Contents

1 Characterizing uncertainty

To test our approach, I tried to write code to the optimal control problem from King and Roughgarden 1982 using the numerical methods we came up with in the spring. King and Roughgarden used the Poyntragin maximum principle to obtain an analytic solution to their optimal control problem. If I've read Clark (19XX) correctly, the maximum principle is useful for low-dimensional problems but numerical methods are often used for higher dimensional problems. However, both approaches involve the following components:

2 Hierarchical Bayes

3 Expert elicitation

4 State-space

5 Dynamic models

6 Machine learning

7 PROACT

8 Propagating uncertainty

9 Analytical DA

10 Ensemble DA

11 Social science

12 Model assessment

13 Forecast infrastructure/FLARE case study

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$$
\begin{aligned}
\dot{x_1} &= u(t)x_1 \\
\dot{x_2} &= (1-u(t))x_1
\end{aligned} \tag{1}
$$

$$
A_{11} = \begin{bmatrix} -1 & 0 & \dots & 0 \\ 0 & -1 & \ddots & \vdots \\ \vdots & \ddots & -1 & 0 \\ 0 & \dots & 0 & -1 \end{bmatrix}_{t \times t} \tag{2}
$$

```
## Function that computes values of derivatives in the ODE system
## Takes the time step, system of differential equations, parameters
derivs = numeric(2);
control <- function(times0,y,parms,f1,...) {

  # x1 and x2 are the two entries in y (ode)
  x1=y[1];

  # values calculated by the interpolated function at different time points
  u <- f1(times0);

  derivs = c(u*x1,(1-u)*x1)
  return(list(derivs));
}
## Compiles the function control()
control=cmpfun(control);
```

References

Dietze, M. 2017. Ecological Forecasting. Princeton University Press, Princeton, NJ. Http://newcatalog.library.cornell.edu/catalog/11408300.