Reinforcement Learning – Assignment 2 - Bongo Board

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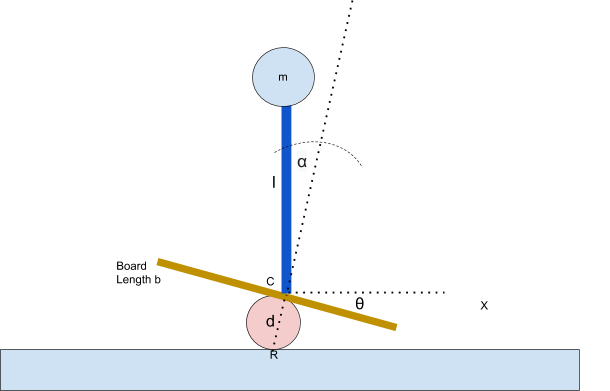
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# Introduction

The problem of balancing a pole on a rolling ball is a widely used benchmark problem for testing reinforcement learning algorithms. The classic papers that introduced cart-pole problem contain mistakes in the equations that govern the dynamics of the cart-pole system. Here we provide the equations that describe the dynamics of bongo-board system.

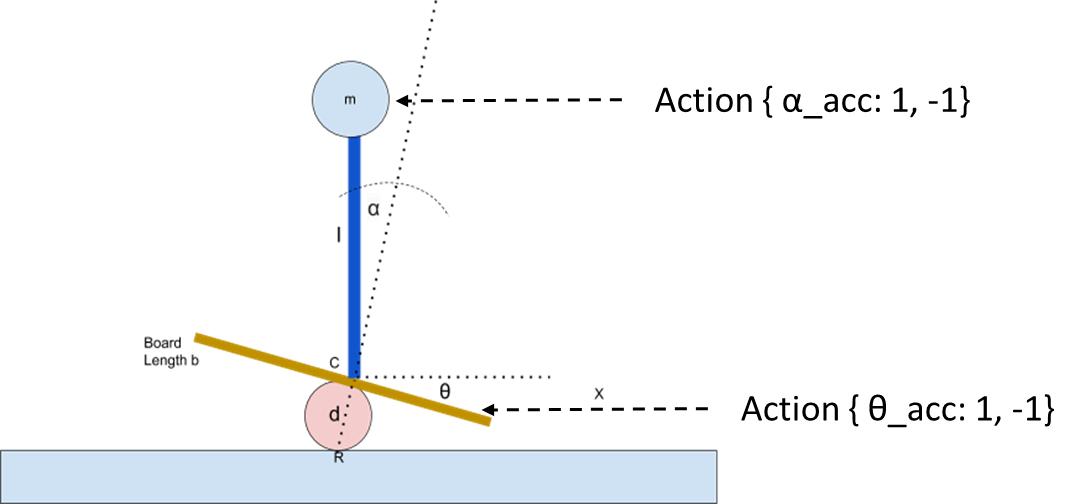
Here, we model the humanoid robot and the bongo board as a simple linear inverted pendulum problem. We assume that the board does not slip on the roll and hence the board rotates around a point at the bottom of the circle. The roll angle θ is limited by the length of the board B l and the diameter d of the cylinder under the board. The control allows actuation at point C that the mass rotates around point C. The simplified dynamics of the system are those of a linear inverted pendulum considering the extra length d and θ. You can ignore the specifics of the dynamics for this assignment.



1. Simplified linear inverted pendulum model of a robot on a Bongo board

# Dynamical System

According Fig1, the mass ball have 5kg and then the pendulum pole and mass ball both influenced by gravity. But this system ignore gravity. So, Action decide plus 1 acceleration or minus 1 acceleration (Shown as Fig 2). This system via action value calculate alpha, alpha dot, theta and theta dot.



1. Push Bongo-board system

Form 1 is dynamical algorithm (acc is acceleration for alpha and theta).

|  |  |
| --- | --- |
|  | (1) |

Form 2 is reward rule. In order to track center point, when the pendulum pole and board approach 0-degree reward will bigger than approach limit angle.