

Computation Time consideration

when using `vle.extension.ibm`

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Introduction

This is a very preliminary study, in order to introduce the subject. And we have taken the a user point of view.

- ▶ An empirical approach.
- ▶ A single model Lotka Voltera
- ▶ A single method, expected to be the same on both side (RK4)
- ▶ ModelMaker 3.0 has been used on a Windows Seven Virtual Machine
- ▶ vle 1.3 has been used Ubuntu 14.04
- ▶ the laptop used is an i7(2.7GHz)

Simulators

All the simulators we have been used for this study, even those of ModelMaker are available in the package `ibm.computation.time`.

ModelMaker & vle.extension.differential-equation

- ▶ The unit of Table 1 is the second.
- ▶ On one side we use the duration given by ModelMaker
- ▶ On the other side we use the user time given by the unix command time
- ▶ MM_vectorized : the compartments of the model are vectorized
- ▶ MM_Duplicated : the diagrams compartments are duplicated
- ▶ VLE_ODE : the models are duplicated

Quantity	MM_Duplicated	MM_vectorized	VLE_ODE
x1	42	1	1
x2	13	1	1
x10	1	1	1

Table 1 : ModelMaker and pure ODE models inside VLE

Readable Mathematics

Let X_1, X_2, \dots, X_n be a sequence of independent and identically distributed random variables with $E[X_i] = \mu$ and $\text{Var}[X_i] = \sigma^2 < \infty$, and let

$$S_n = \frac{X_1 + X_2 + \dots + X_n}{n} = \frac{1}{n} \sum_i^n X_i$$

denote their mean. Then as n approaches infinity, the random variables $\sqrt{n}(S_n - \mu)$ converge in distribution to a normal $\mathcal{N}(0, \sigma^2)$.