FHMM (Factorial Hidden Markov Model) by using sum total data regarding a sum total of current consumed by a plurality of electrical appliances; and a model learning unit that performs learning of the FHMM of which each factor has three or more states by using the state probability.

(E2) The data processing apparatus set forth in (E1), wherein the FHMM includes as model parameters

a unique waveform unique to each state of each factor, used to obtain an average value of observation values of the sum total data observed in combinations of states of the respective factors; a variance of observation values of the sum total data observed in the combinations of states of the respective factors; an initial state probability that a state of each factor is an initial state; and a transition probability that a state of each factor transitions, and wherein the model learning unit includes a waveform separation learning portion that performs waveform separation learning for obtaining the unique waveform; a variance learning portion that performs variance learning for obtaining the variance; and a state variation learning portion that performs state variation learning for obtaining the initial state probability and the transition probability.

(E3) The data processing apparatus set forth in (E2), wherein the variance learning portion obtains an individual variance for each factor, or an individual variance for each state of each factor.

(E4) The data processing apparatus set forth in (E2) or (E3), wherein the state estimation unit obtains the state probability under a state transition restriction where the number of factors of which a state transitions for one time point is restricted.

(E5) The data processing apparatus set forth in (E4), wherein the state estimation unit obtains an observation probability that the sum total data is observed in the combinations of states of the respective factors by using the average value and the variance; a forward probability

$\alpha_{t,z}$

that the sum total data Y1, Y2,..., and Yt is observed and which is in a combination z of states of the respective factors at the time point t, and a backward probability

$\beta_{t,z}$

which is in the combination z of states of the respective factors at the time point t and thereafter that sum total data Yt, Yt+1,..., _and YT is observed, with respect to a series Y1, Y2,..., and YT of

the sum total data, by using the observation probability and the transition probability; a posterior probability

$\gamma_{t,z}$

which is in the combination z of states of the respective factors at the time point t by using the forward probability

$\alpha_{t,z}$

and the backward probability

$\beta_{t,z}$

and the state probability by marginalizing the posterior probability

$\gamma_{t,z}$

and wherein the state estimation unit, by using a combination of states of the respective factors as a particle, predicts a particle after one time point under the state transition restriction, and obtains the forward probability

$\alpha_{t,z}$

of the combination z of states as the particle while repeating sampling of a predetermined number of particles on the basis of the forward probability

$\alpha_{t,z}$

and predicts a particle before one time point under the state transition restriction, and obtains the backward probability

$\beta_{t,z}$

of the combination z of states as the particle while repeating sampling of a predetermined number of particles on the basis of the backward probability

$\beta_{t,z}$

(E6) The data processing apparatus set forth in any one of (E2) to (E5), wherein the waveform separation learning portion obtains the unique waveform under a restriction distinctive to the electrical appliance.

(E7) The data processing apparatus set forth in (E6), wherein the waveform separation learning portion obtains the unique waveform under a load restriction where power consumption of the electrical appliance obtained using the unique waveform does not have a negative value.

(E8) The data processing apparatus set forth in (E6), wherein the waveform separation learning portion obtains the unique waveform under a base waveform restriction where the unique waveform is represented by one or more combinations of a plurality of base waveforms prepared for the electrical appliances.

(E9) A data processing method including the steps of performing state estimation for obtaining a state probability which is in a state of each factor of an FHMM (Factorial Hidden Markov

Model) by using sum total data regarding a sum total of current consumed by a plurality of electrical appliances; and performing learning of the FHMM of which each factor has three or more states by using the state probability.

(E10) A program causing a computer to function as a state estimation unit that performs state estimation for obtaining a state probability which is in a state of each factor of an FHMM (Factorial Hidden Markov Model) by using sum total data regarding a sum total of current consumed by a plurality of electrical appliances; and a model learning unit that performs learning of the FHMM of which each factor has