

Bio-Inspired Analogue Computation

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Microprocessors, DSPs and other digital devices such as FPGAs comprise the hardware elements that have enabled the digital revolution. However, the conflicting demands of computational complexity and very low power consumption demanded by devices such as hand-held computers, ultra-low-power radio units, wireless sensors and body-worn or implanted monitors cannot be resolved by simply making larger and faster digital chips. Our aim is to develop systems based on micropower and nanopower circuit technology for novel - ultimately wireless - sensor interfacing and perceptive modalities in the wider area of continuous monitoring of physiological functions. Combined with telemetry, such devices will open a vast range of possibilities in the prognosis, analysis and treatment of disease. The benefits of our approach are compounded further by advanced logarithmic circuit design paradigms - developed in our group - which facilitate the systematic realisation of real-time, ultra-low-power, static or dynamic, non-linear or not, programmable analog hardware subroutines which substitute for power-hungry software-operated computational tasks.