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**ETNA**
**Kent State University**
**etna@mcs.kent.edu**

# AN APPLICATION OF THE FINITE VOLUME METHOD TO THE BIO-HEAT-TRANSFER-EQUATION IN PREMATURE INFANTS *

MARTIN LUDWIG†, JOCHIM KOCH‡, AND BERND FISCHER†

*In memory of Gene Golub*

**Abstract.** In this report the development of a finite volume method for the time-accurate simulation of the temperature distribution in a premature infant inside an incubator or in an open radiant warmer is described. The real geometry of a premature infant is obtained from MRT-images. The infants thermoregulation is modelled by the so-called bio-heat-transfer-equation incorporating source terms and Neumann boundary conditions. The source terms describe the metabolic heat production, the blood flow and the respiratorical water loss whereas the Neumann boundary conditions model the heat transfer by transepidermal water loss, radiation, convection and conduction. The numerical solution is carried out by the developed finite volume method whose spatial discretization is done by a 3D-mesh-generator from CFD. For the time integration a semi-implicit multistep method is used. The arising large, sparse linear systems are efficiently solved with a Krylov subspace method. Some successful test runs using real life data are presented.

**Key words.** premature infant, bio-heat-transfer-equation, finite volume method, BiCGStab

**AMS subject classifications.** 65M, 92C

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† University of Lübeck, Institute of Mathematics, Wallstraße 40, 23560 Lübeck, Germany (fischer@math.uni-luebeck.de).
‡ Drägerwerk AG, Dept. of Basic Development, Moislinger Allee 53-55, 23542 Lübeck, Germany.