**Task 2: Environment Analysis** for both MountainCar-v0 and Acrobot-v1.

**🚗 MountainCar-v0**

| **Aspect** | **Details** |
| --- | --- |
| **Observation Space** | Box([-1.2, -0.07], [0.6, 0.07]) → 2D vector: [position, velocity] |
| **Action Space** | Discrete(3) → 0: push left, 1: no push, 2: push right |
| **Goal / Objective** | Get the car to the flag (top of the right hill at x >= 0.5) |
| **Episode Length** | Max 200 steps (usually ends there unless early success) |
| **Challenges** | Low power: the car can’t climb directly—must learn to *swing* up using momentum |

💡 Think of it like a toddler trying to get out of a swing — they must rock back and forth to escape.

**🔗 Acrobot-v1**

| **Aspect** | **Details** |
| --- | --- |
| **Observation Space** | Box([-1, -1, -1, -1, -12.57, -28.27], [1, 1, 1, 1, 12.57, 28.27]) → 6D: [cos(θ1), sin(θ1), cos(θ2), sin(θ2), θ̇1, θ̇2] |
| **Action Space** | Discrete(3) → Apply torque: -1, 0, or +1 |
| **Goal / Objective** | Swing the lower link so that the tip of the top link reaches height ≥ 1 (upright) |
| **Episode Length** | Max 500 steps (usually takes hundreds if random) |
| **Challenges** | No control over the first joint; needs *pendulum physics trickery* to work the whole arm up |

💡 It’s like trying to flip a double-jointed pole vertically using only the elbow. Timing is everything.

**🔍 Summary Table**

| **Environment** | **Obs Space** | **Action Space** | **Max Steps** | **Challenge Keyword** |
| --- | --- | --- | --- | --- |
| MountainCar-v0 | 2D | Discrete(3) | 200 | **Momentum** |
| Acrobot-v1 | 6D | Discrete(3) | 500 | **Dynamic control** |