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Teaching relativity: computer aided modeling

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Mathematical derivations alone do not necessarily lead to physical understanding. A tool that can replace the mathematical treatment of a physical process and at the same time increase physical understanding are interactive computer programs, also known as *system dynamics* software, such as Stella, Berkeley Madonna, Wensim, Dynasys, Powersim or Coach. Such interactive software solves differential equations and systems of differential equations using numerical methods. One works with a graphical user interface that is for the most part self-explanatory. We want to show how, for example, using Coach 7, one can start from a model from classical physics with only minimal changes, and arrive at a relativistic model. It is sufficient to set mass and energy equal and the model provides essential statements of relativistic dynamics: the existence of a terminal velocity for all physical movements, the relativistic dependence of the velocity of a body on its momentum, the relation between momentum and energy of a body. All this is done without any change of the reference frame and without any calculations and is even suitable for teaching in the high school.

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