



Introducción parte B

The Operator is the one who imposes the control vector u on the system input knowing the state vector X and the vector of uncontrolled inputs r . We call the Operation Policy the function used by the Operator to calculate the control vector u based on the state and knowledge of the non-controllable inputs at the beginning of each step.

- The optimal dispatch of generation resources is a Stochastic Dynamic Programming problem.

In simple words, it is about minimizing the cost of transiting a time step, for example a week, a day, an hour plus the future cost of the state to which it is transited. Like the walker who will try to balance the effort on the immediate path and the place on the horizon where he arrives.

- In 1957 Richard Bellman published a solution to Stochastic Dynamic Programming problems.
- In the same publication, Bellman stated that his algorithm suffered from what he called The Curse of Dimensionality.
- The computational effort of his algorithm exploded in a combinatorial way when the number of state variables and random variables considered increased.

- The structure of both robots is the same. Both have an array of neural networks, one per time step. These networks attempt to model the future cost function.
- The robots are in a permanent learning loop, simulating multiple possible trajectories of the operation using their representation of the future cost function and improving it based on the information on the operational costs collected during the simulations.

In a continuously operated system, learning is processed continuously and the Robots take advantage of the previously acquired knowledge.

- At ADME we have two Robots that are permanently solving the optimal dispatch.
- Both assimilate the information on the state of the system and on the forecasts of rainfall, wind, solar radiation and Demand and resolve the optimal operation policy.
- One Robot analyzes the next three months with daily detail and publishes the results twice a day.
- The other analyzes the next seven days with hourly detail and publishes the results every hour.
- Both robots use the Bellman Recursion, which condemns us to not be able to continue adding state variables and details to the system model.
- This led us to develop a new generation of Robots based on Artificial Intelligence techniques to try to escape the Bellman Curse.

To fix ideas, the figure shows the supply of the Demand of Uruguay in the first four days of July 2018. They were not chosen for anything in particular.

