with donation of a whole PLM Lab. Finally, Alberto moved in 2014 to Mathematics and Physics Department of Roma Tre, where he contributed to the start of a new graduate program in Computational Science. (25–52)

Several his students were appointed important positions in Italy and abroad, e.g. at IBM, LLNL, SCI, Google, Italian CNR, Geoweb, and SOGEI (entirely owned by Italian Ministry of Economics and Finance), where some collaborated with Paoluzzi's CVDLAB (Computational Visual Design Laboratory) to company web-based tools, including a visual language. Between 2011-14 he entered the IEEE-SA (Standard Association) project for development of a standardization grid for 3D medical models from 3D medical imaging, starting a series of collaborations with people from Eastern Asia and Czech Republic. In 2017 Alberto Paoluzzi received from SMA the honorific title of Pioneer of Solid Modeling Association. (11–24)

In the last fifteen years he worked on novel approaches to geometry and topology computation, using linear algebra and sparse matrices to represent the set of generators / atoms corresponding to columns of boundary matrices, so encoding both a decomposition of Euclidean 3-space, and the Boolean algebra (CSG) generated by it, where every Boolean formula, of every complexity, may be evaluated by bitwise set algebra. His last research is using Julia to implement on Nvidia DGX-1 a library for next generation of solid modeling system. This one is a completely new world, whose rules and language are yet to discover. (1–10)

Statement. The foundations of solid modeling technology were established between 70's and 80's. After 40 years, the time is ripe to explore new paradigms, not based only on data structures and computational geometry algorithms, but on novel abstractions taking into account structures and operators of algebraic topology and linear algebra, like is happening in modern AI, based as well on tensors and linear algebra. Something similar is going on nowadays in graph algorithms, with the GraphBLAS initiative.

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