

Case 2

<Inventive step>

<Description requirements>

“Estimation system of hydroelectric
generating capacity”

(Case 34 ; Examination Handbook for Patent
and Utility Model “Annex A”)



[Claim 1]

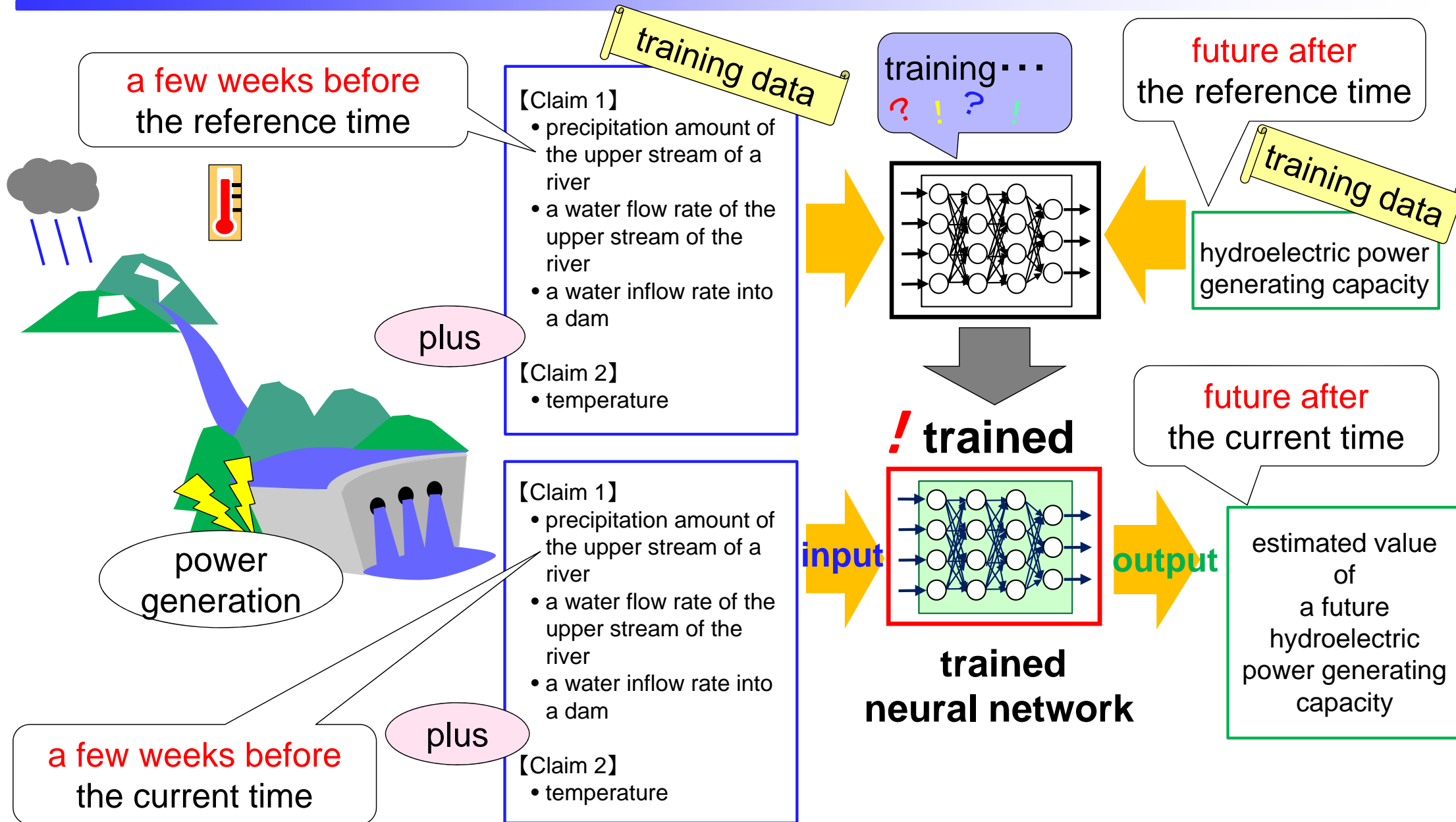
An estimation system of a hydroelectric power generating capacity of a dam comprising:

- a neural network that is built by means of an information processor, the neural network having an input layer and an output layer, in which an input data to the input layer containing a precipitation amount of the upper stream of a river, a water flow rate of the upper stream of the river, and a water inflow rate into a dam during a predetermined period between a reference time and a predetermined time before the reference time, and an output data from the output layer containing a hydroelectric power generating capacity in the future after the reference time;
- a machine learning unit that trains the neural network using a training data corresponding to actual values of the input data and the output data; and
- an estimation unit that inputs the input data to the neural network that has been trained by the machine learning unit with setting a current time as the reference time, and then calculates an estimated value of a future hydroelectric power generating capacity based on the output data of which reference time is the current time.

[Claim 2]

The estimation system of a hydroelectric power generating capacity as in Claim 1, wherein the input data to the input layer further contains a temperature of the upper stream of the river during the predetermined period between the reference time and the predetermined time before the reference time.

Case 2: Outline of the claimed invention



[Cited invention 1]

An estimation system of a hydroelectric power generating capacity that carries out a multiple regression analysis by an information processor, comprising:

a regression equation model, in which explanatory variables are a precipitation amount of the upper stream of a river, a water flow rate of the upper stream of the river, and a water inflow rate into a dam during a predetermined period between a reference time and a predetermined time before the reference time, and an objective variable is a hydroelectric power generating capacity in the future after the reference time;

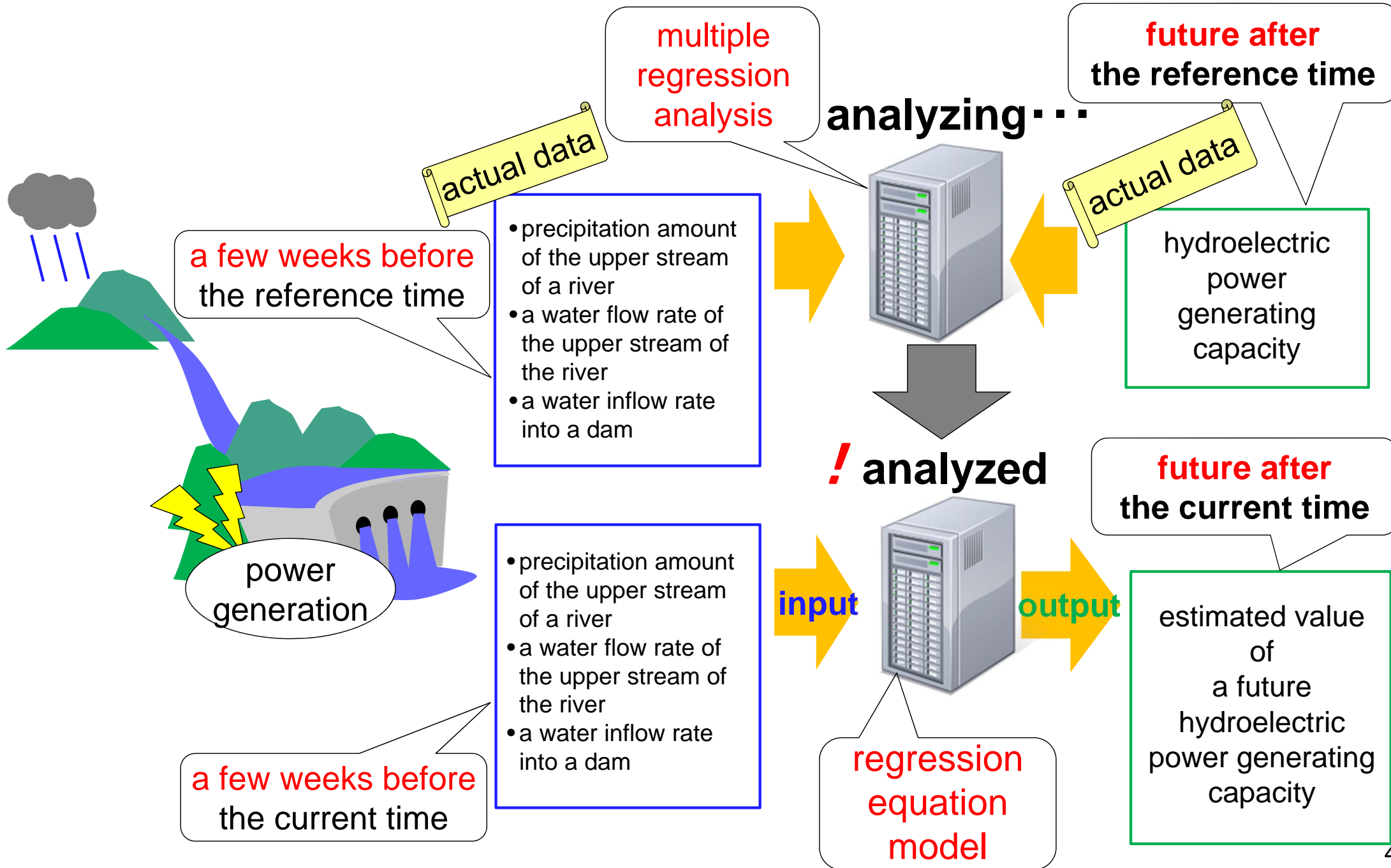
an analysis unit that calculates a partial regression coefficient of the regression equation model based on actual values corresponding to the explanatory variables and the objective variable; and

an estimation unit that, into the regression equation model to which the partial regression coefficient that has been calculated by the analysis unit is set, inputs data of the explanatory variables with setting a current time as the reference time, and then, calculates an estimated value of a future hydroelectric power generating capacity based on an output data from the objective variable setting a current time as the reference time.

[Well-known art]

In the technical field of machine learning, it is well-known that an estimation process of an output in the future is carried out based on an input of time series data in the past, by using a trained neural network which has been trained with a training data containing an input of time series data in the past and a certain output in the future.

Case 2: Outline of the cited invention 1



◆ Inventive step

⇒ Whether the claimed invention would have easily been conceived by a person skilled in the art based on the prior art.

✗ The invention of Claim 1 lacks an inventive step.

[Explanation]

< Difference between the inventions of Claim 1 and Cited Invention 1 >

The invention of Claim 1 realizes an estimation of a hydroelectric power generating capacity by means of a neural network having an input layer and output layer. Meanwhile, Cited Invention 1 realizes an estimation of a hydroelectric power generating capacity by means of a regression equation model.

< Determination on the Difference >

Cited Invention 1 and the well-known art are common with each other in estimating a certain output in the future based on an input of time series data in the past, with reference to a correlation among data.

Therefore, a person skilled in the art could easily derive a configuration that enables estimation of a hydroelectric power generating capacity, by applying the well-known art to Cited Invention 1 and adopting a trained neural network in substitution of a regression equation model.

○ The invention of Claim 2 has an inventive step.

[Explanation]

< Difference between the inventions of Claim 2 and Cited Invention 1 >

The invention of Claim 2 has the input data to the input layer further contains a temperature of the upper stream of the river during the predetermined period between the reference time and the predetermined time before the reference time. So, in addition to what has been considered in Claim 1, the invention of Claim 2 differs at this point from Cited Invention 1 which does not have such a configuration.

< Determination on the difference >

The invention of Claim 2 uses a temperature of the upstream of the river for estimation of a hydroelectric power generating capacity. There is no prior art found disclosing such use of a temperature of the upstream of the river. Further, it is not a common general technical knowledge that there is a correlation between a temperature and a hydroelectric power generating capacity.

Generally, an input of data of which correlation is unknown may cause a noise in machine learning. However, the invention of Claim 2 uses an input data containing a temperature of the upstream of the river during a predetermined period between a reference time and a predetermined time before the reference time. This enables a highly accurate estimation of a hydroelectric power generating capacity, taking an increase of inflow rate due to meltwater in the spring into consideration. It is a significant effect that a person skilled in the art cannot expect.

Accordingly, a person skilled in the art would not easily conceive to contain a temperature of the upstream of the river in an input data to estimate a hydroelectric power generating capacity.

◆ Description requirements

- ***Enablement requirement***

⇒ Whether the statement in the description is so clear and sufficient that a person skilled in the art can carry out the claimed invention.

- ***Support requirement***

⇒ Whether the claimed invention is described in the description.

- ◆ **The correlation between input data and output data is a key in making a determination on the description requirement (enablement requirement) in AI-related inventions.**
- **The enablement requirement is satisfied if the correlation is obvious from the viewpoints below.**
 - ✓ Whether it is presumable based on a common technical knowledge
 - ✓ Whether there is a support in the description with an explanation or statistic information
 - ✓ Whether there is a support with a performance evaluation of an AI model
- **The enablement requirement is not satisfied without an obvious correlation between input data and output data.**