



GST 49 – States

Formal Description

The state of an entity or system is the condition in which it exists at a particular time, as described by the values of its relevant variables. A state provides a snapshot of the entity or system at a specific moment and enables its condition to be compared with that at other times. The concept of state forms the foundation for understanding change, behaviour and dynamics.

Plain English Explanation

We often describe something by saying what condition it is in. We might say that a room is warm, a reservoir is full, a vehicle is stationary or a business is profitable. In practice, however, states are often defined by the values of many properties simultaneously. A warm room also has a humidity, air pressure and light level. A reservoir has a water level, temperature and flow rate. A stationary vehicle has a speed of zero together with an engine temperature, fuel level and battery charge. A profitable business also has staff, customers, assets and cash reserves. A system state therefore usually represents a combination of many variable values at a particular moment.

In General Systems Theory, a state is described using the values of relevant variables. Consider a reservoir. Its water level, water temperature, rate of inflow and rate of outflow can all be represented by variables. The particular values of these variables at a given moment describe the current state of the reservoir.

A state is therefore like a snapshot. It records the condition of an entity or system at one point in time. If we take another snapshot later, some of the values may have changed while others remain the same. Comparing these snapshots allows us to determine whether the state has changed.

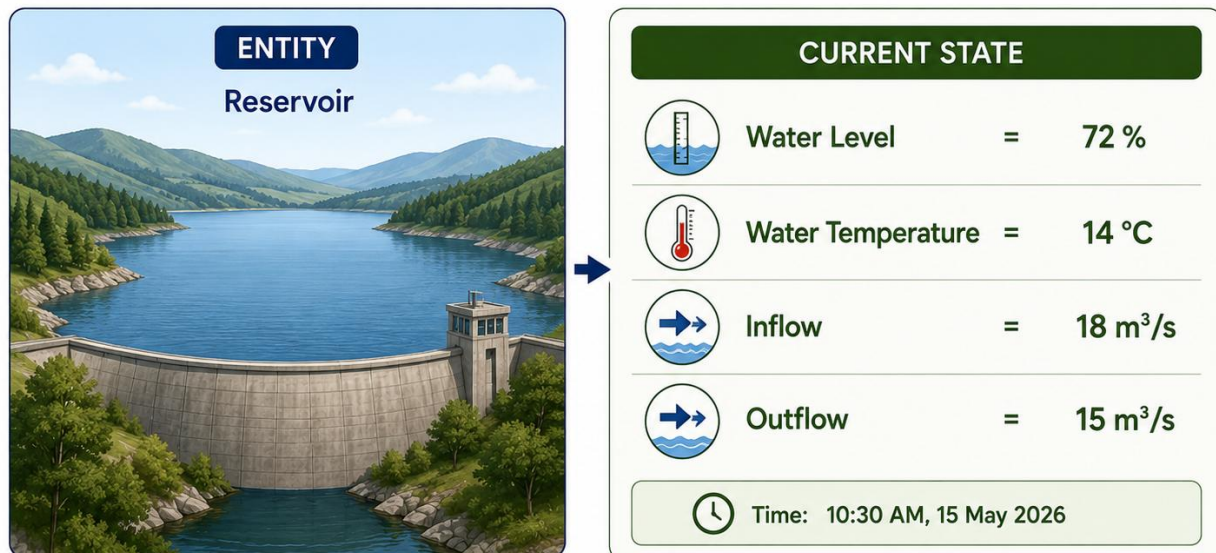
Not every property needs to be included when describing a state. The variables selected depend upon the purpose of the investigation. An engineer may describe a bridge using variables such as load, temperature and displacement, while a maintenance manager may be more interested in its condition, age and inspection history. Both descriptions represent states, but they are intended for different purposes.

The idea of state is fundamental because it provides the basis for understanding change. Before we can describe how something changes, we must first be able to describe the condition from which it changes.



STATE

A state is the collection of relevant variable values that describe the condition of an entity or system at a particular time.



KEY POINT

A state is not a single value.

It is the set of relevant variable values that together describe the condition of an entity or system at a given time.

Examples

A person's health can be described by variables such as body temperature, heart rate, blood pressure and oxygen saturation. Together, the values of these variables provide a description of the person's current state.

Similarly, the state of a motor car may be described using variables such as speed, engine temperature, fuel level and battery voltage. At any particular moment these values define the condition of the vehicle, allowing its state to be monitored and compared with its state at another time.

Provenance and Links

The concept of state has developed across many disciplines, including physics, engineering, mathematics and computer science. In physics, the state of a physical system is commonly represented by the values of relevant physical variables. Engineering disciplines use state variables to monitor and control complex systems, while dynamical systems theory studies how states evolve over time. General Systems Theory adopts this general concept and applies it to physical, biological, engineered and social systems.



Practical Exercise

Choose a familiar entity or system, such as a bicycle, a room, a garden, a business or a household. Identify at least five variables that could be used to describe its current state. Record the present value of each variable and explain why you chose it. Finally, consider whether someone investigating the same entity for a different purpose might choose a different set of variables to describe its state.