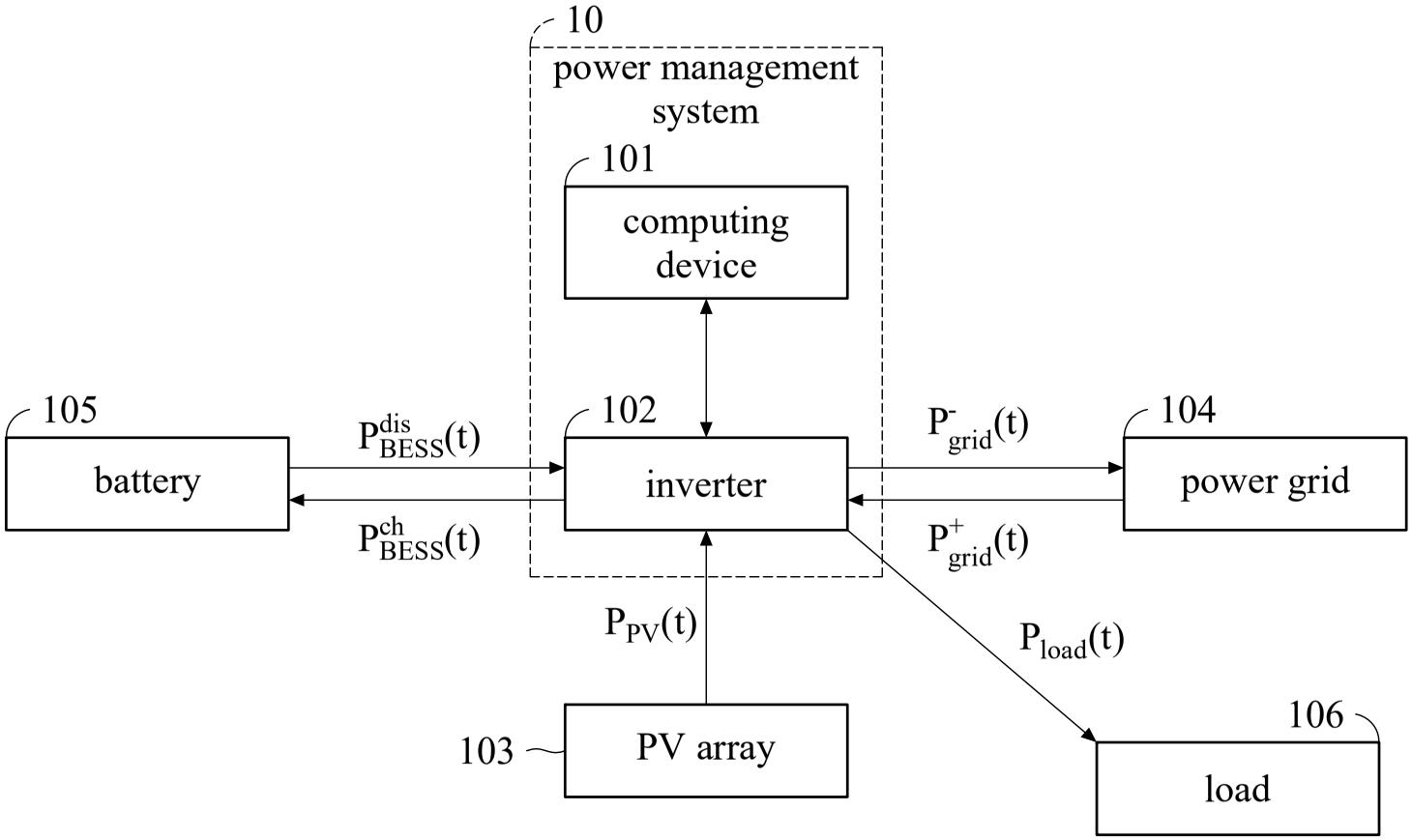
10
power management system
101
computing device
105
battery
$P^{dis}_{BESS}(t)$
$P^{ch}_{BESS}(t)$
102
inverter
$P^{-}_{grid}(t)$
$P^{+}_{grid}(t)$
104
power grid
$P_{PV}(t)$
$P_{load}(t)$
103
PV array
106
load

FIG. 1

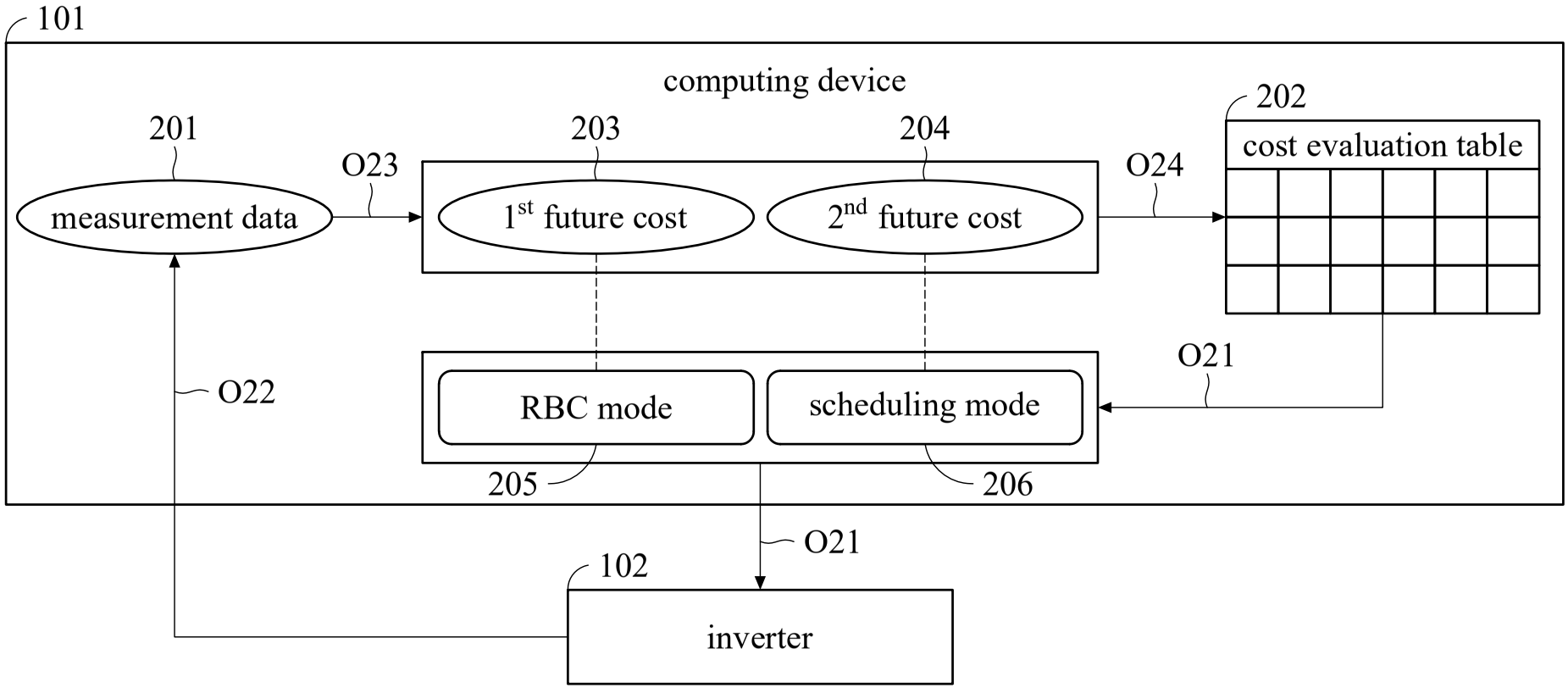
101
computing device
201
measurement data
O23
203
1st future cost
204
2nd future cost
O24
202
cost evaluation table
O21
O22
RBC mode
scheduling mode
205
206
O21
102
inverter

FIG. 2

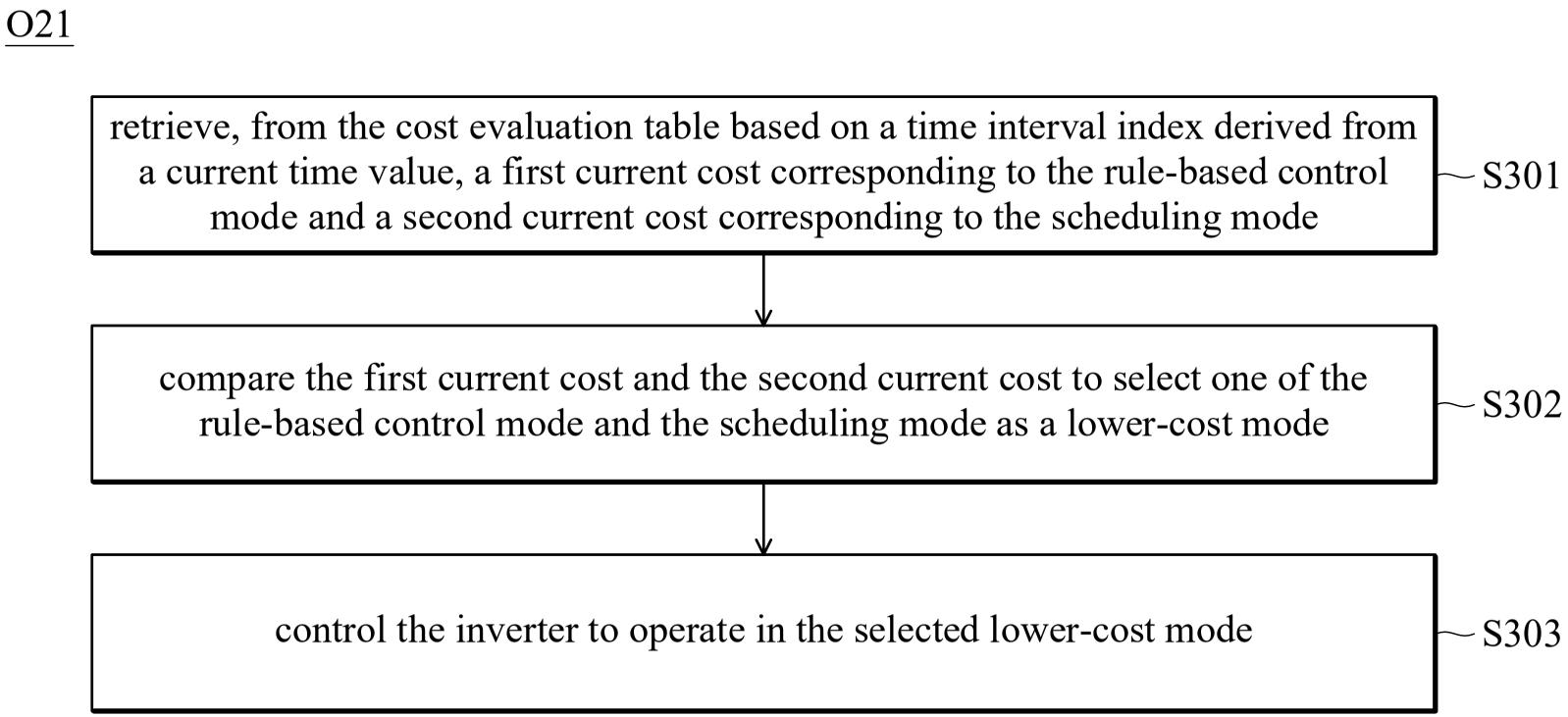
O21
retrieve, from the cost evaluation table based on a time interval index derived from a current time value, a first current cost corresponding to the rule-based control mode and a second current cost corresponding to the scheduling mode
S301
compare the first current cost and the second current cost to select one of the rule-based control mode and the scheduling mode as a lower-cost mode
S302
control the inverter to operate in the selected lower-cost mode
S303

FIG. 3

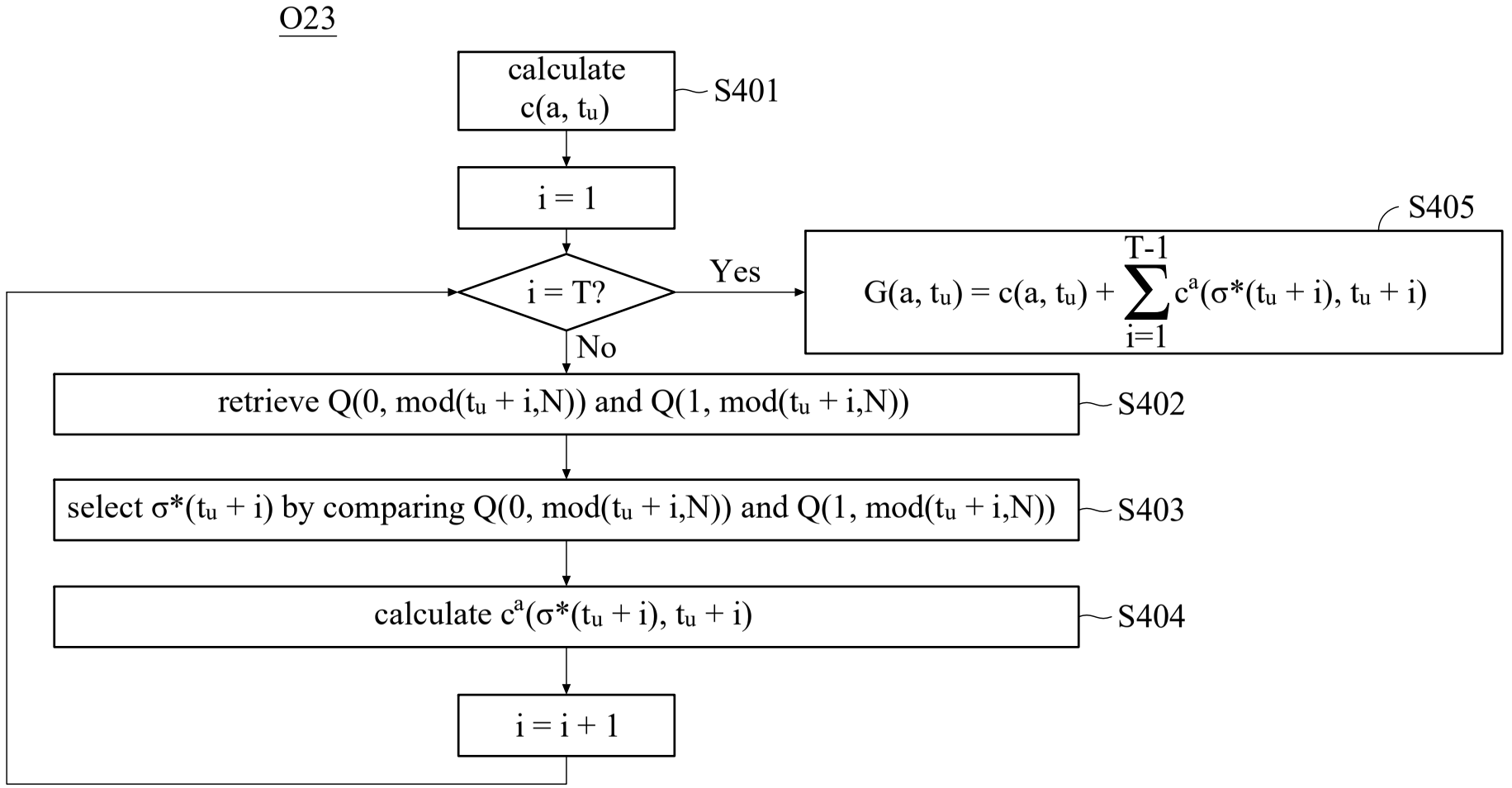
O23
calculate c(a, t_u)
S401
i = 1
i = T?
Yes
S405
$G(a, t_u) = c(a, t_u) + \sum_{i=1}^{T-1} c^a(\sigma^*(t_u + i), t_u + i)$
No
retrieve Q(0, mod(t_u + i,N)) and Q(1, mod(t_u + i,N))
S402
select $\sigma^*(t_u + i)$ by comparing Q(0, mod(t_u + i,N)) and Q(1, mod(t_u + i,N))
S403
calculate $c^a(\sigma^*(t_u + i), t_u + i)$
S404
i = i + 1

FIG. 4

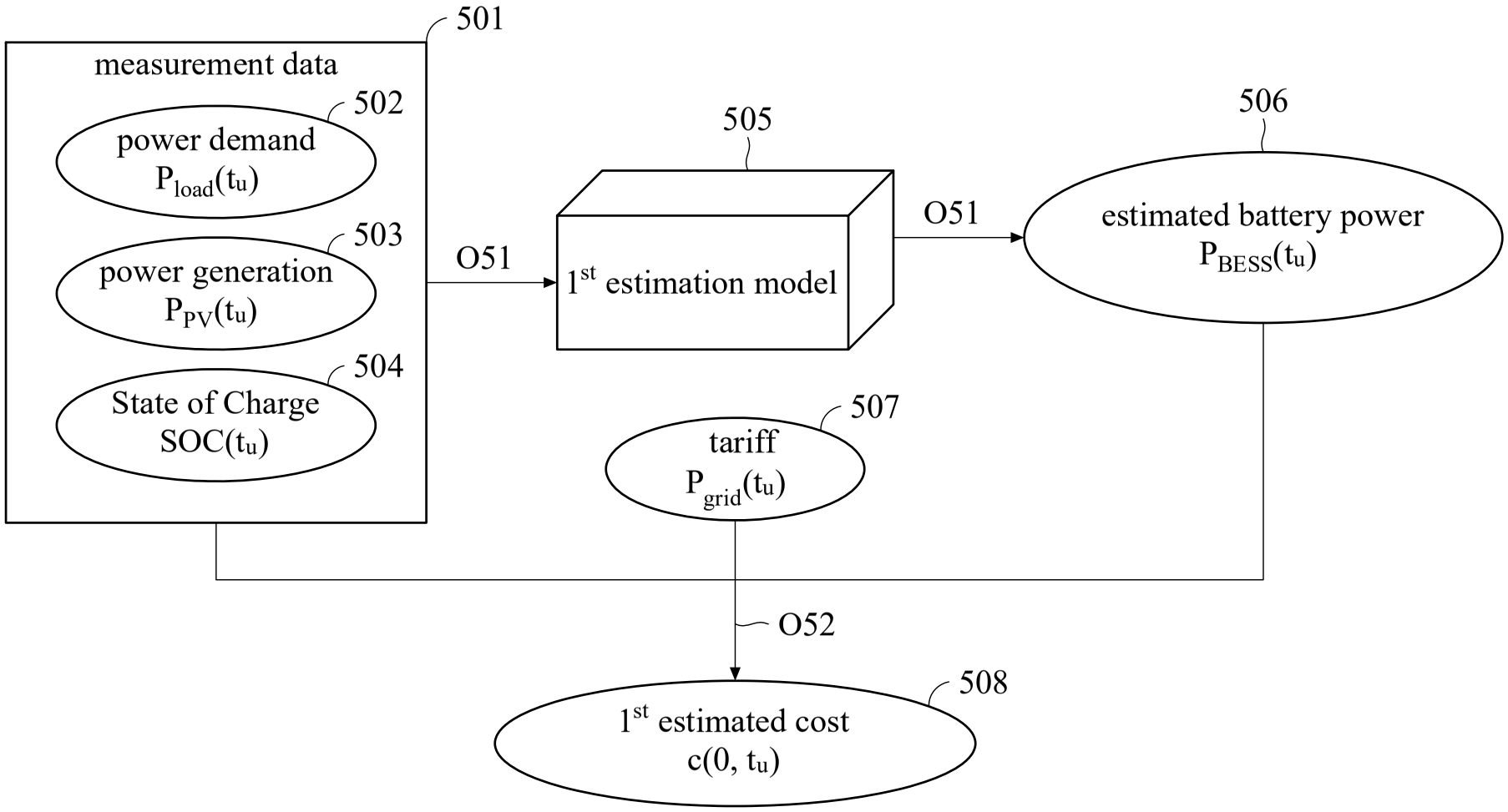
501
measurement data
502
power demand
$P_{load}(t_u)$
503
power generation
$P_{PV}(t_u)$
504
State of Charge
$SOC(t_u)$
O51
505
1st estimation model
O51
506
estimated battery power
$P_{BESS}(t_u)$
507
tariff
$P_{grid}(t_u)$
O52
508
1st estimated cost
$c(0, t_u)$

FIG. 5A

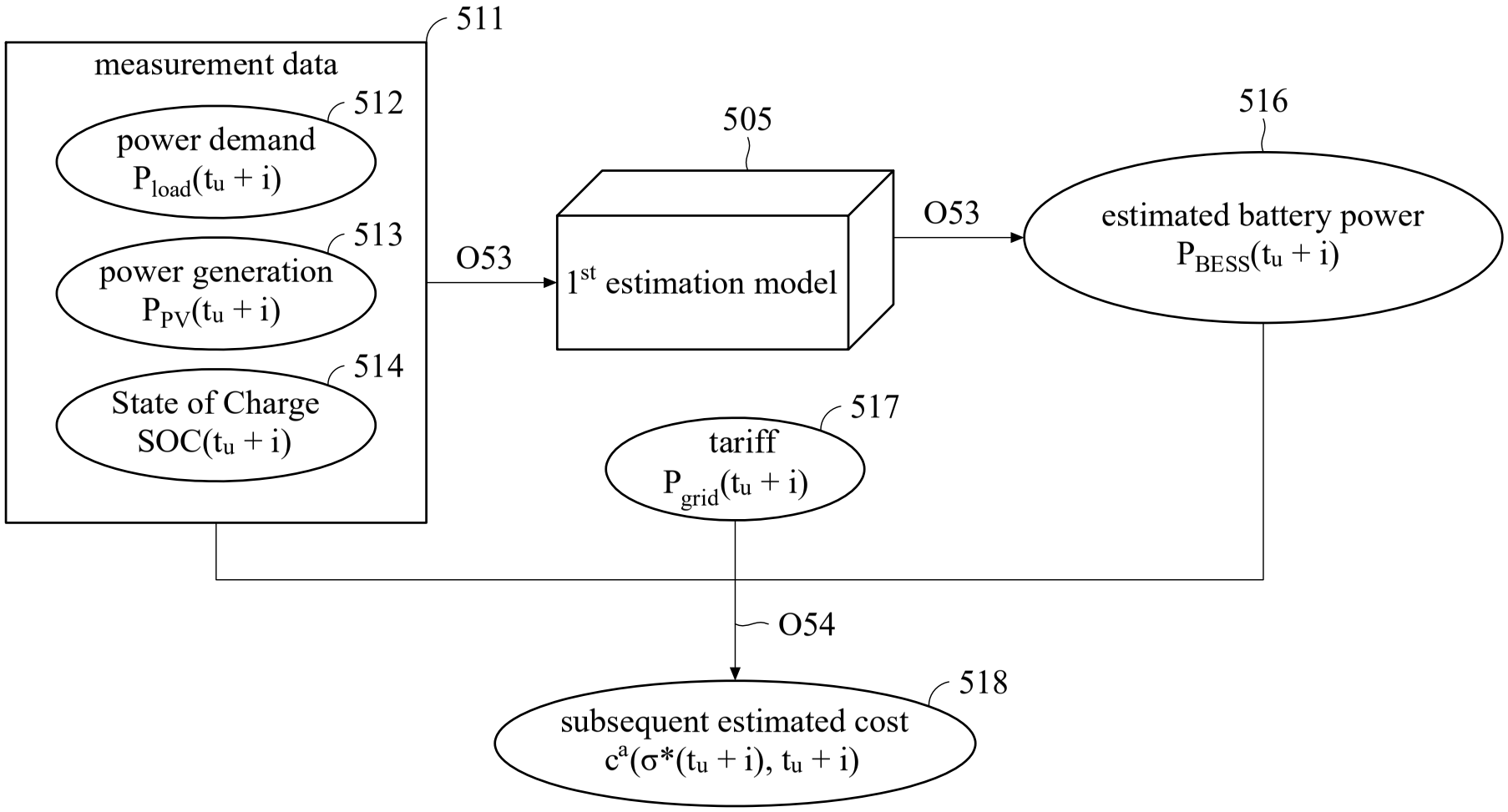
511
measurement data
512
power demand
$P_{load}(t_u + i)$
513
power generation
$P_{PV}(t_u + i)$
514
State of Charge
$SOC(t_u + i)$
O53
505
1st estimation model
O53
516
estimated battery power
$P_{BESS}(t_u + i)$
517
tariff
$P_{grid}(t_u + i)$
O54
518
subsequent estimated cost
$c^a(\sigma^*(t_u + i), t_u + i)$

FIG. 5B

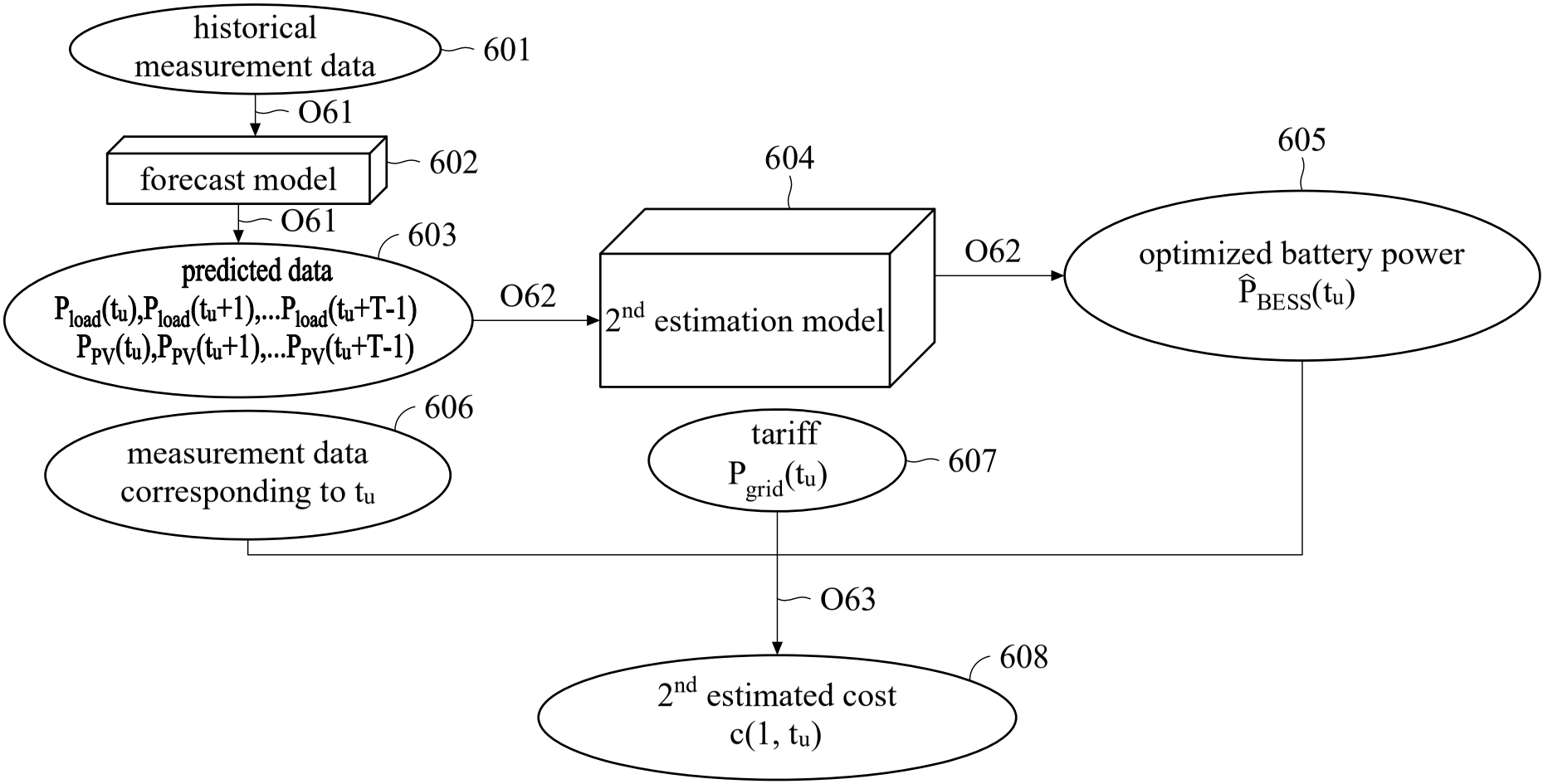
historical measurement data
601
O61
forecast model
602
O61
603
predicted data
$P_{load}(t_u), P_{load}(t_u+1), \ldots P_{load}(t_u+T-1)$
$P_{PV}(t_u), P_{PV}(t_u+1), \ldots P_{PV}(t_u+T-1)$
O62
604
2nd estimation model
O62
605
optimized battery power
$\hat{P}_{BESS}(t_u)$
606
measurement data corresponding to t_u
tariff
$P_{grid}(t_u)$
607
O63
608
2nd estimated cost
$c(1, t_u)$

FIG. 6A

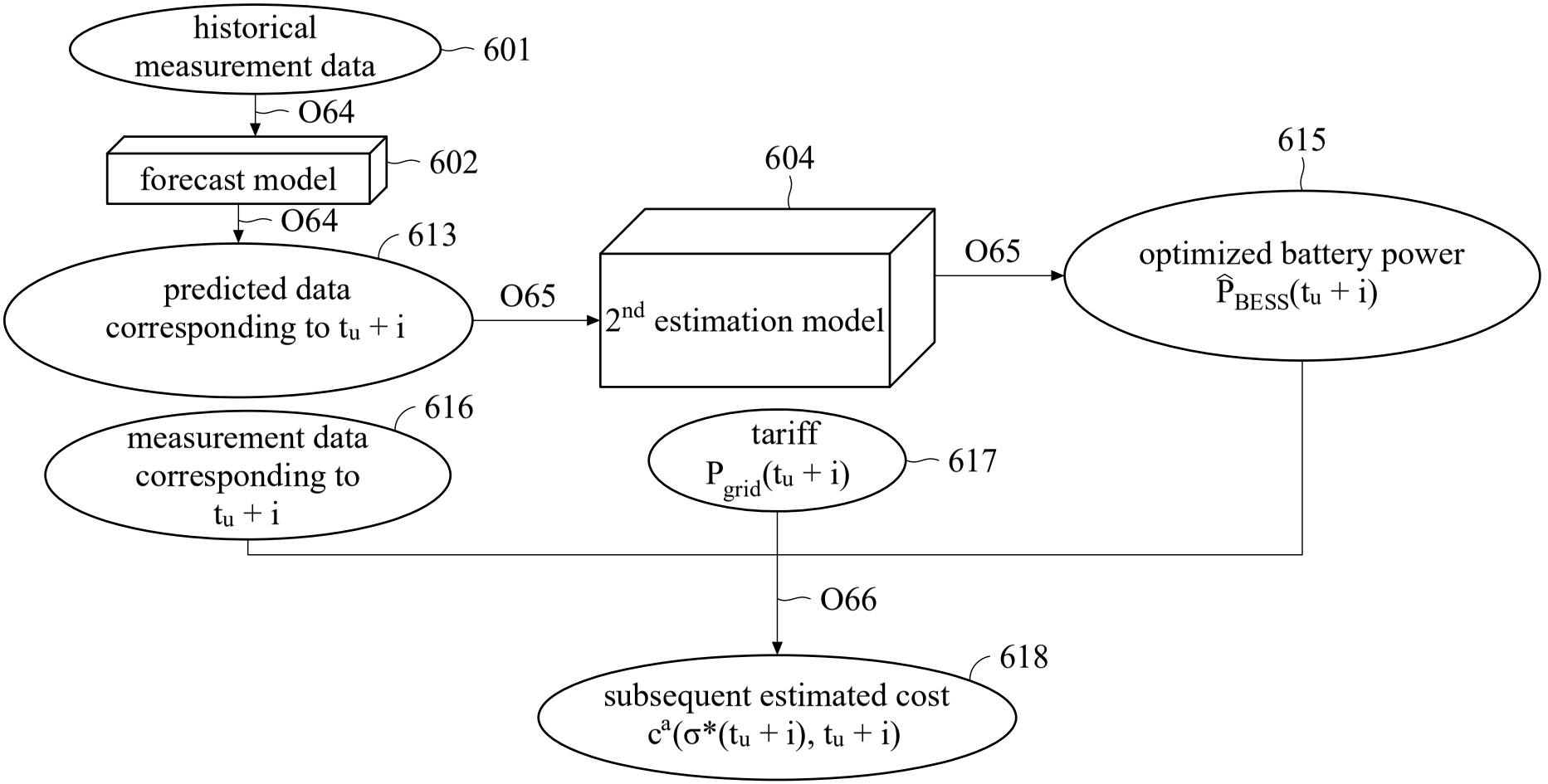
historical measurement data
601
O64
forecast model
602
O64
613
predicted data corresponding to $t_u + i$
O65
604
2nd estimation model
O65
615
optimized battery power $\hat{P}_{BESS}(t_u + i)$
616
measurement data corresponding to $t_u + i$
tariff $P_{grid}(t_u + i)$
617
O66
618
subsequent estimated cost $c^a(\sigma^*(t_u + i), t_u + i)$

FIG. 6B

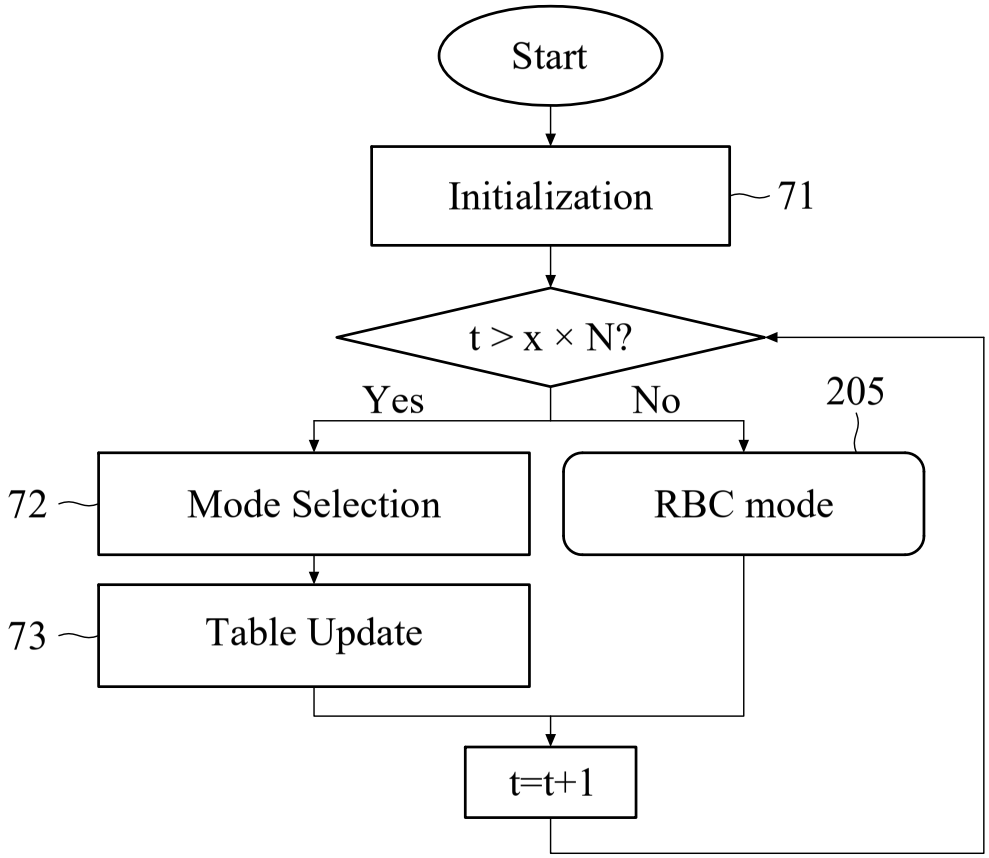
Start
Initialization
71
t > x × N?
Yes
No
205
72
Mode Selection
RBC mode
73
Table Update
t=t+1

FIG. 7