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## **SAPHIR - a multiscale, multiresolution modeling environment targeting blood pressure regulation and fluid homeostasis : current progress**

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The project SAPHIR -a *Systems Approach for PHysiological Integration of Renal, cardiac, and respiratory functions*- aims at developing an open-source, and interactive modeling environment of human and animal cardio-vascular and respiratory physiology. Using state-of-the-art multi-scale simulation methods, it is based on modularity and hierarchical paradigms. As a first step, our model targets blood pressure and body fluid homeostasis, together with respiratory regulations and influences. To this end, the basic "core model" includes lumped-parameter *input-output* descriptions of relevant organs as modules, i.e., heart, vasculature, intra- and extracellular spaces, lungs, kidneys, and muscles.

Such an approach will allow for (i) selected extensions of the model (e.g., addition of a pancreas module and regulation of blood glucose) and (ii) assessment of system-level consequences of local perturbations (e.g., polymorphism, by substituting a block by a more detailed, mechanistic model). One important goal is to keep the model compact enough to insure fast execution time (in view of eventual use in clinical settings), yet to allow fairly detailed sub-modules (to maintain system-integrated feedback loops).

Progress is presented of our current re-implementations of two legacy models that treated overall regulation of blood pressure (Guyton et al., 1972), and fluid regulation (Ikeda et al., 1979). As modeling/simulation environments, Berkeley-Madonna© was used for Ikeda's model (JF, PB); Fortran (SRT, RW), Matlab/Simulink© (PH, FG) and the M2SL C++ software library (developped by two of us, AH & VL), were used for Guyton's model.

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