

Individual Project 4

Models of the Spread of the Disease Among Rabbits in Mecklenburg-West Pomerania

The following scenario is considered. In the spring of 2007, an unknown highly infectious disease spread rapidly among rabbits in Mecklenburg-West Pomerania. Predicting the course of the disease – how many rabbits would be infected, how long it would last – is important to the local officials trying to minimise the impact of the disease. This project compares three predictions about the spread of the disease. We measure time t , in days since March 17, 2007. Let $P(t)$ be the total number of cases reported in the region by day t . On March 17, 95 cases are reported. We compare predictions from the following three models for June 12, 2007, the last day a new case reported in the region.

The linear model

Suppose $P(t)$ satisfies $\frac{dP}{dt} = 30.2$, with $P(0) = 95$.

The exponential model

Suppose $P(t)$ satisfies $\frac{1}{P} \frac{dP}{dt} = 0.12$, with $P(0) = 95$.

The logistic model

Suppose $P(t)$ satisfies $\frac{1}{P} \frac{dP}{dt} = 0.19 - 0.0002P$, with $P(0) = 95$.

Questions:

- Find the solution $P(t)$ with pen and paper and use it to predict the number of cases of the disease in the region by June 12 ($t = 87$) for each model.
- Draw a graph of each solution using Matlab.
- From the graphs predict the number of cases of the disease by June 30, 2007.
- Give possible reasons for the differences in the predictions from question c).