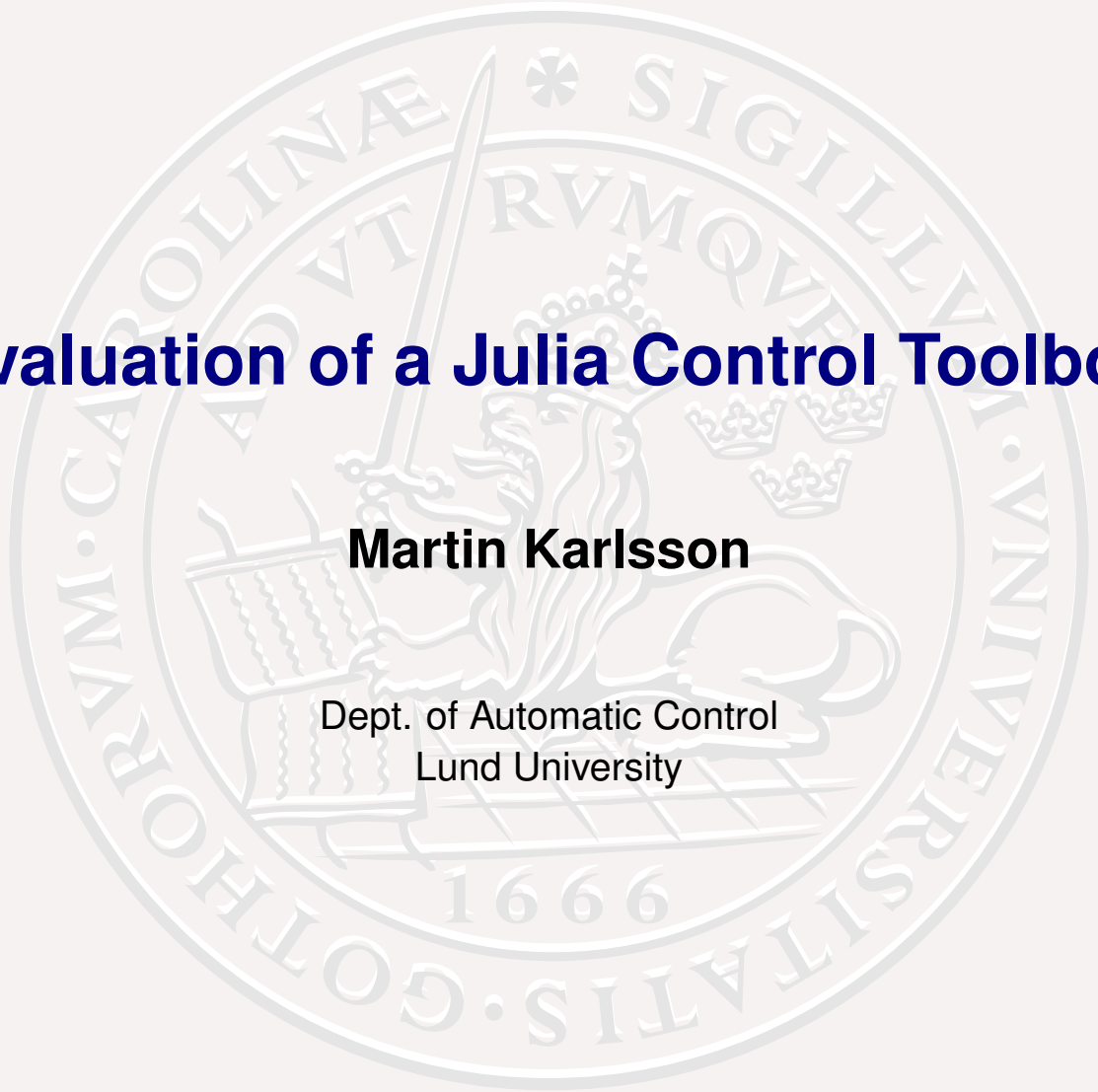

Evaluation of a Julia Control Toolbox

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Introduction

- `Control.jl` (first hit on google; julia control toolbox)
- Julia 0.4 is required
- No documentation yet, but exported functions have docstrings
- Appears similar to other control systems design toolboxes, e.g. Control Systems Toolbox in Matlab.
  - Systems stored as transfer functions or state-space representations
  - Evaluation in both time and frequency domain
  - Stability and performance properties
- My approach: Evaluation of functionality, rather than stress test

Contents

1. Systems: Transfer functions and state-space representations
2. Basic analysis: poles, zeros, gain etc.
3. Frequency domain: Bode and Nyquist diagrams
4. Time domain: step response etc.
5. Controller synthesis
6. Comparison with toolbox in Matlab

Transfer functions

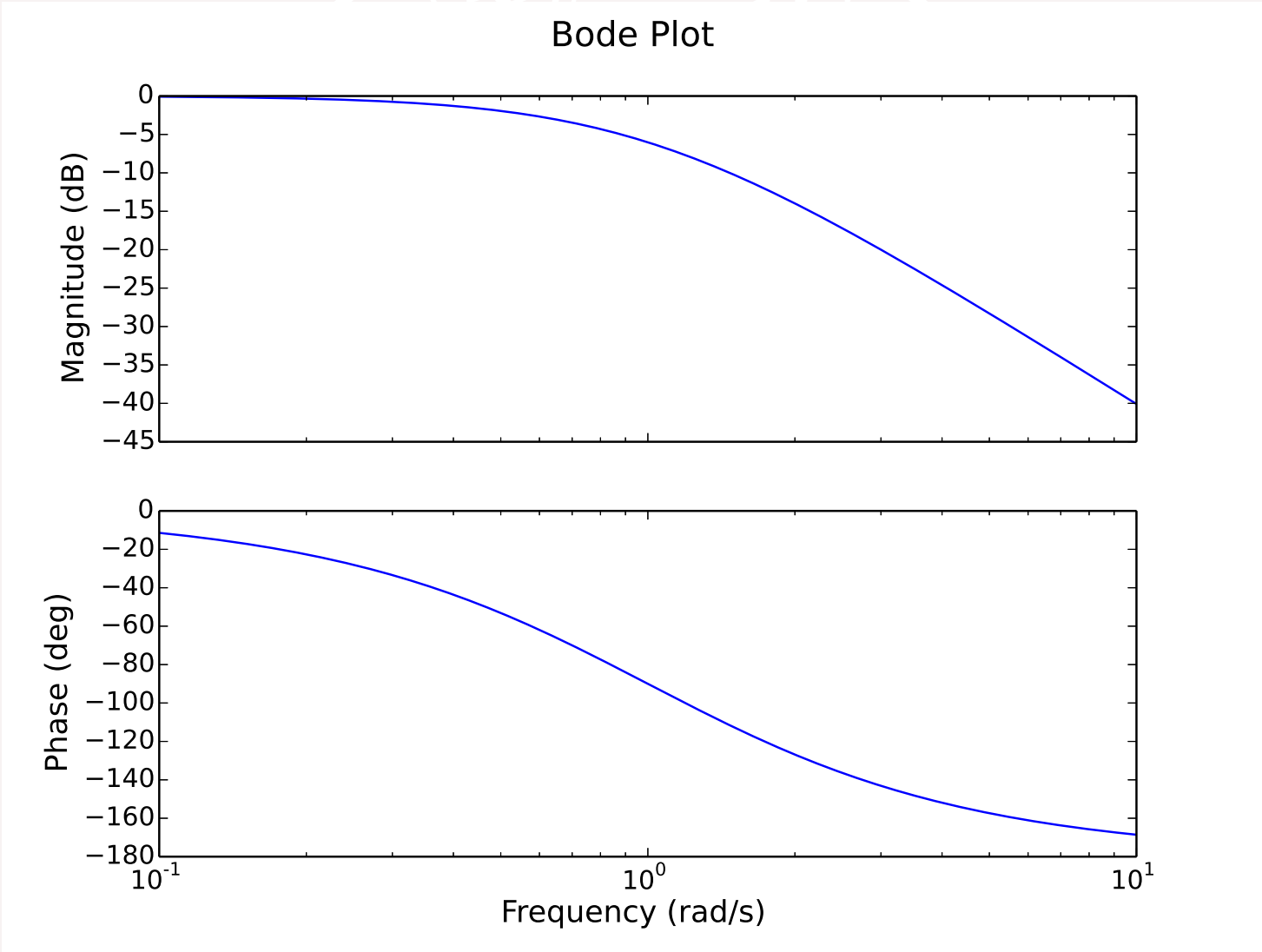
```
G = tf([1],[1, 2, 1])

TransferFunction:
       1.0
-----------------
s^2 + 2.0s + 1.0

pole(G)
-1
-1

tzero(G)
0-element Array{Float64,1}

gain(G)
1.0
```

State-space

```
Gss = convert(StateSpace, G)
StateSpace:
A =
            x1      x2
   x1    -2.0    -1.0
   x2     1.0     0.0
B =
            u1
   x1    1.0
   x2    0.0
C =
            x1      x2
   y1    0.0     1.0
D =
            u1
   y1    0.0
Continuous-time state-space model
```

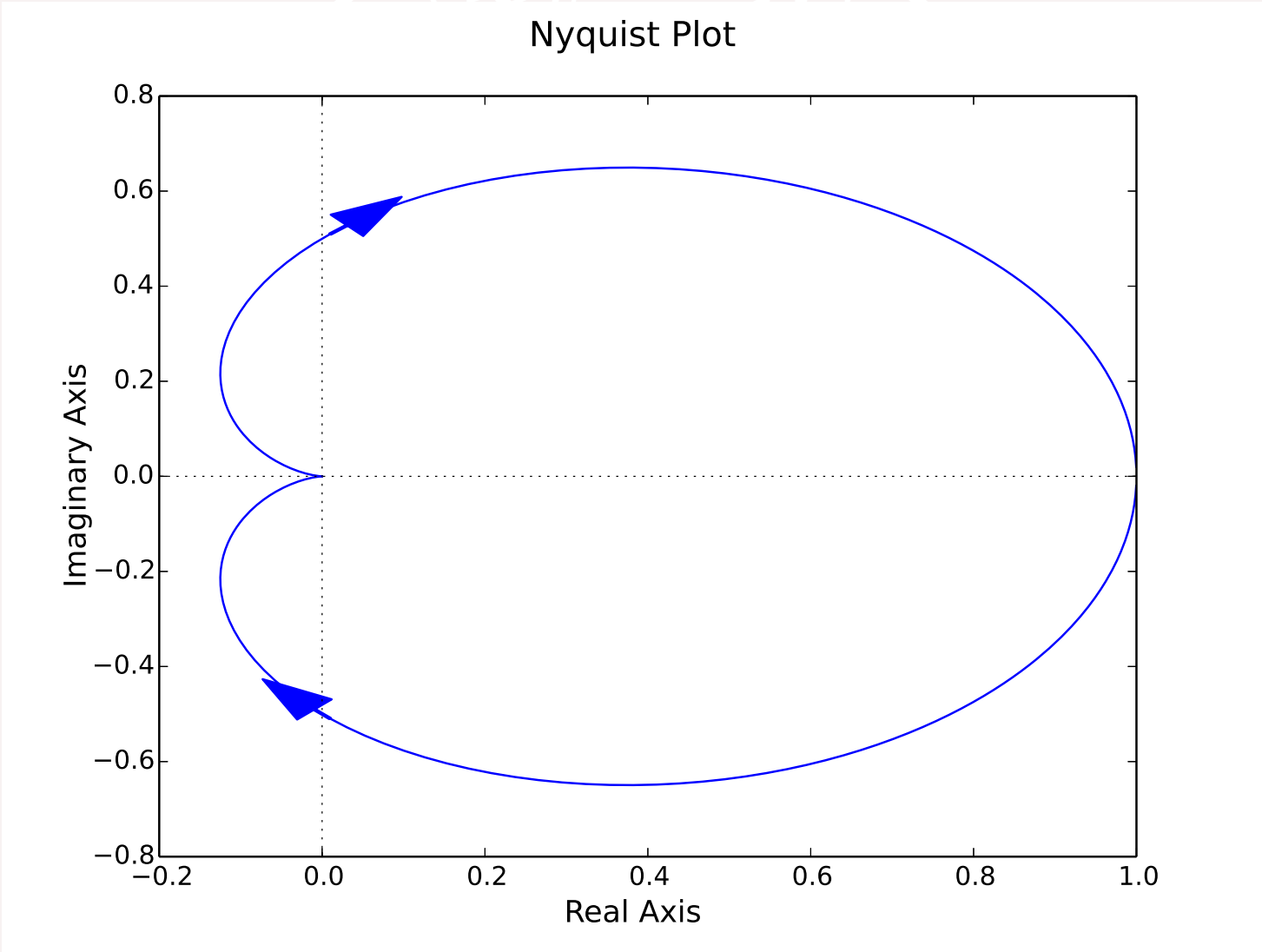
Bode diagram

```
bodeplot(G)
```



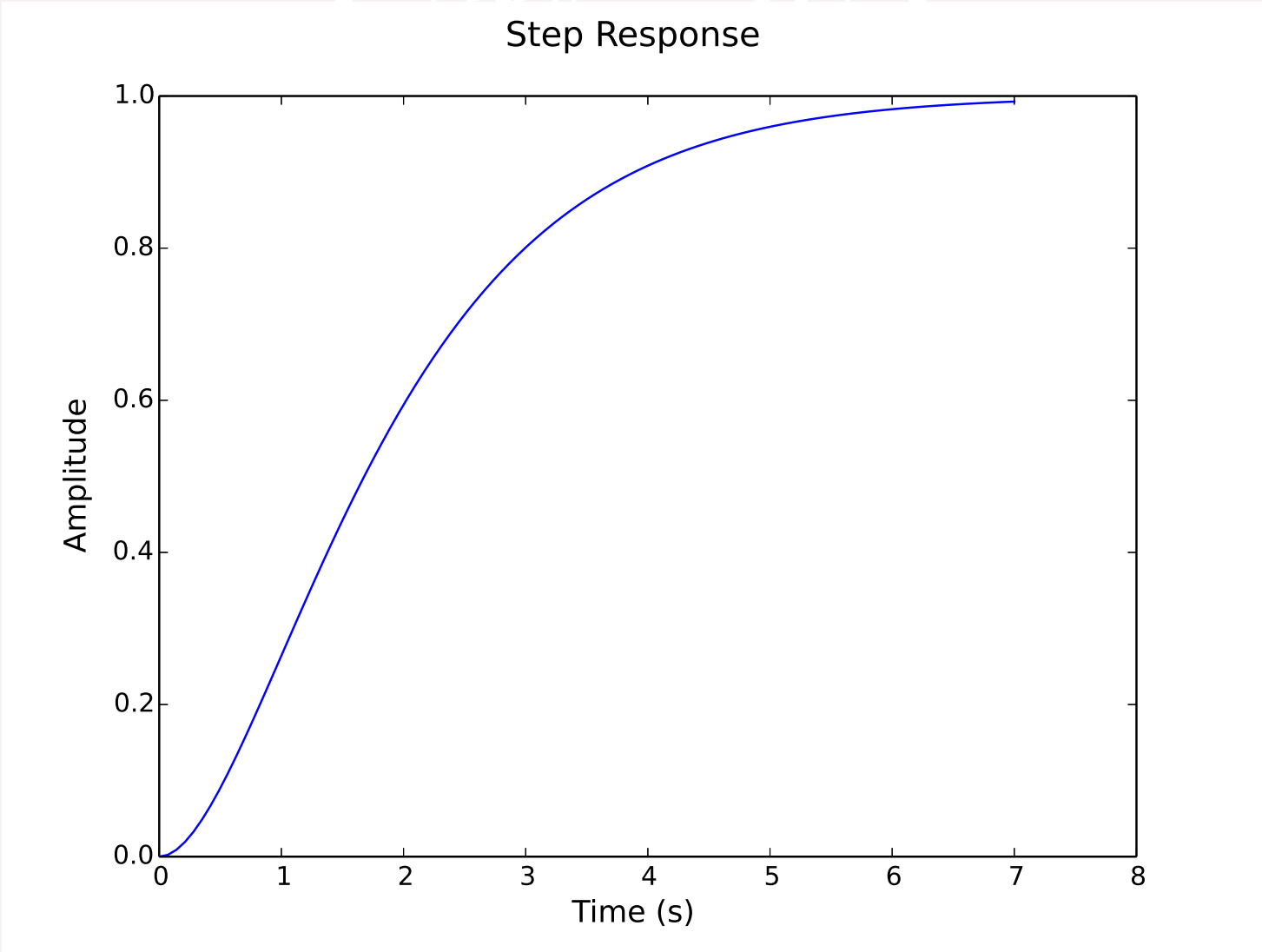
Nyquist diagram

```
nyquistplot(G)
```



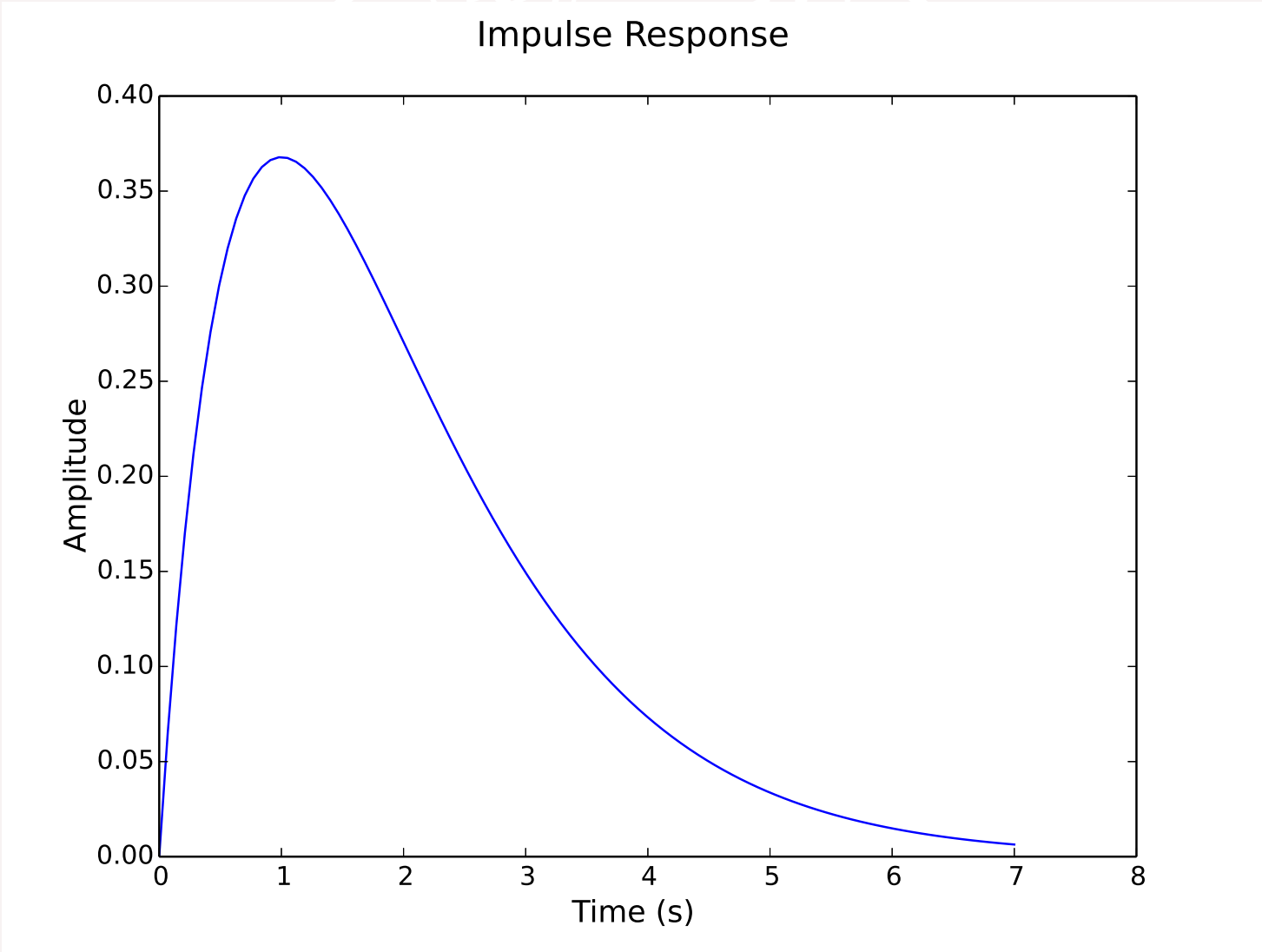
Step response

```
stepplot(G)
```



Impulse response

```
impulseplot(G)
```



Comparison with the Matlab toolbox

- The code does not look similar, i.e. not just a quick conversion
- Currently, the Matlab toolbox wins on w.o.

Conclusion

- Looks promising, but runs on an unstable version of Julia
- Only the basics worked without modification
- Difficult to evaluate the more advanced functionality

Assignment for next seminar- very optional

- Get the control toolbox
- Define a system of particular interest, either as a `tf` or `ss`
- Analyse your system. Generate Bode and Nyquist plots, evaluate the stability etc.
- And the final grade is...

Final grade