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This homework requires the material covered in Lectures #1 and #2.

Exercise 1 (Inverted pendulum swing-up). Consider the inverted pendulum swing-up controller discussed in the first lecture and shown in Figure 1.

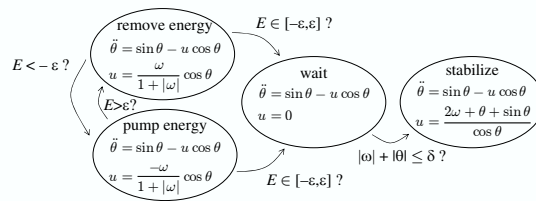
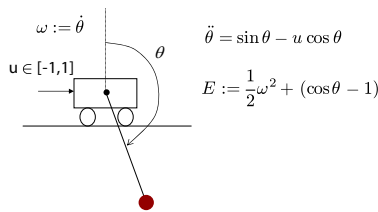


Figure 1. Swing-up hybrid controller

1. Provide a formal description of the closed-loop system by specifying its discrete and continuous state-space as well as the vector field and reset maps.
2. What is required of δ ? Select an appropriate value for this parameter
3. What is required of ϵ ? Select an appropriate value for this parameter.
4. The controller will not work if the pendulum starts exactly from the down position at rest. How can you fix this? □