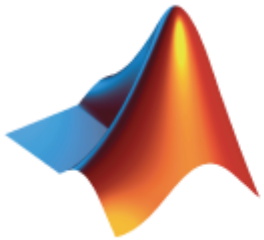


MATLAB and Simulink Robotics Arena

Drone Modeling, Perception and Control

Planning Flight States

Maitreyee Mordekar, *MathWorks*

During the Webinar

- Requirement:
  - Complete MATLAB Onramp
  - Complete Simulink Onramp
  - See Video Series on Drone Simulation and Control

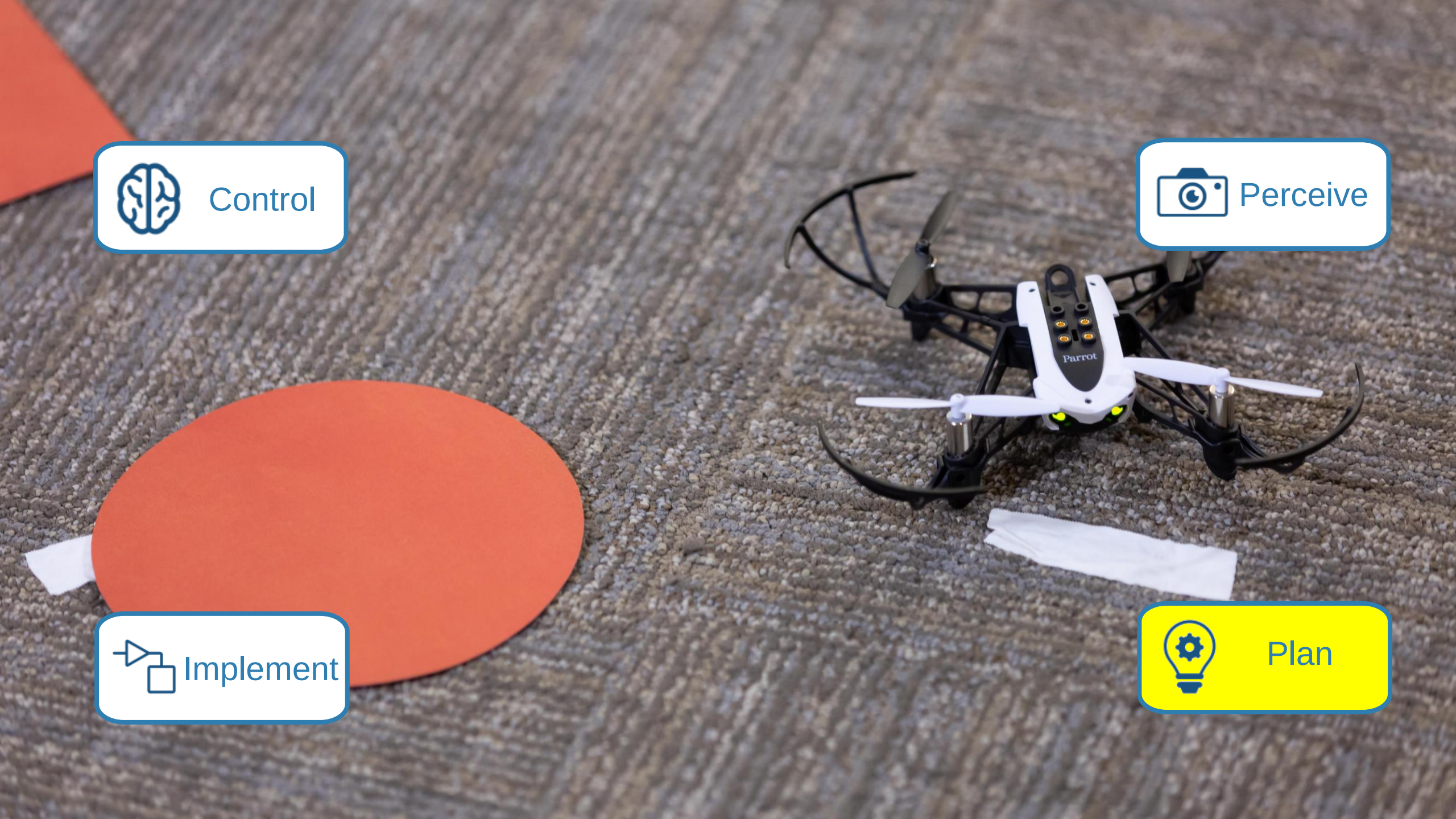
- ~45 minutes and open to questions

- For more questions:

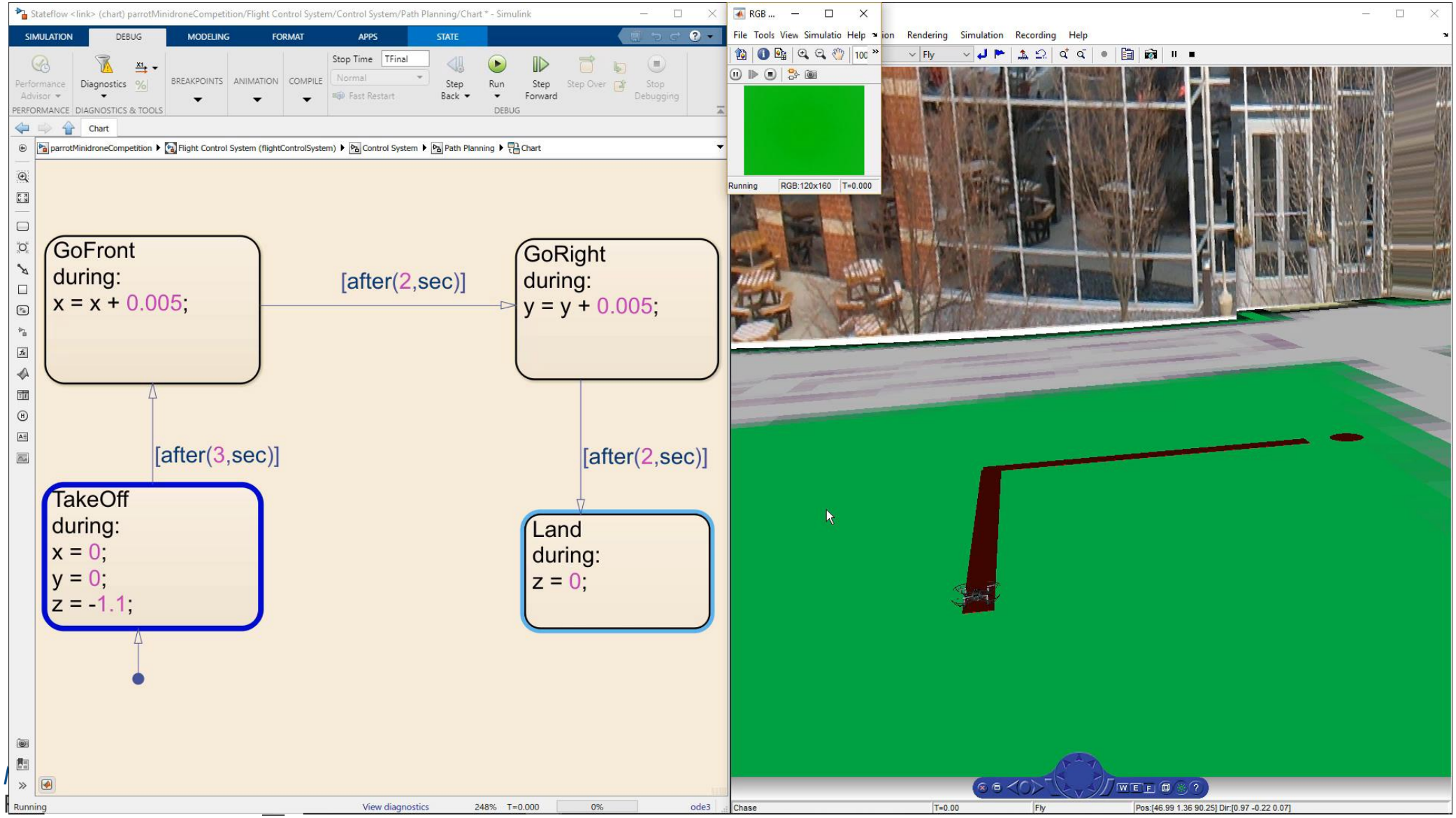

minidronecompetition@mathworks.com


facebook.com/groups/RoboticsArena/

- **Complete MATLAB Onramp**
- **Complete Simulink Onramp**
- **See Video Series on Drone Simulation and Control**


Control
Perceive
Implement
Plan
Parrot

What we will learn by the end of this session?



[Poll Question]
Have you completed the Simulink Onramp?

#simulink #droneseries @MATLAB @MathWorks

Agenda

- Introduction to State Machines
- Introduction to Stateflow
- Modelling States
- Using Stateflow to follow waypoints
- Summary of the upcoming webinar

Modeling a rectifier using zero crossing

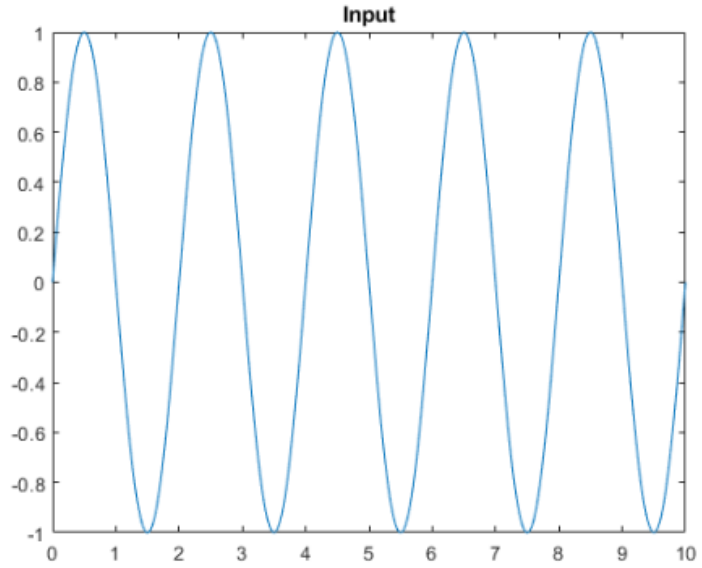
MATLAB Script

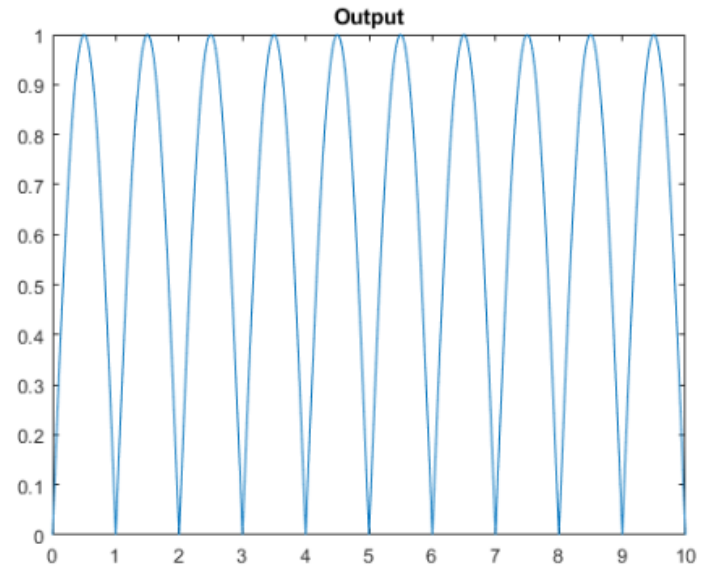
```
t = 0:0.01:10
input = sin(pi*t)
plot(t, input)

output = zeros(size(t));

for i = 1:1:size(t,2)
    if input(i) >= 0
        output(i) = input(i);
    elseif input(i) < 0
        output(i) = -input(i);
    end
end

plot(t,output)
```

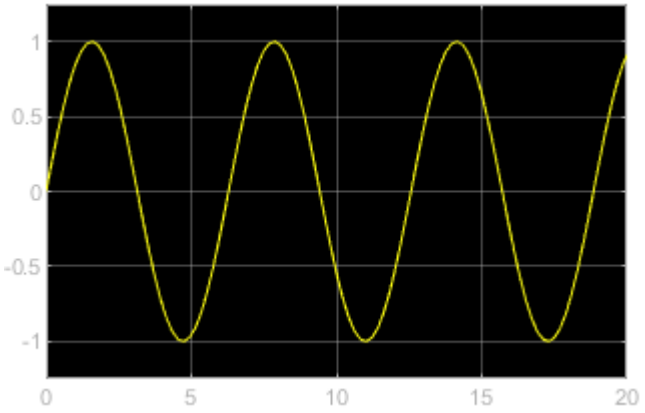




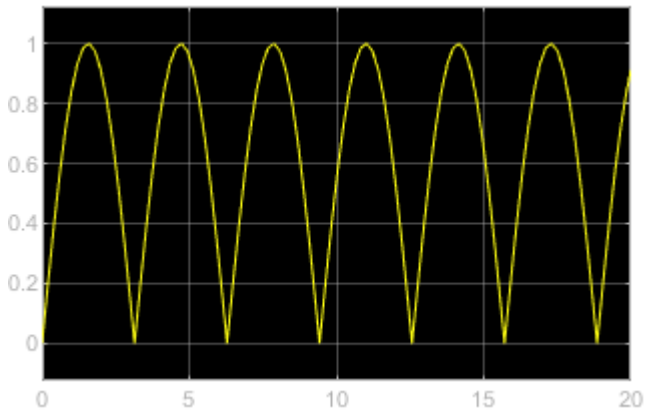
What are State Machines?

- Represent reactive systems that have states or modes
- States change based on defined conditions and events

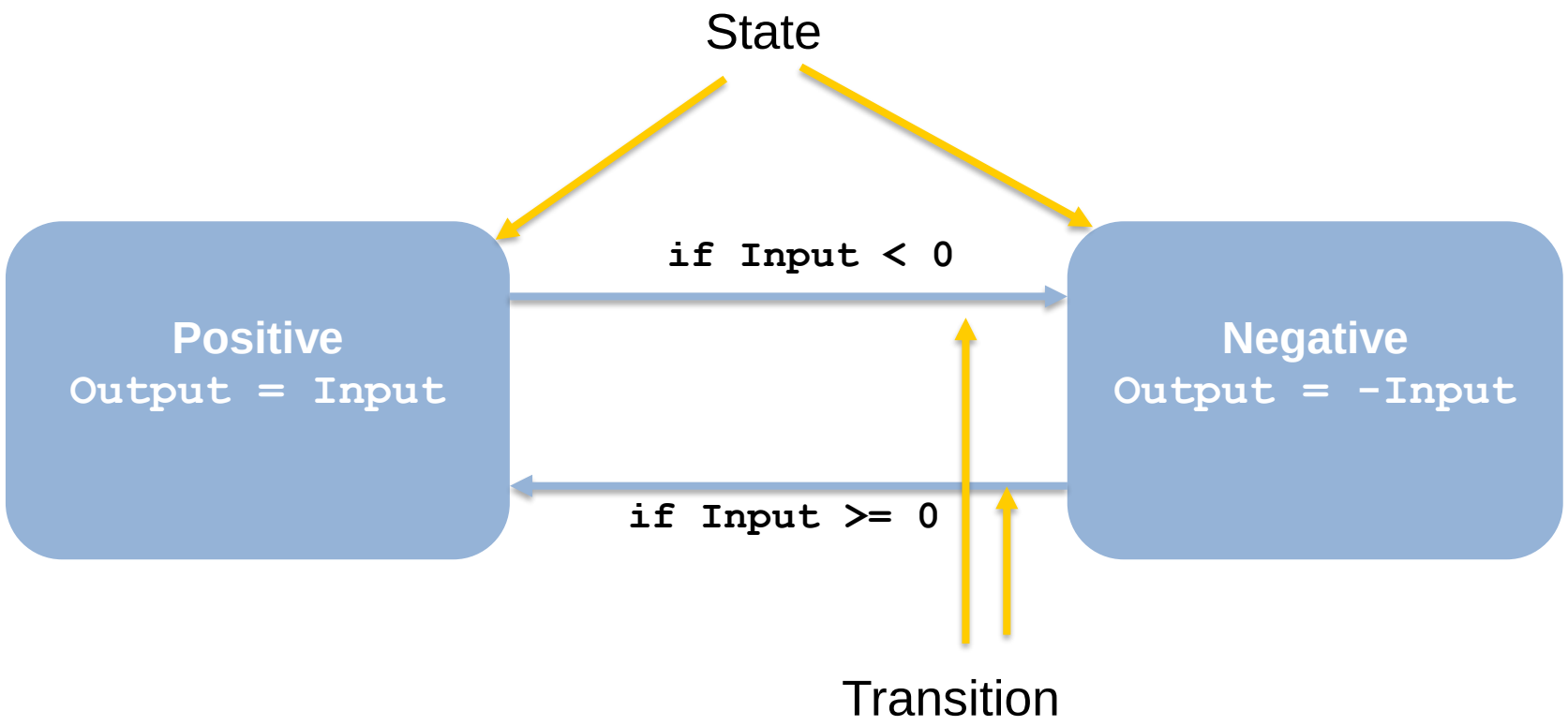
Input



Output

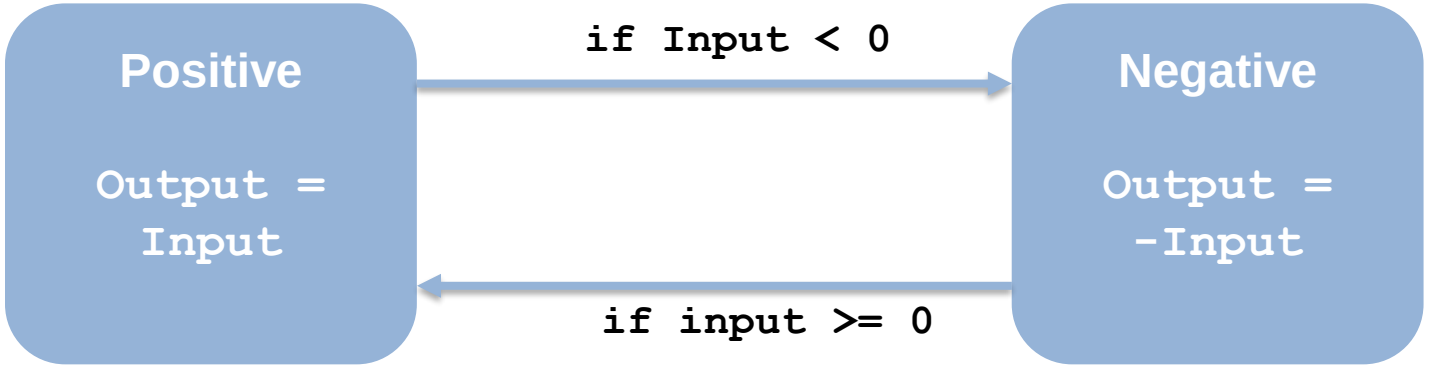


What are State Machines?



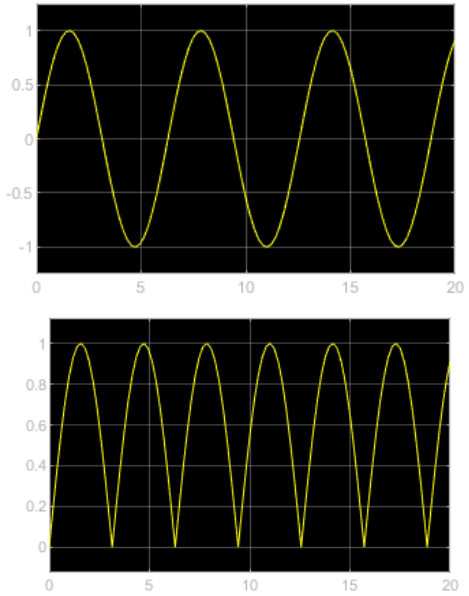
How to transition between states?

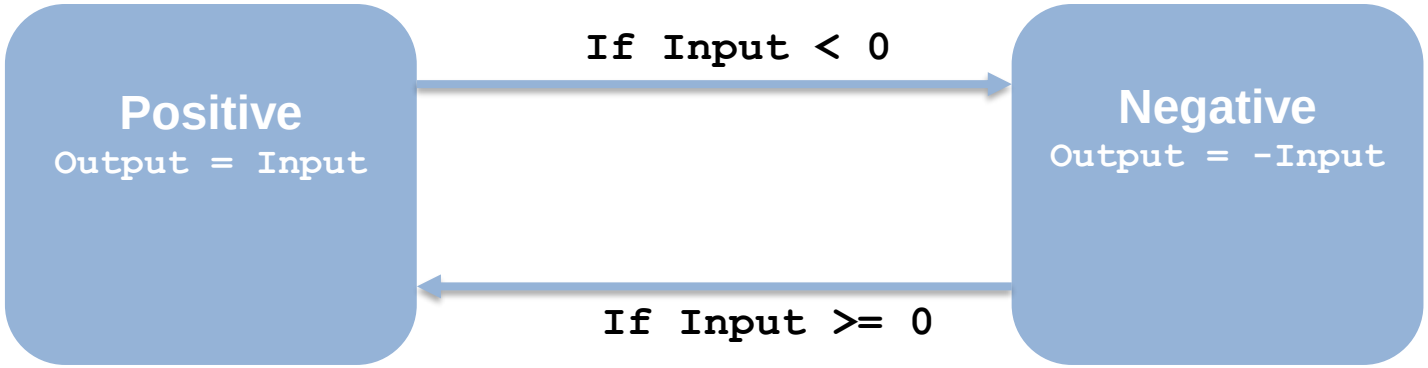
- Rules to transition between states
- State transition diagram
- Current state depends on variables and previous state



Stateflow

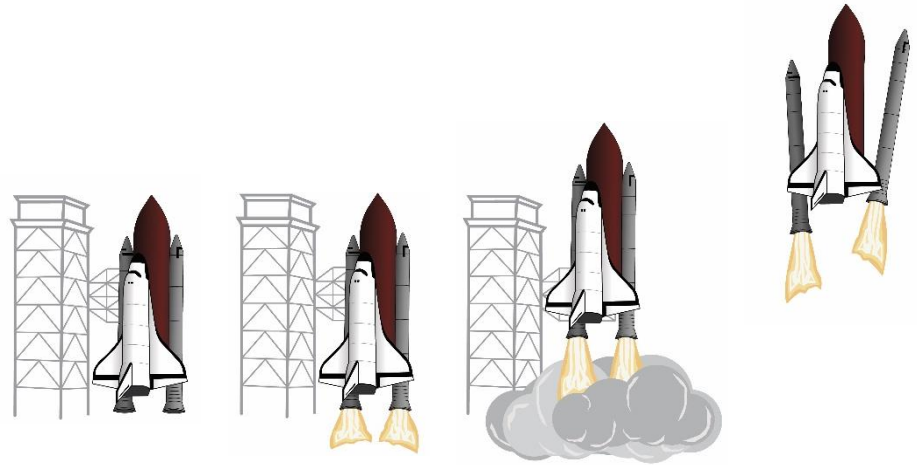
Modelling a rectifier using zero crossing





What is Stateflow?

- Model and simulate decision logic for reactive systems
- Develop mode-logic using state machines and flow charts
- See how the logic behaves with diagram animation and integrated debugger



How is Stateflow different from Simulink?

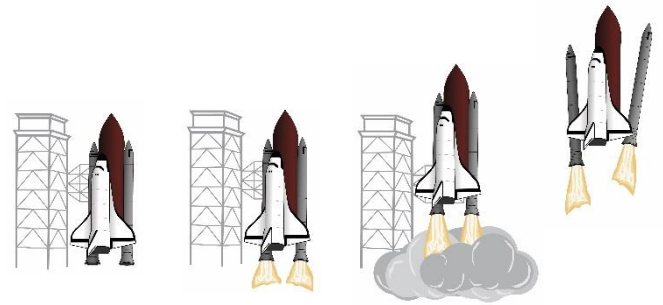
- **Simulink**

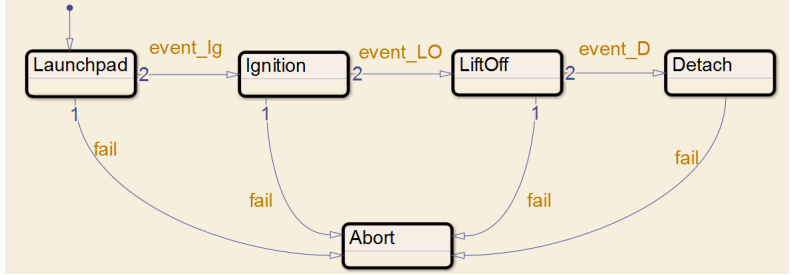
Simulink is used to respond to **continuous** changes in dynamic systems.

- **Stateflow**

Stateflow is used to respond to **instantaneous** changes in dynamic systems.

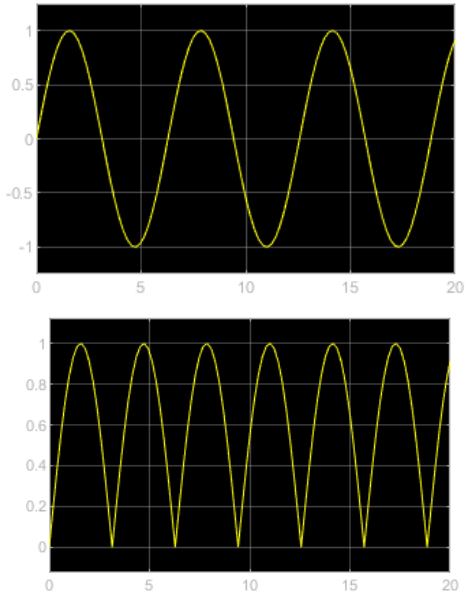
Real-world systems have to respond to both continuous and instantaneous changes.

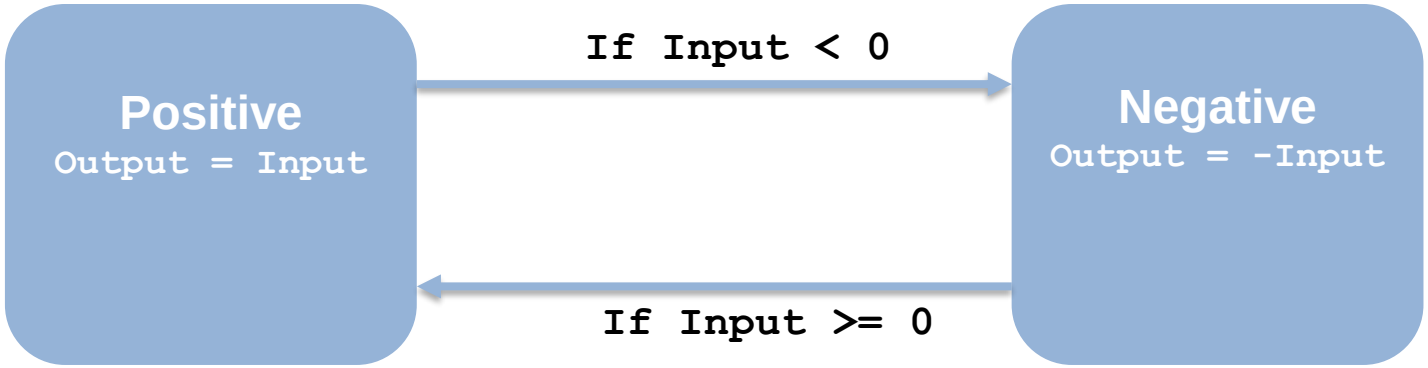




Stateflow

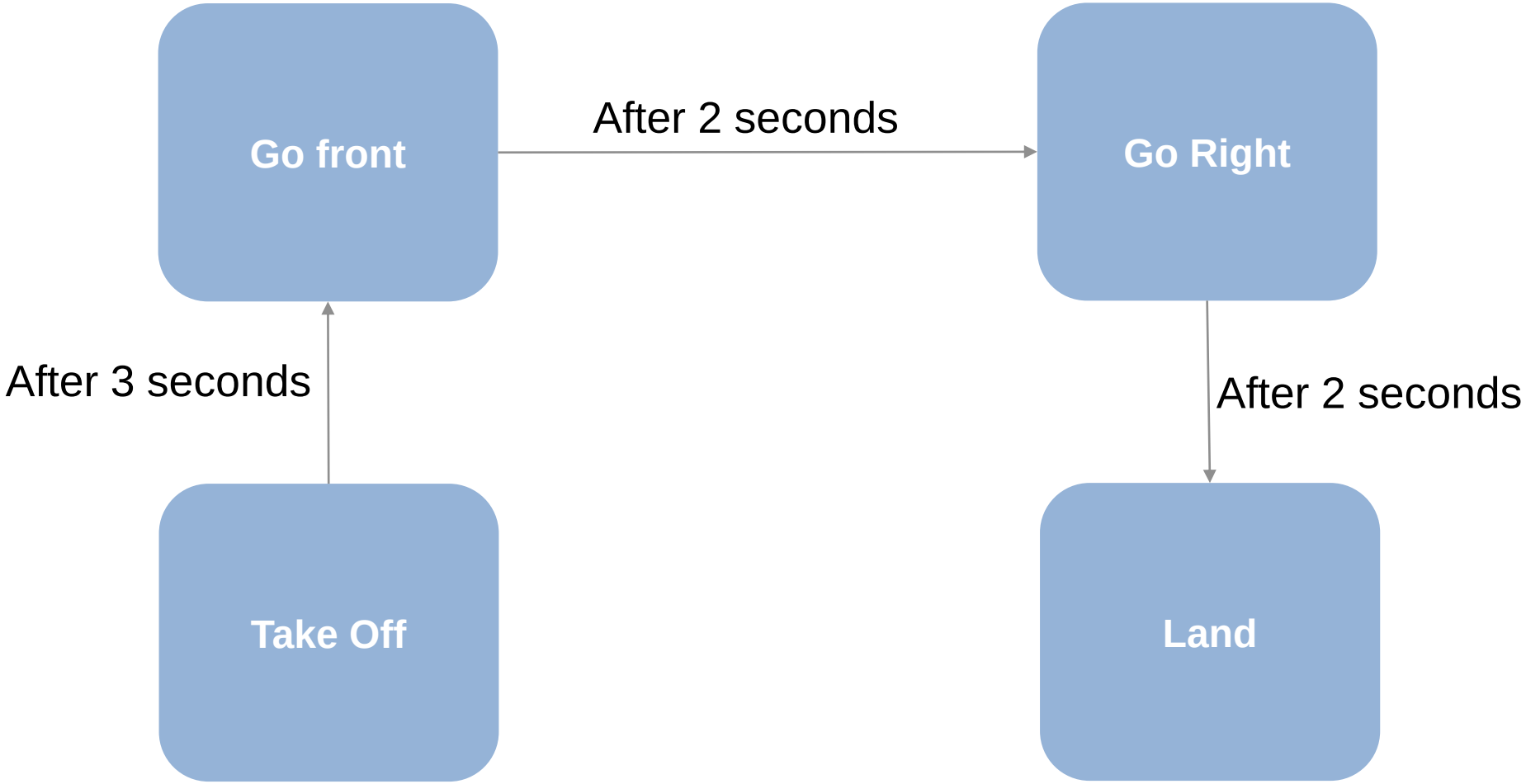
Modelling a rectifier using zero crossing





[Modelling a rectifier using zero crossing]
[>> sf_abs]

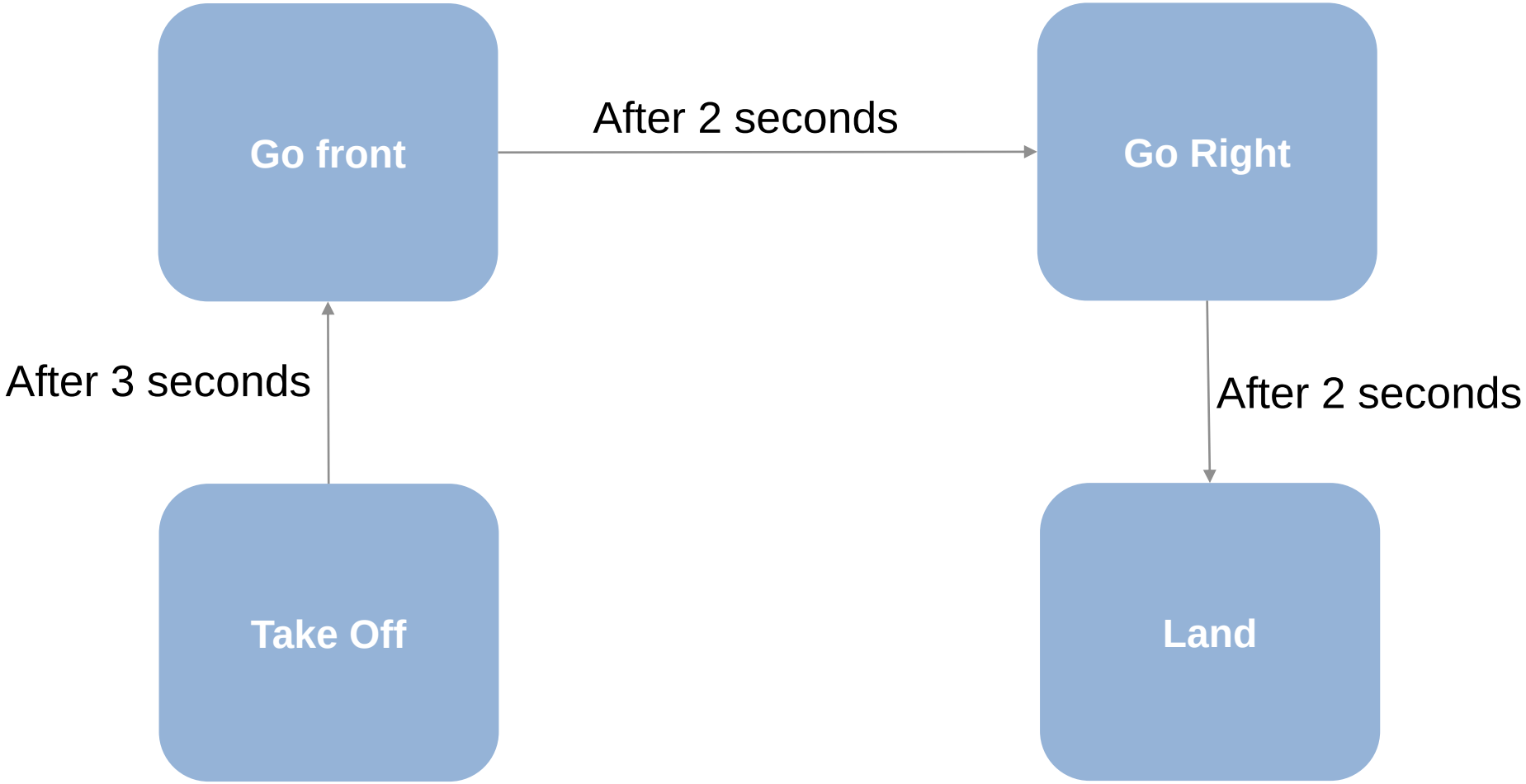
Drone Flight States



Drone frame of reference

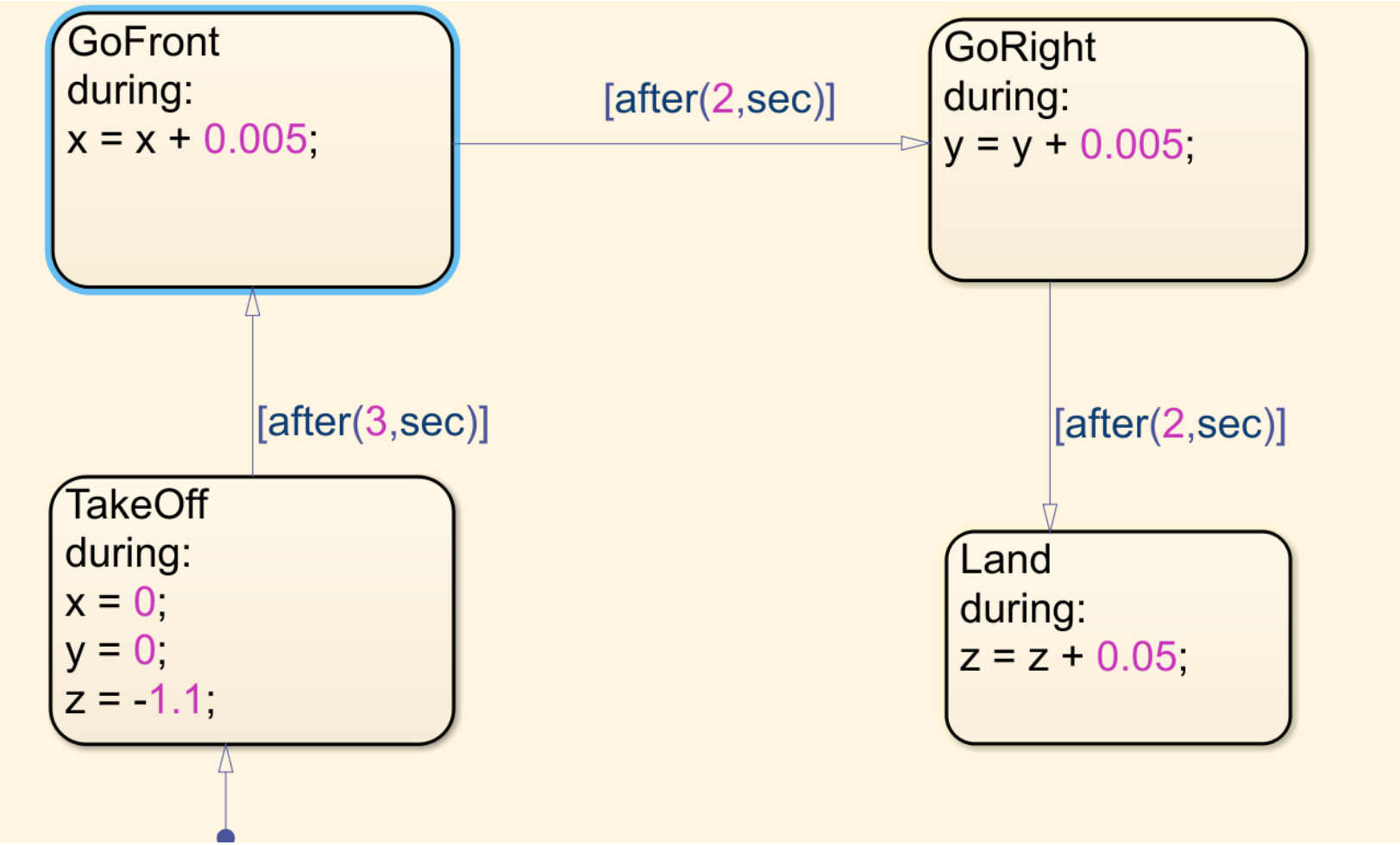
[Modeling Stateflow Waypoint Follower]
[parrotMinidroneCompetitionStart]

Drone Flight States



Drone Flight States

Stateflow

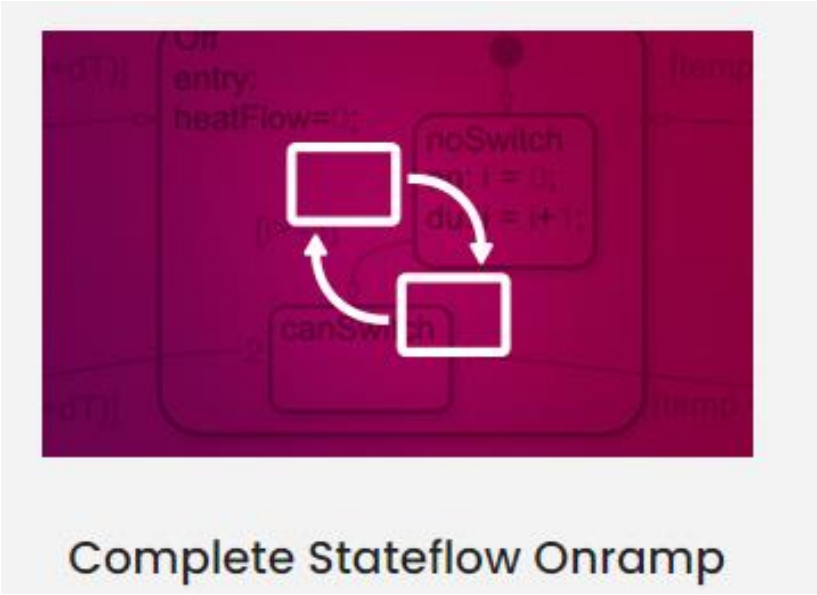


Recommendations for Upcoming Webinar

- Complete Stateflow Onramp
  - To emphasize on the concepts we learnt today

- Try the model hands-on
  - Install Simulink Support for Parrot Minidrone

#droneseries
#Simulink
@MATLAB
@MathWorks



Complete Stateflow Onramp

How to access the Onramps/Tools to try hands-on?

- Check if your institute has Campus Wide License:
  - https://www.mathworks.com/academia/tah-support-program/eligibility.html
- Request for Trial:
  - https://www.mathworks.com/campaigns/products/trials.html
- E-mail us at minidronecompetition@mathworks.com for access to license to work with the models for the series
  - First Name:
  - Last Name:
  - University:

What will we learn in the upcoming webinar?

Resources

Robotics Arena

- **Contact us**

   minidronecompetition@mathworks.com

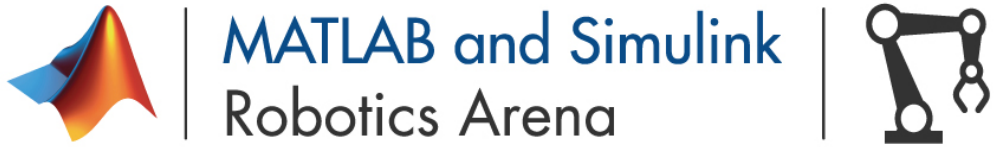
   facebook.com/groups/RoboticsArena/

- **Student Videos and Tutorials**
  mathworks.com/academia/student-competitions/tutorials-videos.html
- **Software offer**
  mathworks.com/academia/student-competitions
- **Racing Lounge blog:**
  blogs.mathworks.com/racing-lounge

Before Next Lesson!

- Complete Stateflow Onramp

- Try the example hands on
  - See if your institute has Campus Wide License
  - E-mail us at minidronecompetition@mathworks.com for access to license
    - First Name:
    - Last Name:
    - University:



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