**CPU Controls the GPU**

In a typical system with a **CPU** and **GPU**, the **CPU controls** the execution of the program, and the **GPU executes tasks** that are parallelizable. The key difference lies in the **role of each processor**:

**How the CPU Controls the GPU:**

1. **CPU**:  
   The **Central Processing Unit (CPU)** is the **main processor** of a computer. It executes general-purpose instructions and controls most of the system's operations.
2. **GPU**:  
   The **Graphics Processing Unit (GPU)** is a **specialized processor** designed to handle parallel computation tasks, especially **graphics rendering**. It is massively parallel, with thousands of cores working in parallel.

**The Relationship:**

* **CPU as the Host**: The **CPU** is generally considered the **host** processor, and it is responsible for:
  + Running the main application.
  + Allocating memory (including GPU memory).
  + Sending **commands** to the **GPU** to execute specific tasks.
  + Managing data transfers between **main memory** (RAM) and **GPU memory**.
* **GPU as the Device**: The **GPU** is considered the **device** processor, designed to perform highly parallel tasks. It **follows commands** from the CPU and runs those computations in parallel.

**Typical Workflow:**

1. **CPU initiates a task**:
   * The **CPU** starts a program and processes serial tasks (like program flow control, logic, etc.).
2. **CPU sends work to the GPU**:
   * The **CPU** determines that a task can be parallelized and sends it to the **GPU** for execution (like matrix multiplication, graphics rendering, etc.).
3. **GPU executes parallel tasks**:
   * The **GPU** runs the parallel computation (like a kernel in CUDA).
   * The GPU is much faster for these tasks due to the high number of **cores** working simultaneously.
4. **GPU completes the task and returns data**:
   * The **GPU** sends the results back to the **CPU**, where further processing may take place (e.g., integrating GPU results into the main program).

**In Summary:**

* **CPU controls** the overall system and gives instructions to the GPU.
* **GPU executes specific parallel tasks** when instructed by the CPU.
* **GPU cannot control the CPU** — it operates only under the CPU’s commands and executes parallel computations.