3.6 Nonlinear mixed models; a comparison with NLME

Model description The orange tree growth data was used by Pinheiro & Bates (2000, Ch.8.2) to illustrate how a logistic growth curve model with random e ects can be t with the S-Plus function `nlme`. The data contain measurements made at seven occasions for each of ve orange trees:

t_{ij}	Time point when the jth measurement was made on tree i
y_{ij}	Trunk circumference of tree i when measured at time point t_{ij}

The following logistic model is used:

$$y_{ij} = \frac{\phi_1 + u_i}{1 + \exp\left[-\left(t_{ij} - \phi_2\right)/\phi_3\right]} + \varepsilon_{ij},$$

where (ϕ_1, ϕ_2, ϕ_3) are hyper-parameters, and $u_i \sim N(0, \sigma_u^2)$ is a random e ect, and $\varepsilon_{ij} \sim N(0, \sigma^2)$ is the residual noise term.

Results Parameter estimates are shown in the following table.

	ϕ_1	ϕ_2	ϕ_3	σ	σ_u
ADMB-RE	192.1	727.9	348.1	7.843	31.65
Std. dev.	15.658	35.249	27.08	1.013	10.26
`nlme`	191.0	722.6	344.2	7.846	31.48

The di erence between the estimates obtained with ADMB-RE and `nlme` is small. The di erence is caused by the fact that the two approaches use di erent approximations to the likelihood function. (ADMB-RE uses the Laplace approximation, and for `nlme` the reader is referred to (Pinheiro & Bates 2000, Ch. 7).)

The computation time for ADMB was 0.58 seconds, while the computation time for `nlme` (running under S-Plus 6.1) was 1.6 seconds.