Hastings et al. (2018) Science

T.J. Clark

2020-08-11

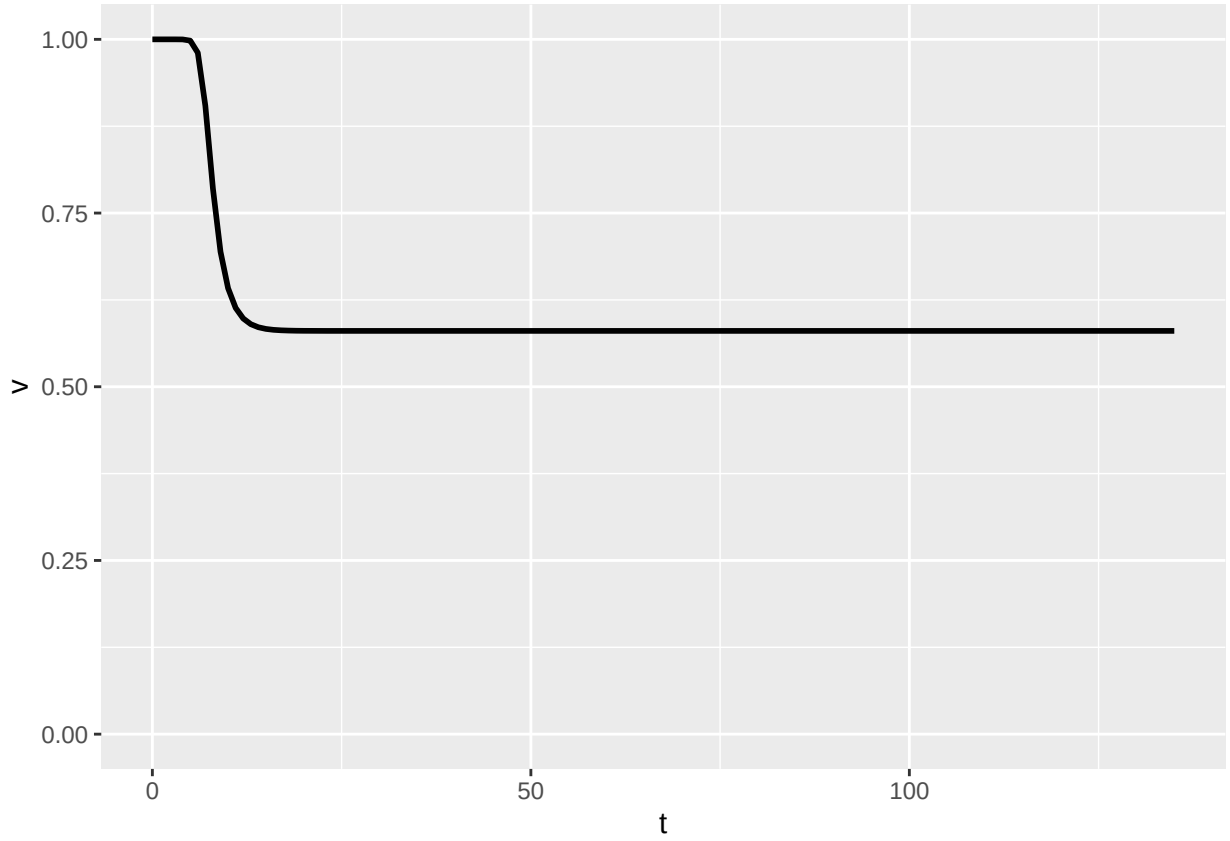
Trying to recreate the figures

```
library(tidyverse)
library(deSolve)
library(nimble)
```

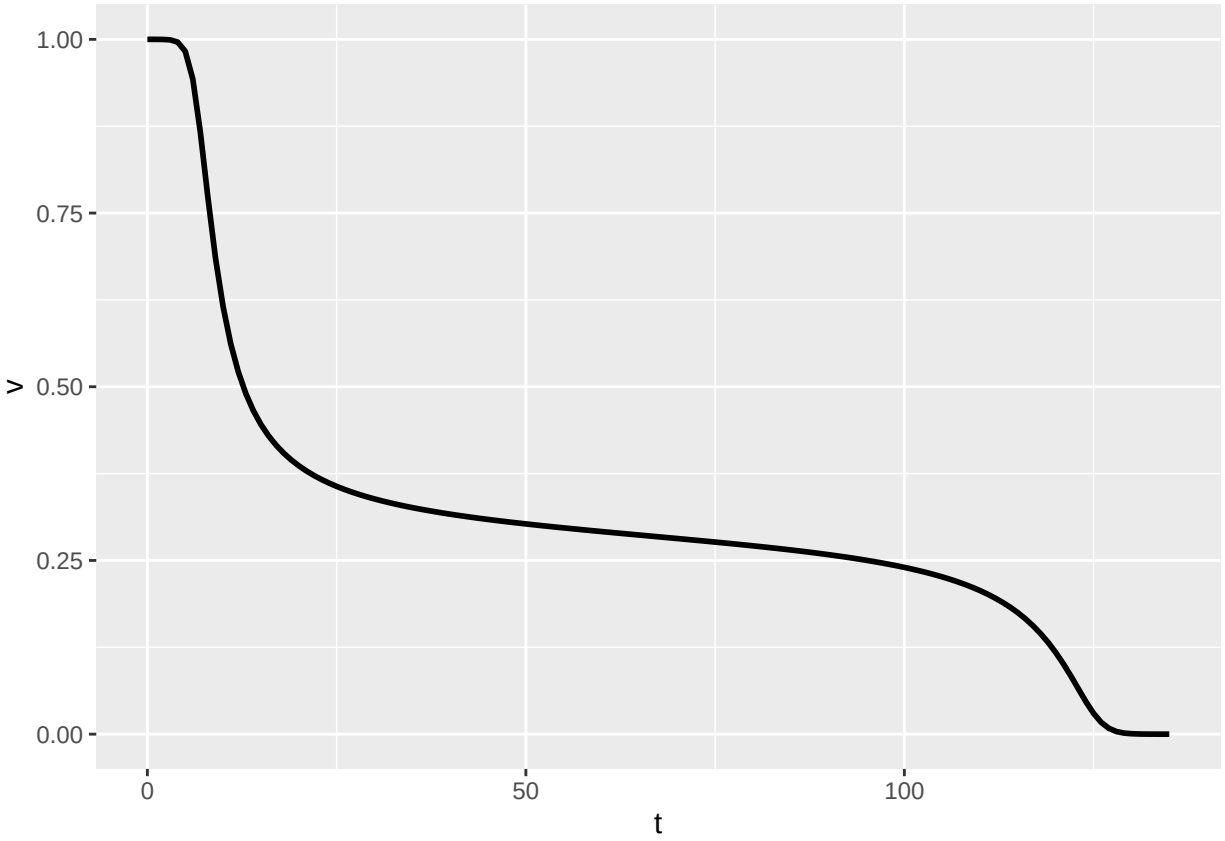
Figure 1-D - Competition Model showing Ghost Attractor

$$\frac{du}{dt} = u(1-u) - a_{12}u^n v$$
$$\frac{dv}{dt} = \gamma[v(1-v) - a_{21}u^n v]$$

```
comp <- function(Time, State, Pars){
  with(as.list(c(State, Pars)), {
    du <- u*(1-u) - a12*u^n*v
    dv <- gamma*(v*(1-v) - a21*u^n*v)
    return(list(c(du,dv)))
  })
}

# params
p <- c(a12 = 0.9, a21 = 1.1, gamma = 10, n=3) # Fig. 1A and C
p2 <- list(a12 = 0.9, a21 = 1.1, gamma = 10, n=1.8) # Fig. 1B and D
y <- c(u = .001, v = 1)
t <- seq(0,135,by=1)

out1 <- as_tibble(ode(y, t, comp, p)[,-1])
out2 <- as_tibble(ode(y, t, comp, p2)[,-1])

out1 %>%
  ggplot(aes(t, v)) +
  geom_line(lwd=1) +
  ylim(c(0,1))
```




```
out2 %>%
  ggplot(aes(t, v)) +
  geom_line(lwd=1) +
  ylim(c(0,1))
```


1.00
0.75
0.50
0.25
0.00
v
0
50
100
t