**📁 Repository: AI Steam Robot – Motor System**

**🔧 Motor Subsystem Overview**

The **AI Steam robot** utilizes two primary motor types that serve distinct but coordinated functions:

1. **Ordinary Motor** – Enables **forward and backward movement**.
2. **Rudder Motor** – Controls **directional steering**, enabling turns and path adjustments.

These motors work together to ensure smooth navigation and obstacle avoidance.

**1. ⚙️ Ordinary Motor – Mobility**

**Purpose:**

The **Ordinary Motor** is the main driver of robot movement, responsible for linear motion.

**Key Functions:**

* **Forward Movement:** Activates to propel the robot ahead.
* **Backward Movement:** Reverses polarity to drive the robot in reverse.
* **Speed Control:** Often managed via PWM (Pulse Width Modulation) for smooth acceleration/deceleration.

**Technical Details:**

* **Type:** DC Motor (Brushed or Brushless)
* **Voltage:** 5V–12V depending on design
* **Control:** Via motor driver (e.g., L298N, TB6612FNG)
* **Connection:** Connected to the robot’s wheels or tracks

**Integration:**

* Controlled by a microcontroller (e.g., Arduino, ESP32)
* Commands are issued based on sensor input (e.g., obstacle detection or camera feedback)

**2. 🧭 Rudder Motor – Steering System**

**Purpose:**

The **Rudder Motor** adjusts the robot’s orientation, enabling it to **turn left or right** as needed.

**Key Functions:**

* **Steering Left/Right:** Rotates rudder or steering arm based on desired direction.
* **Precision Turning:** Allows curved paths or sharp directional shifts.
* **Corrective Control:** Assists in realignment after avoidance maneuvers.

**Technical Details:**

* **Type:** Servo Motor (commonly SG90 or MG996R)
* **Control Signal:** PWM signal defines angle (0°–180°)
* **Torque:** Selected based on robot weight and turning resistance

**Integration:**

* Linked to the front axle or turning mechanism
* Angle adjusted through microcontroller commands
* Responds to path planning or object avoidance logic

**3. ⚡ Power and Control**

**Power Supply:**

* Motors powered by Li-ion battery pack (typically 7.4V–12V)
* Voltage regulators used if required by specific motor type

**Control Circuit:**

* **Motor Driver IC:** For DC motors (L298N or similar)
* **Servo PWM Signal:** From microcontroller (e.g., Arduino PWM pin)
* Safety measures include current limiting and motor shutdown logic

**4. 🧠 Motor Coordination Logic**

Both motors work together in real time:

* **Obstacle Detected Ahead:**
  + Ordinary motor slows or stops
  + Rudder motor turns to find a new path
* **Path Clear:**
  + Ordinary motor resumes forward motion
  + Rudder motor realigns

**✅ Summary**

| **Motor Type** | **Role** | **Control Method** | **Component Example** |
| --- | --- | --- | --- |
| Ordinary Motor | Forward/Backward Movement | H-Bridge Driver | L298N + DC Motor |
| Rudder Motor | Steering/Turning | PWM | SG90 Servo Motor |

This simple but robust motor system allows the AI Steam robot to **navigate intelligently**, **avoid obstacles**, and **follow paths** autonomously.