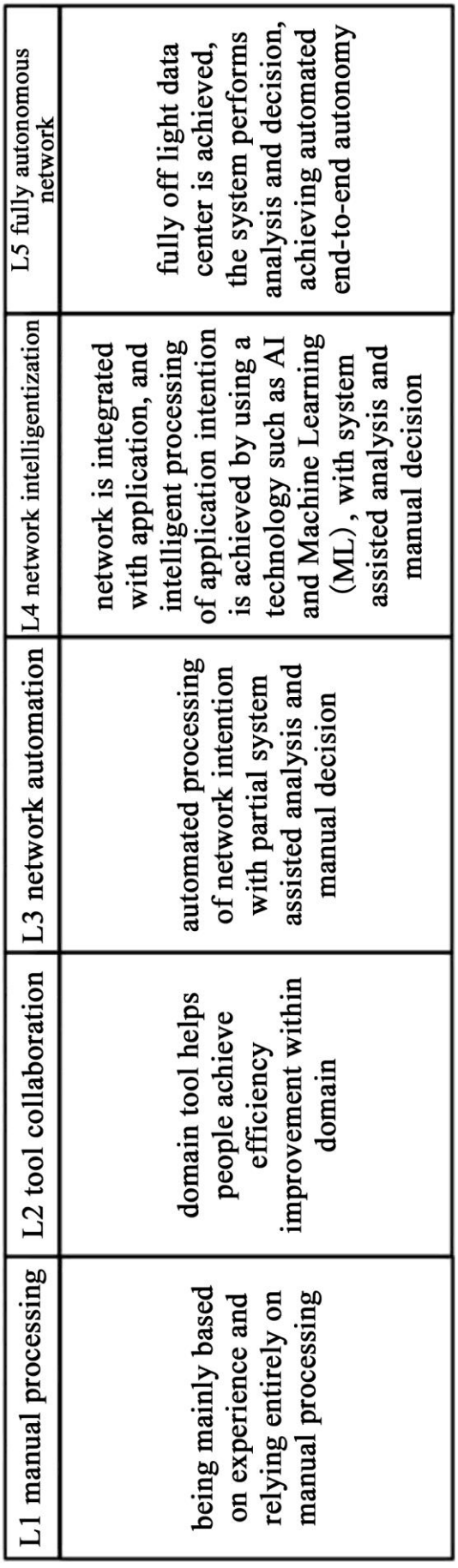

L1 manual processing
being mainly based on experience and relying entirely on manual processing
L2 tool collaboration
domain tool helps people achieve efficiency improvement within domain
L3 network automation
automated processing of network intention with partial system assisted analysis and manual decision
L4 network intelligentization
network is integrated with application, and intelligent processing of application intention is achieved by using a technology such as AI and Machine Learning (ML), with system assisted analysis and manual decision
L5 fully autonomous network
fully off light data center is achieved, the system performs analysis and decision, achieving automated end-to-end autonomy

FIG. 1

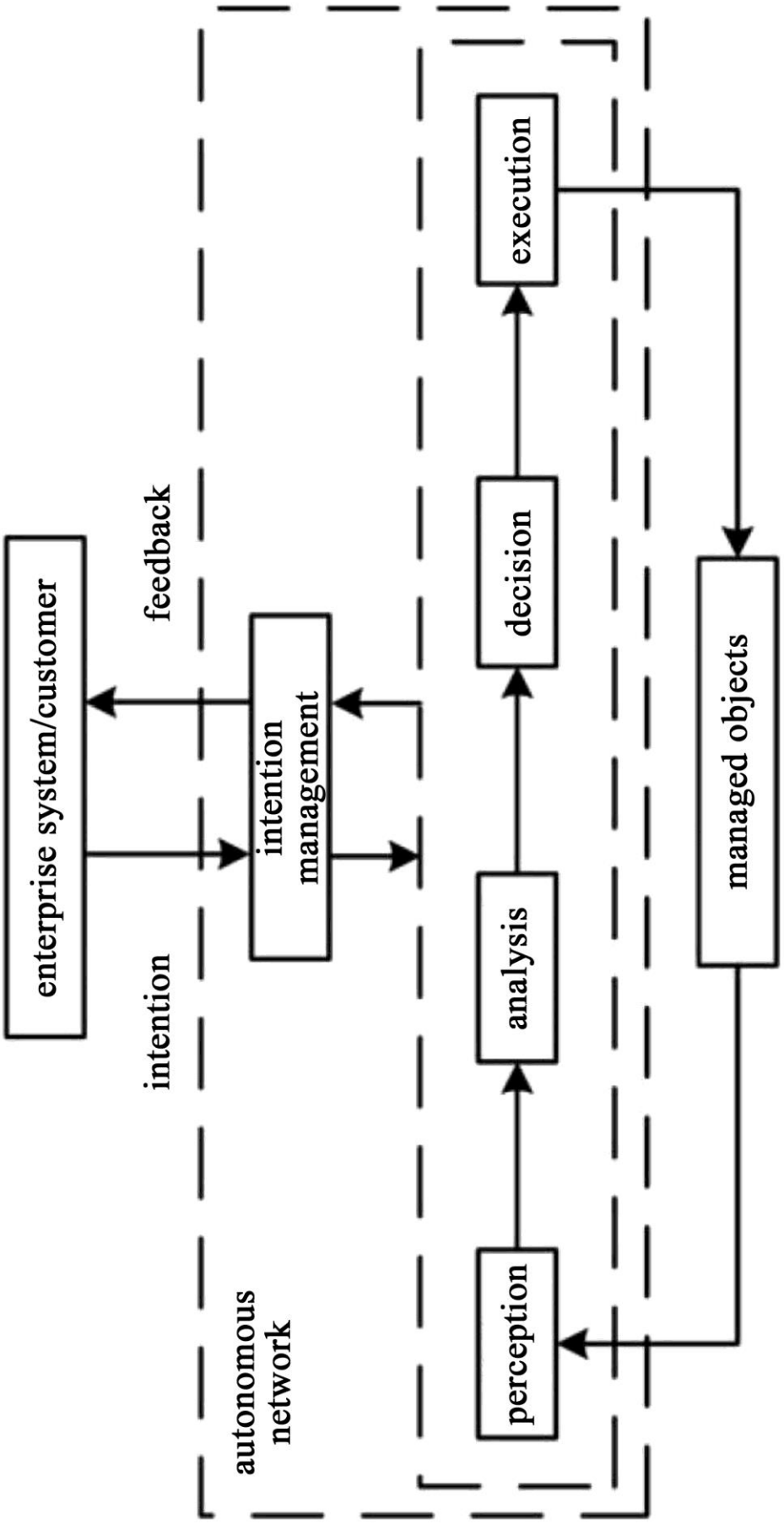

enterprise system/customer
feedback
intention
intention management
autonomous network
perception
analysis
decision
execution
managed objects

FIG. 2

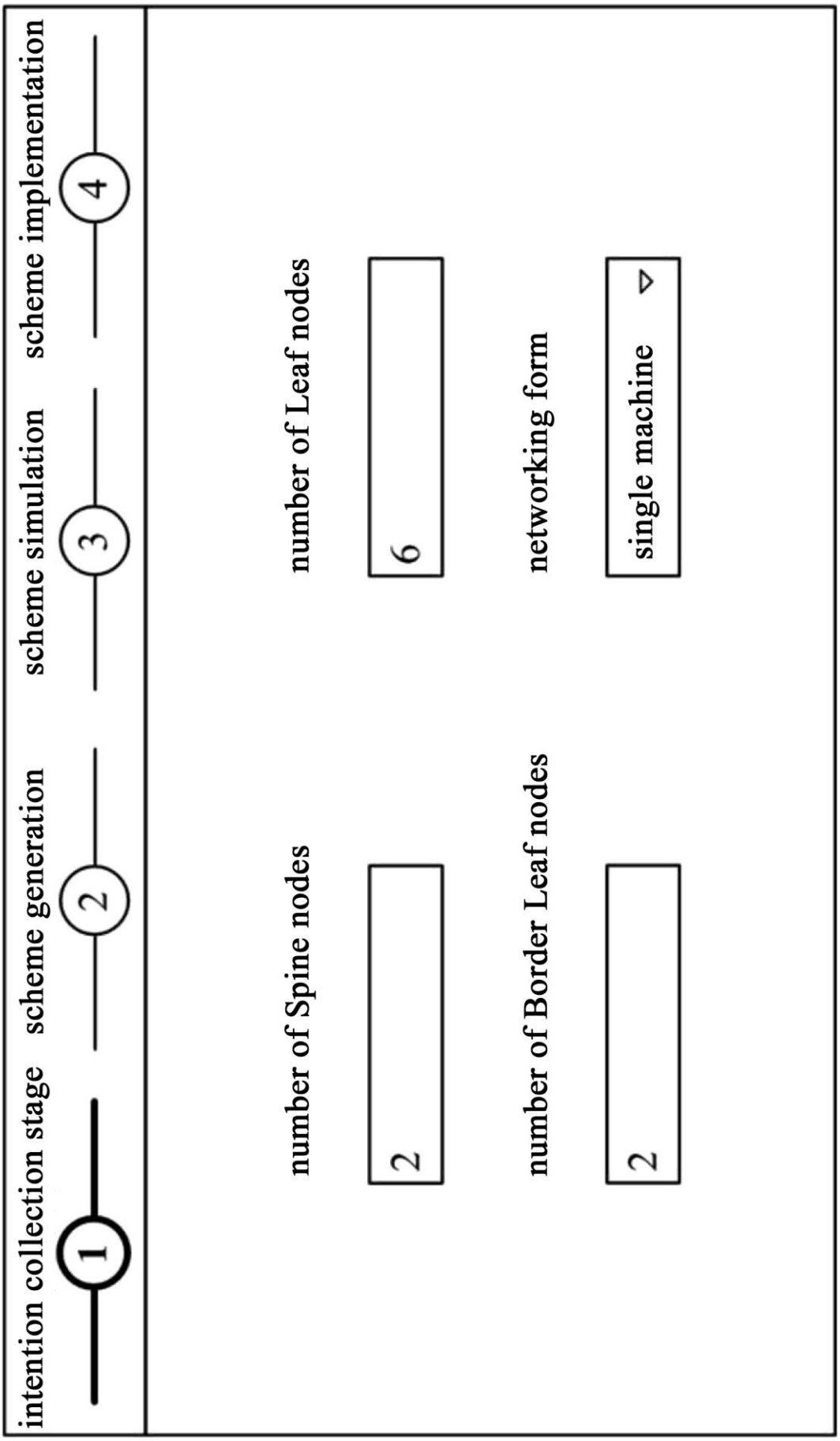

intention collection stage
scheme generation
scheme simulation
scheme implementation
1
2
3
4
number of Spine nodes
2
number of Leaf nodes
6
number of Border Leaf nodes
2
networking form
single machine

FIG. 3

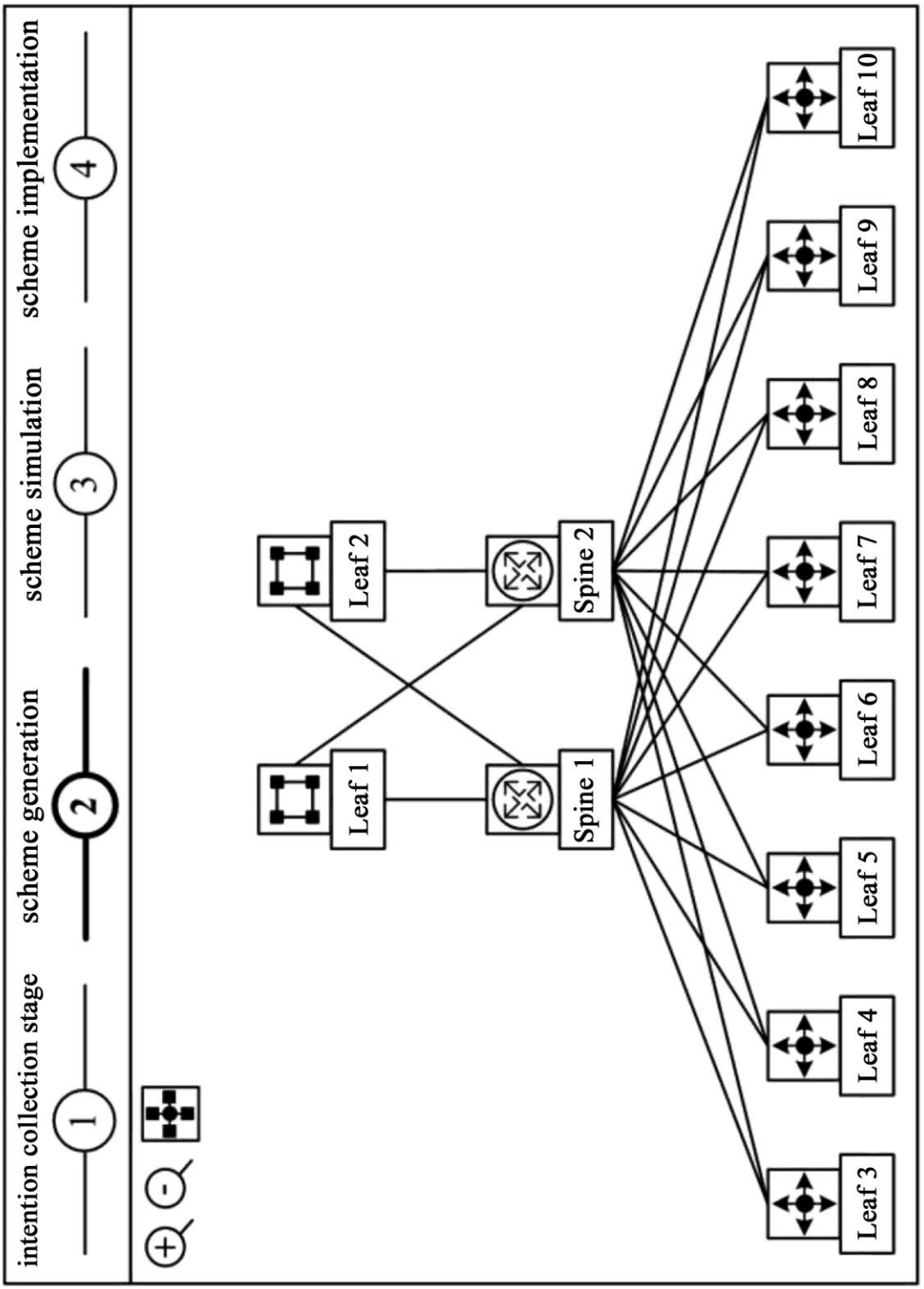

intention collection stage
scheme generation
scheme simulation
scheme implementation
1
2
3
4
Leaf 1
Leaf 2
Spine 1
Spine 2
Leaf 3
Leaf 4
Leaf 5
Leaf 6
Leaf 7
Leaf 8
Leaf 9
Leaf 10

FIG. 4

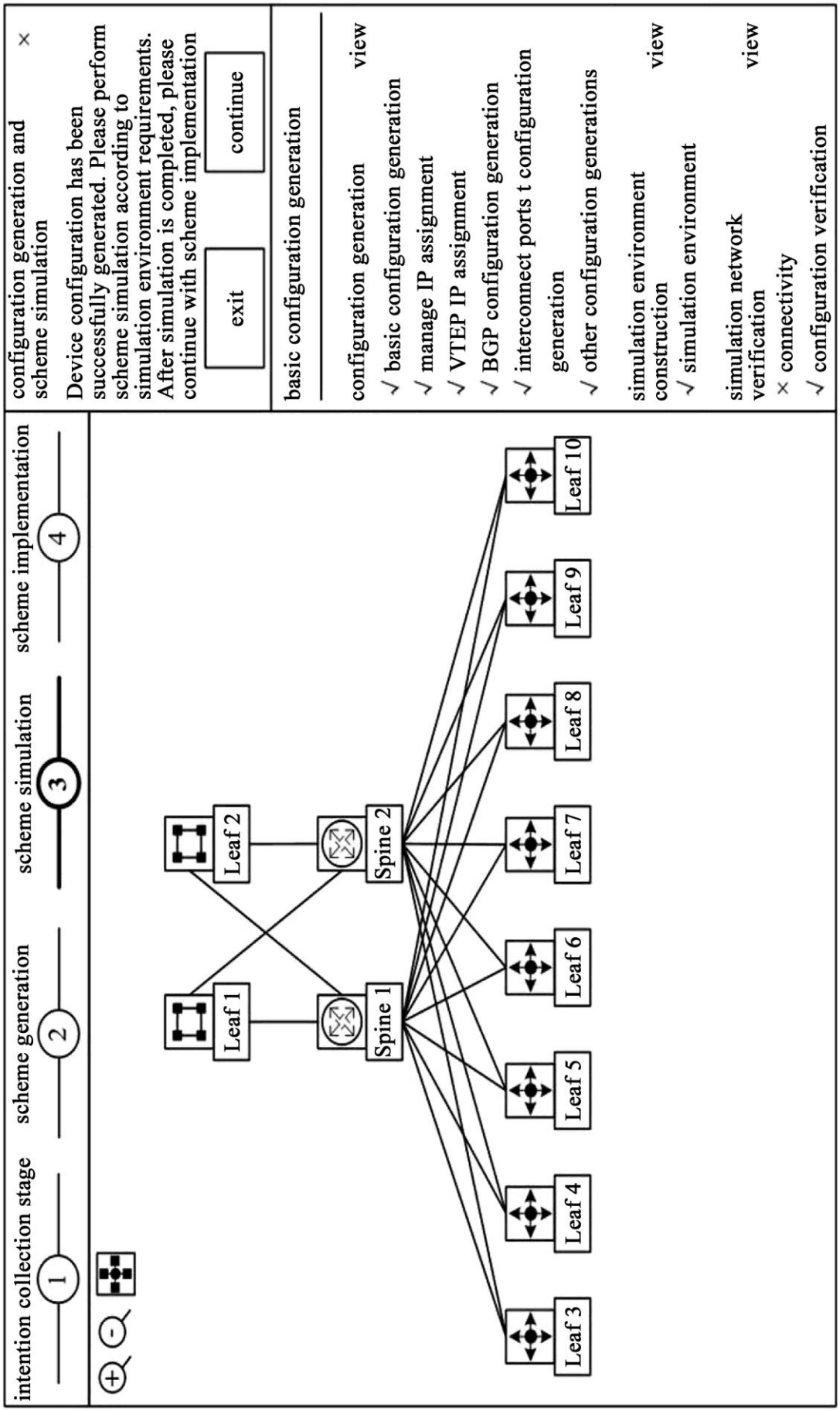

intention collection stage
scheme generation
scheme simulation
scheme implementation
1
2
3
4
Leaf 1
Leaf 2
Spine 1
Spine 2
Leaf 3
Leaf 4
Leaf 5
Leaf 6
Leaf 7
Leaf 8
Leaf 9
Leaf 10
configuration generation and scheme simulation
Device configuration has been successfully generated. Please perform scheme simulation according to simulation environment requirements. After simulation is completed, please continue with scheme implementation
exit
continue
basic configuration generation
configuration generation view
√ basic configuration generation
√ manage IP assignment
√ VTEP IP assignment
√ BGP configuration generation
√ interconnect ports t configuration generation
√ other configuration generations
simulation environment construction view
√ simulation environment
simulation network verification view
× connectivity
√ configuration verification

FIG. 5

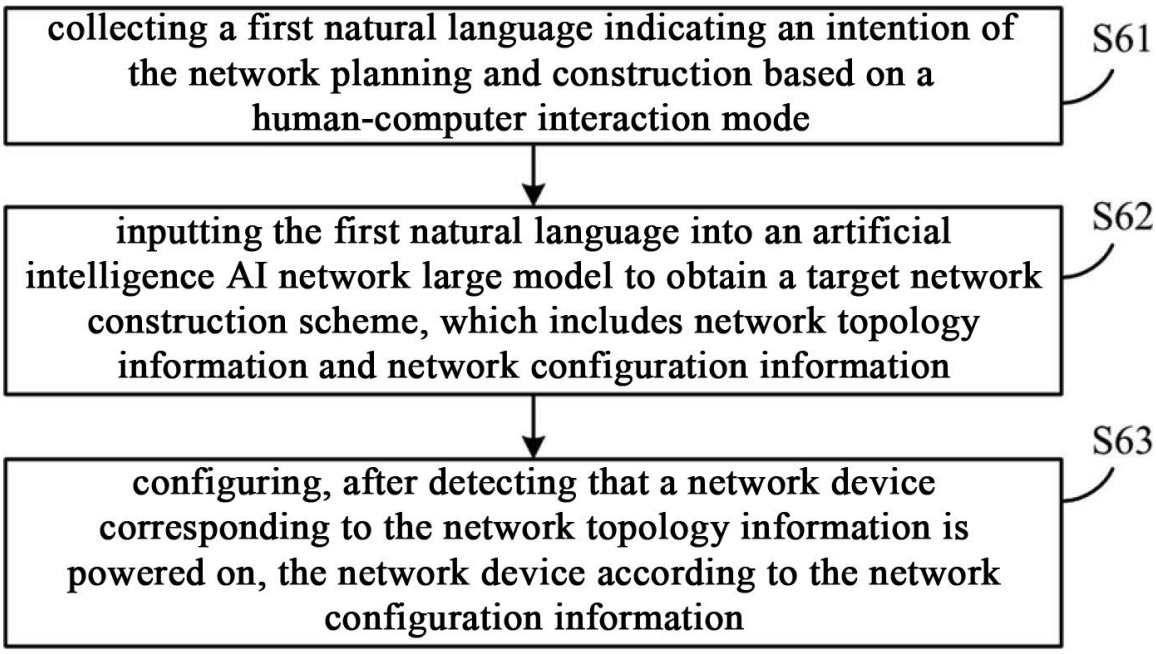

collecting a first natural language indicating an intention of the network planning and construction based on a human-computer interaction mode
S61
inputting the first natural language into an artificial intelligence AI network large model to obtain a target network construction scheme, which includes network topology information and network configuration information
S62
configuring, after detecting that a network device corresponding to the network topology information is powered on, the network device according to the network configuration information
S63

FIG. 6

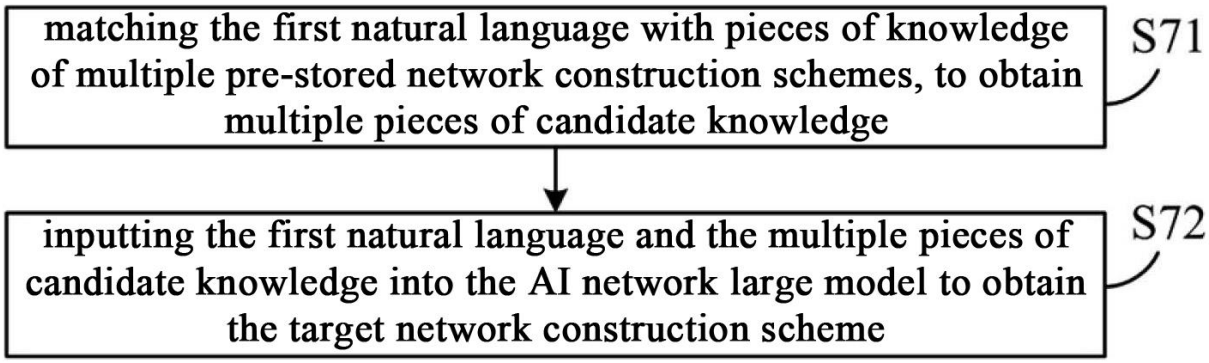

matching the first natural language with pieces of knowledge of multiple pre-stored network construction schemes, to obtain multiple pieces of candidate knowledge
S71
inputting the first natural language and the multiple pieces of candidate knowledge into the AI network large model to obtain the target network construction scheme
S72

FIG. 7

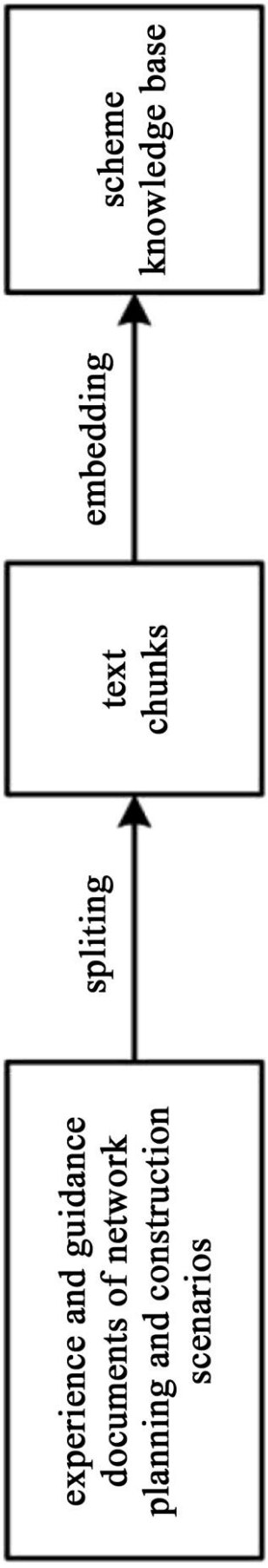

experience and guidance documents of network planning and construction scenarios
spliting
text chunks
embedding
scheme knowledge base

FIG. 8

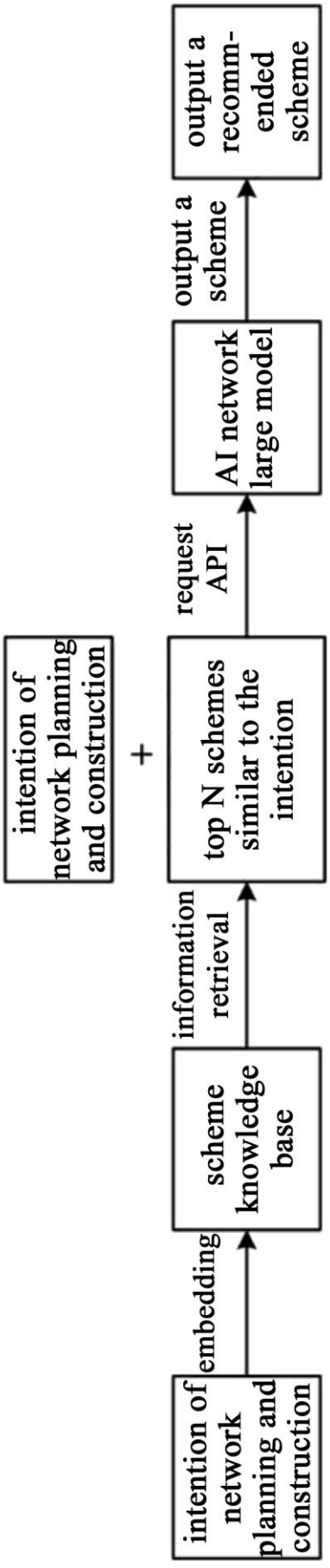

intention of network planning and construction
embedding
scheme knowledge base
information retrieval
top N schemes similar to the intention
+
request API
AI network large model
output a scheme
output a recommended scheme

FIG. 9

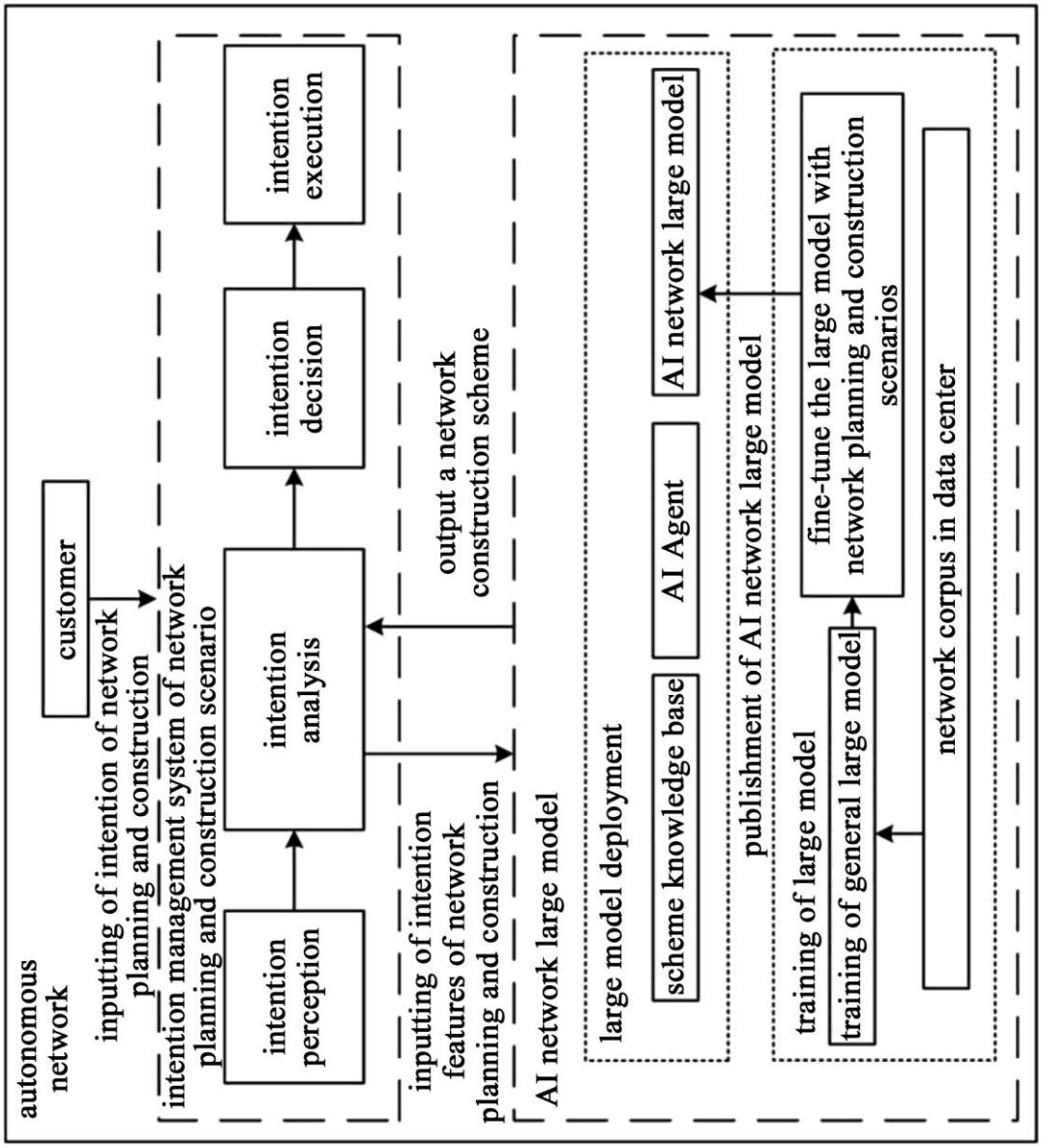

autonomous network
customer
inputting of intention of network planning and construction
intention management system of network planning and construction scenario
intention perception
intention analysis
intention decision
intention execution
inputting of intention features of network planning and construction
output a network construction scheme
AI network large model
large model deployment
scheme knowledge base
AI Agent
AI network large model
publishment of AI network large model
training of large model
training of general large model
fine-tune the large model with network planning and construction scenarios
network corpus in data center

FIG. 10

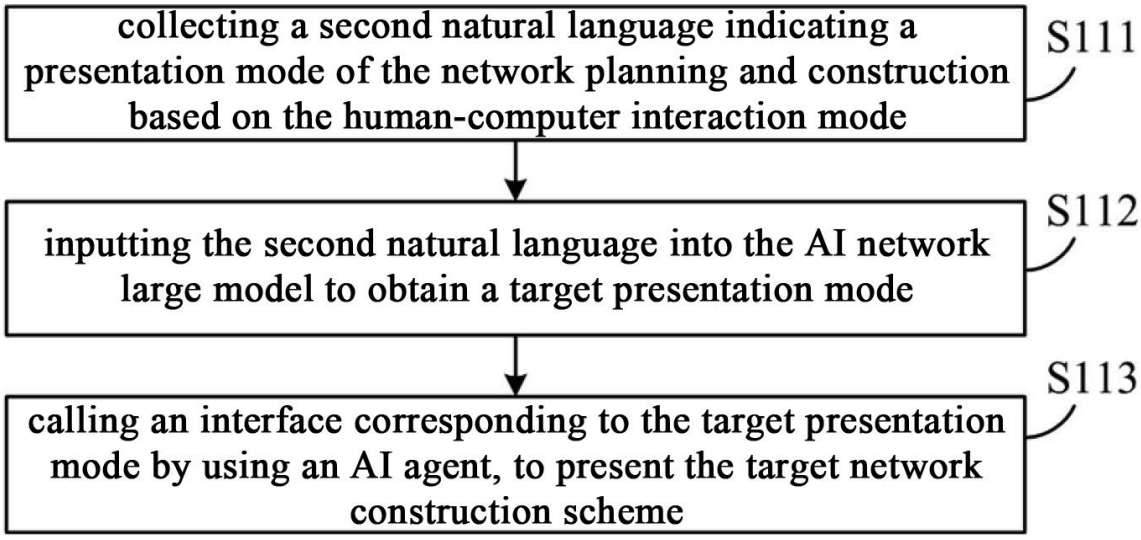

collecting a second natural language indicating a presentation mode of the network planning and construction based on the human-computer interaction mode
S111
inputting the second natural language into the AI network large model to obtain a target presentation mode
S112
calling an interface corresponding to the target presentation mode by using an AI agent, to present the target network construction scheme
S113

FIG. 11

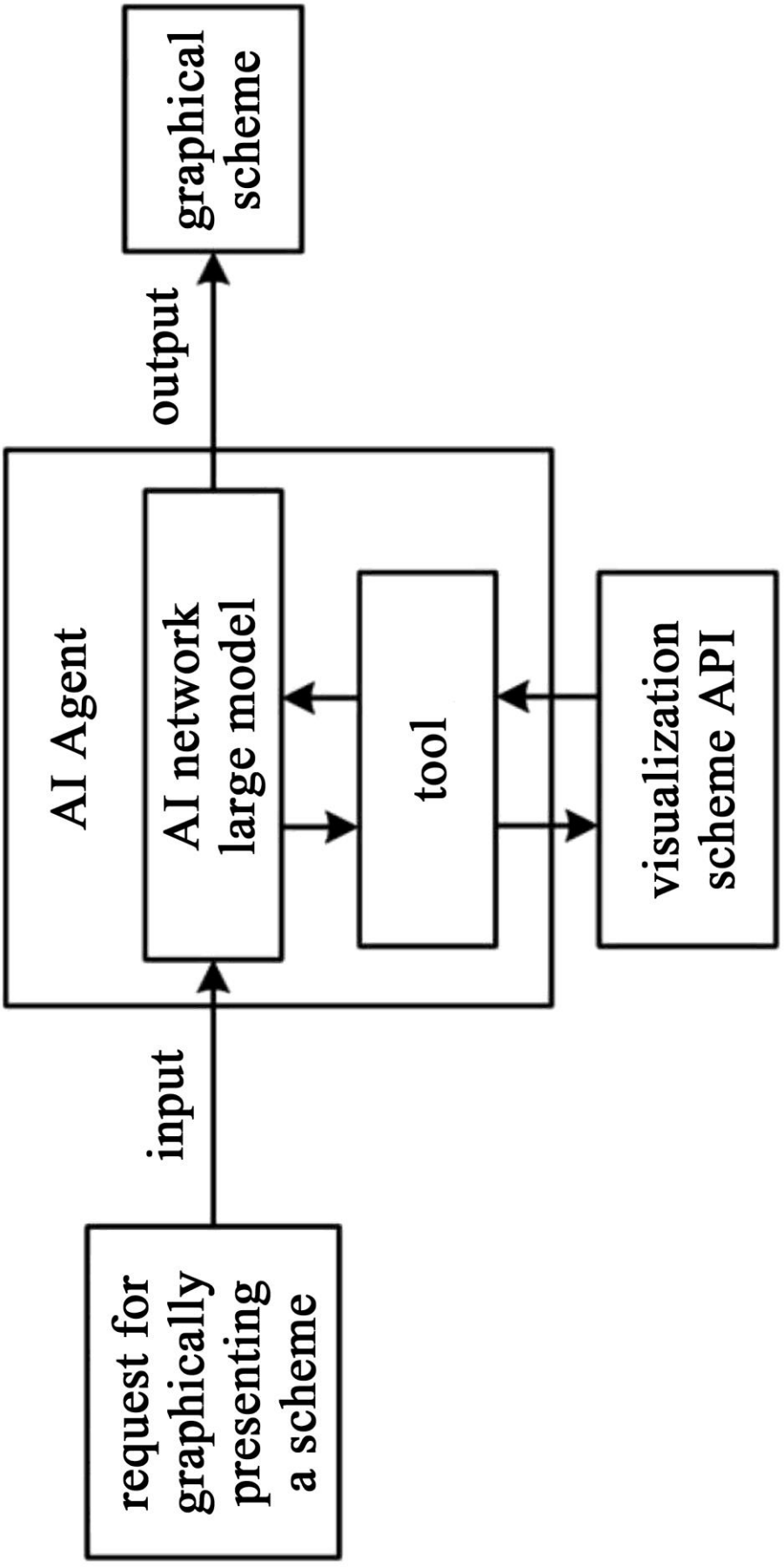

request for graphically presenting a scheme
input
AI Agent
AI network large model
tool
visualization scheme API
output
graphical scheme

FIG. 12

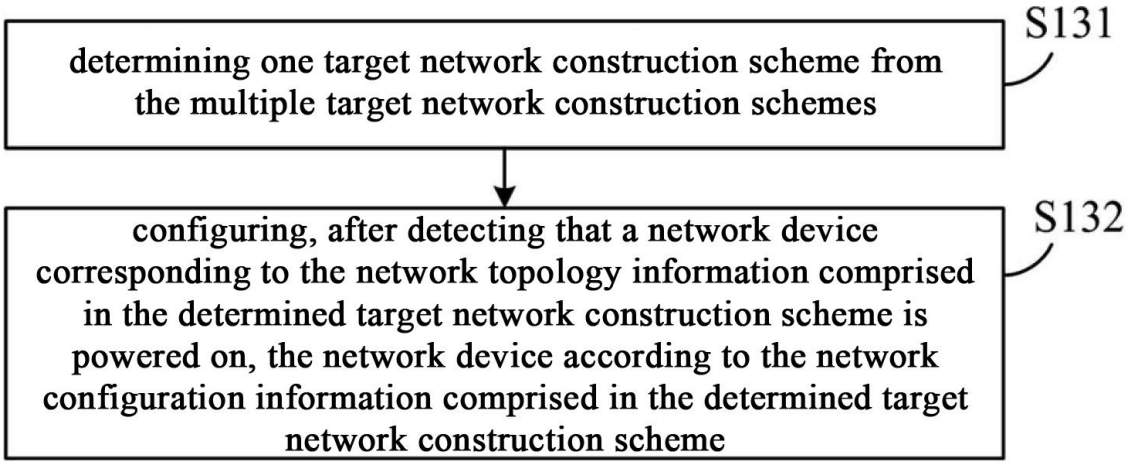


FIG. 13

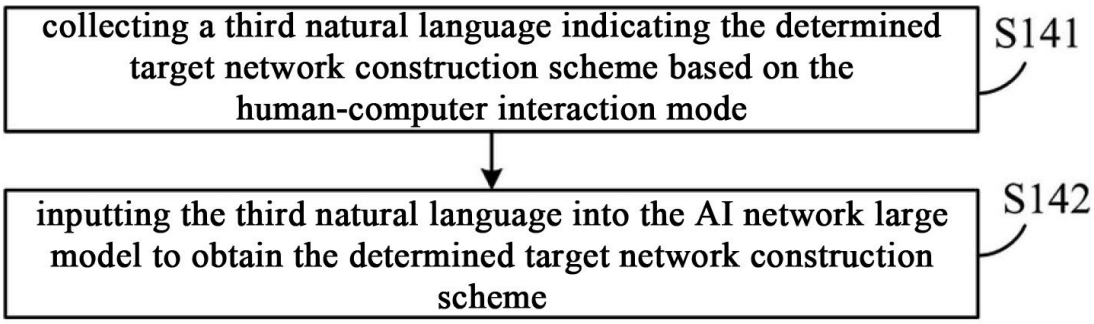


FIG. 14

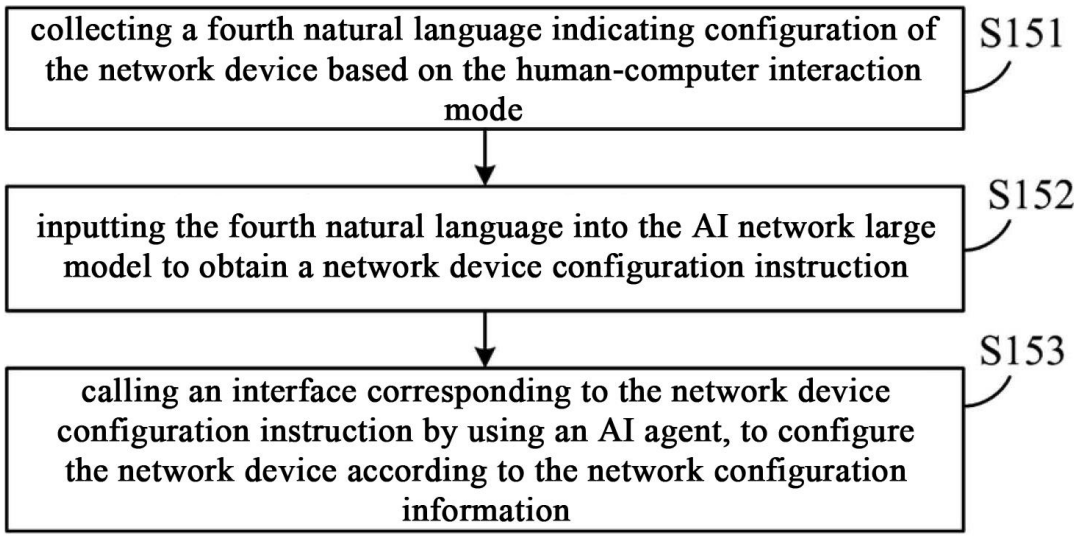


FIG. 15

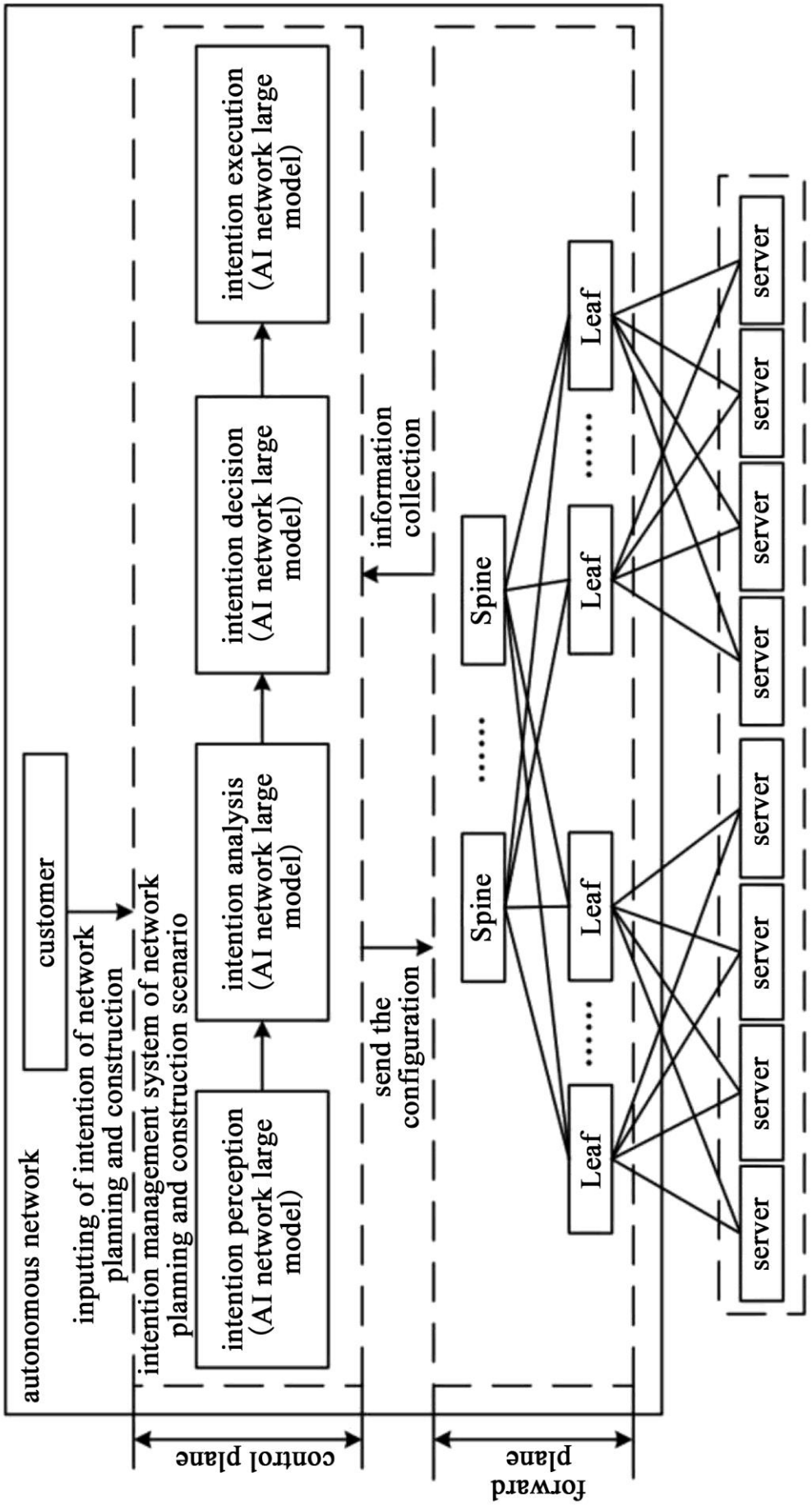

autonomous network
customer
inputting of intention of network planning and construction
intention management system of network planning and construction scenario
intention perception (AI network large model)
intention analysis (AI network large model)
intention decision (AI network large model)
intention execution (AI network large model)
send the configuration
information collection
Spine
Spine
Leaf
Leaf
Leaf
Leaf
Leaf
server
server
server
server
server
server
server
server
server
server
control plane
forward plane

FIG. 16

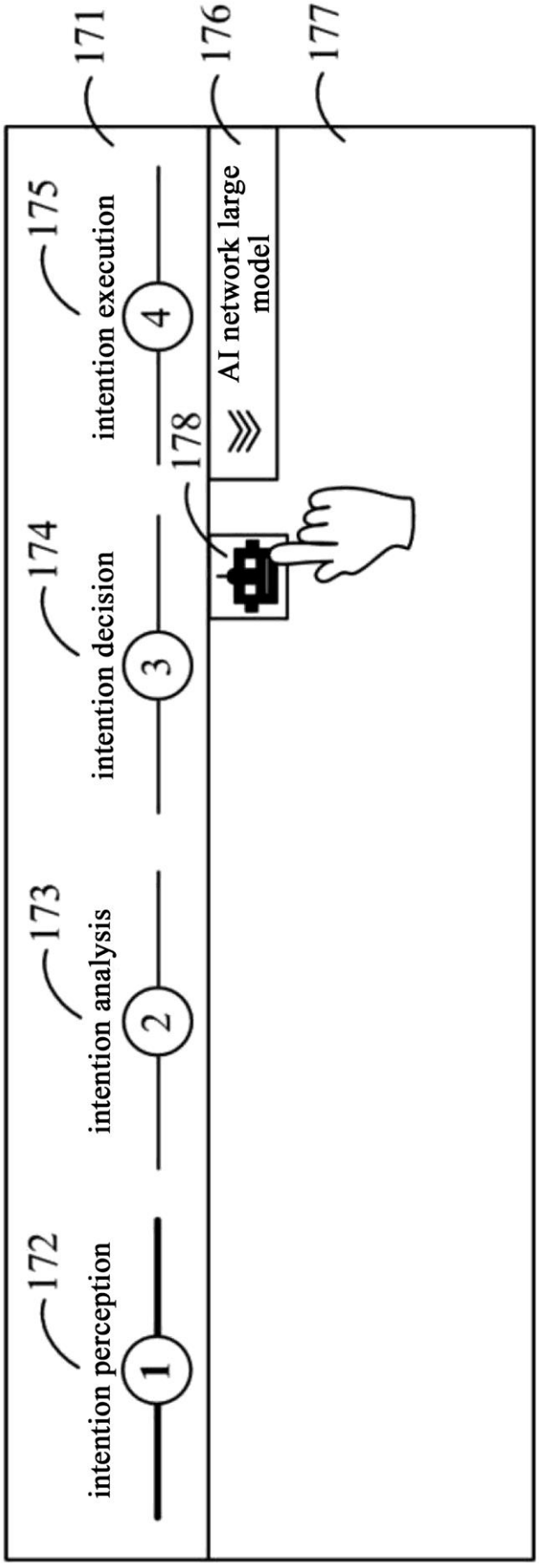

171
176
177
175
intention execution
4
AI network large model
178
174
intention decision
3
173
intention analysis
2
172
intention perception
1

FIG. 17a

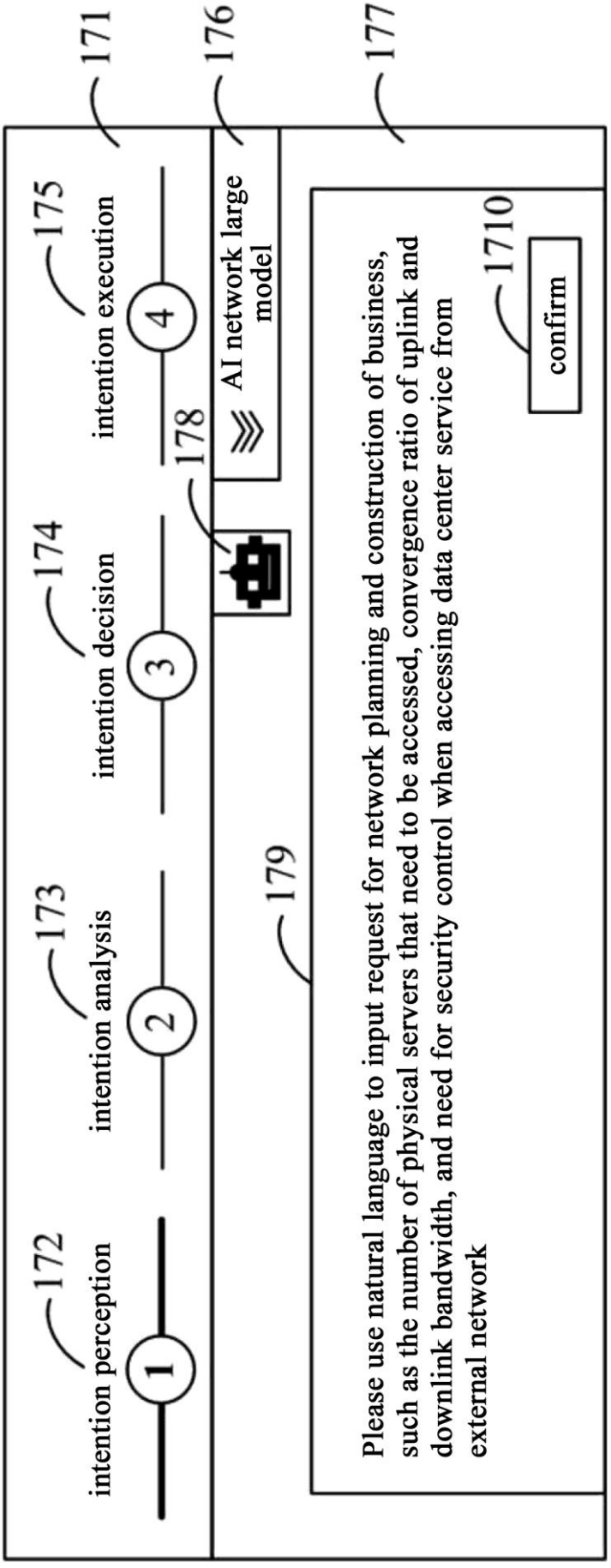

171
176
177
172
intention perception
173
intention analysis
174
intention decision
175
intention execution
1
2
3
4
178
AI network large model
179
Please use natural language to input request for network planning and construction of business, such as the number of physical servers that need to be accessed, convergence ratio of uplink and downlink bandwidth, and need for security control when accessing data center service from external network
1710
confirm

FIG. 17b

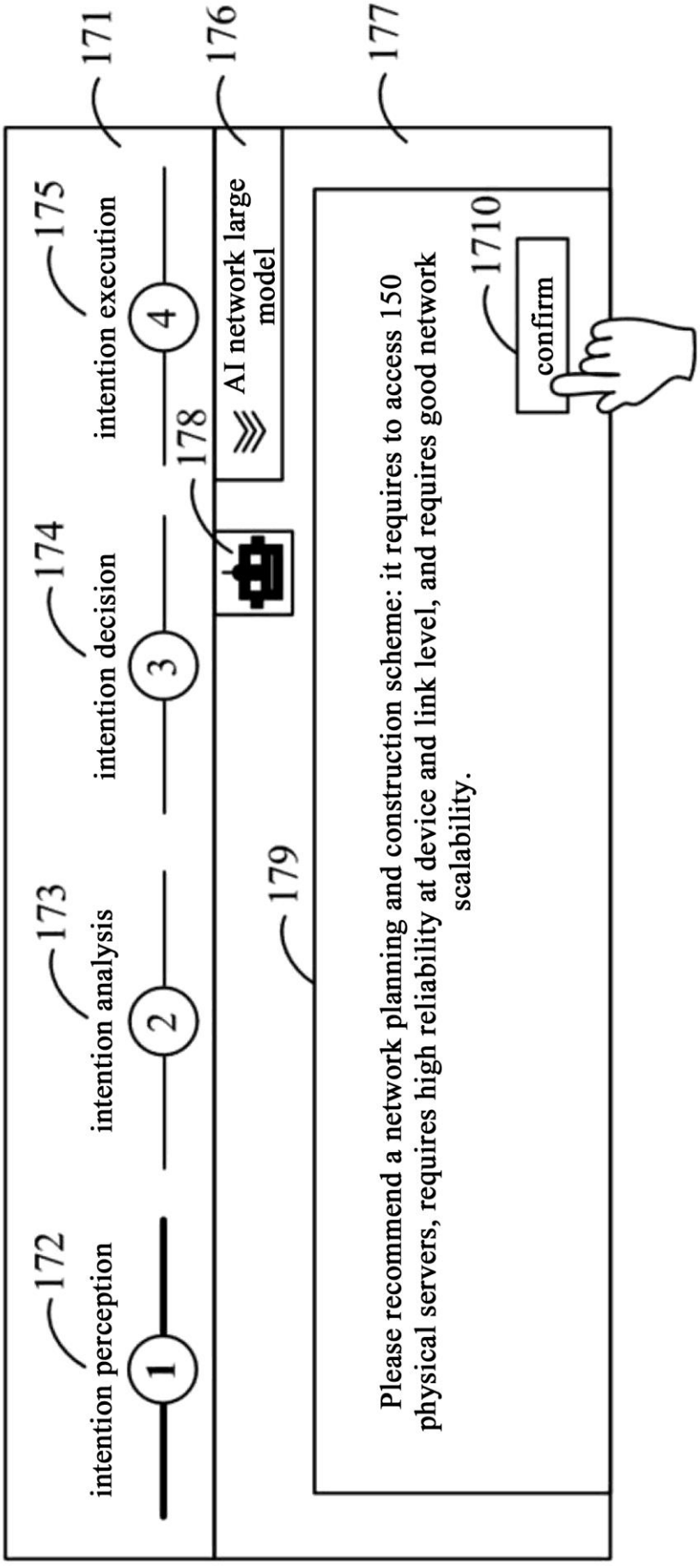

171
176
177
172
intention perception
1
173
intention analysis
2
174
intention decision
3
178
175
intention execution
4
AI network large model
179
Please recommend a network planning and construction scheme: it requires to access 150 physical servers, requires high reliability at device and link level, and requires good network scalability.
1710
confirm

FIG. 17c

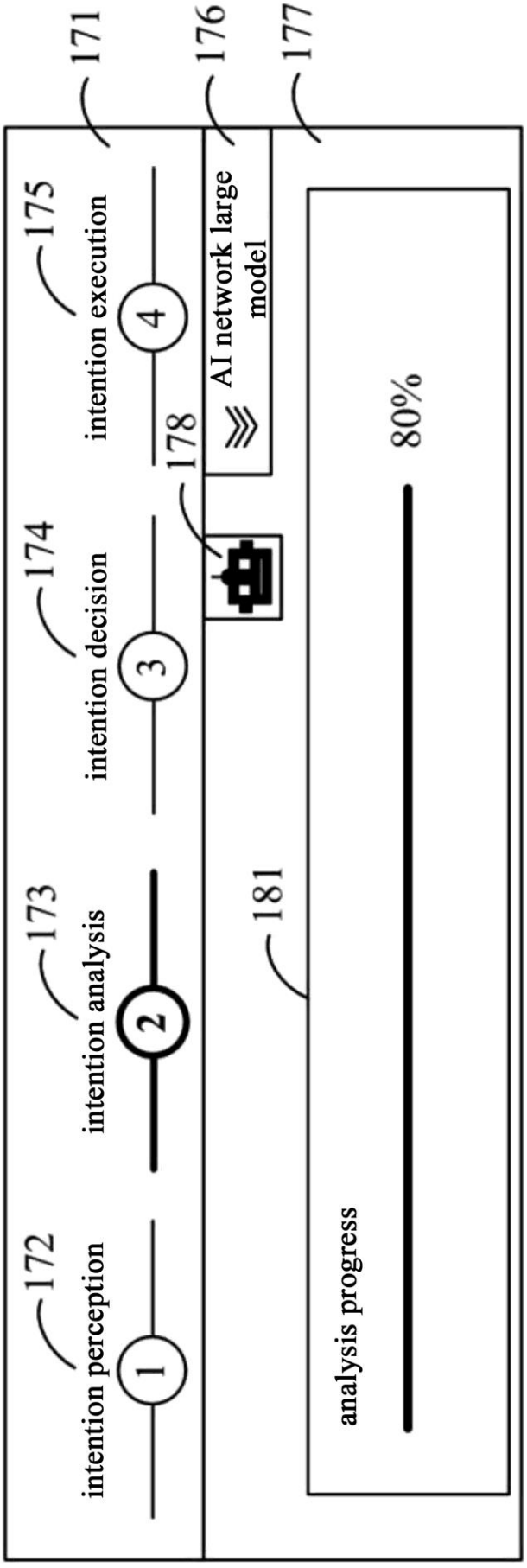

171
176
177
175
intention execution
AI network large model
4
178
174
intention decision
3
80%
173
intention analysis
2
181
172
intention perception
1
analysis progress

FIG. 18a

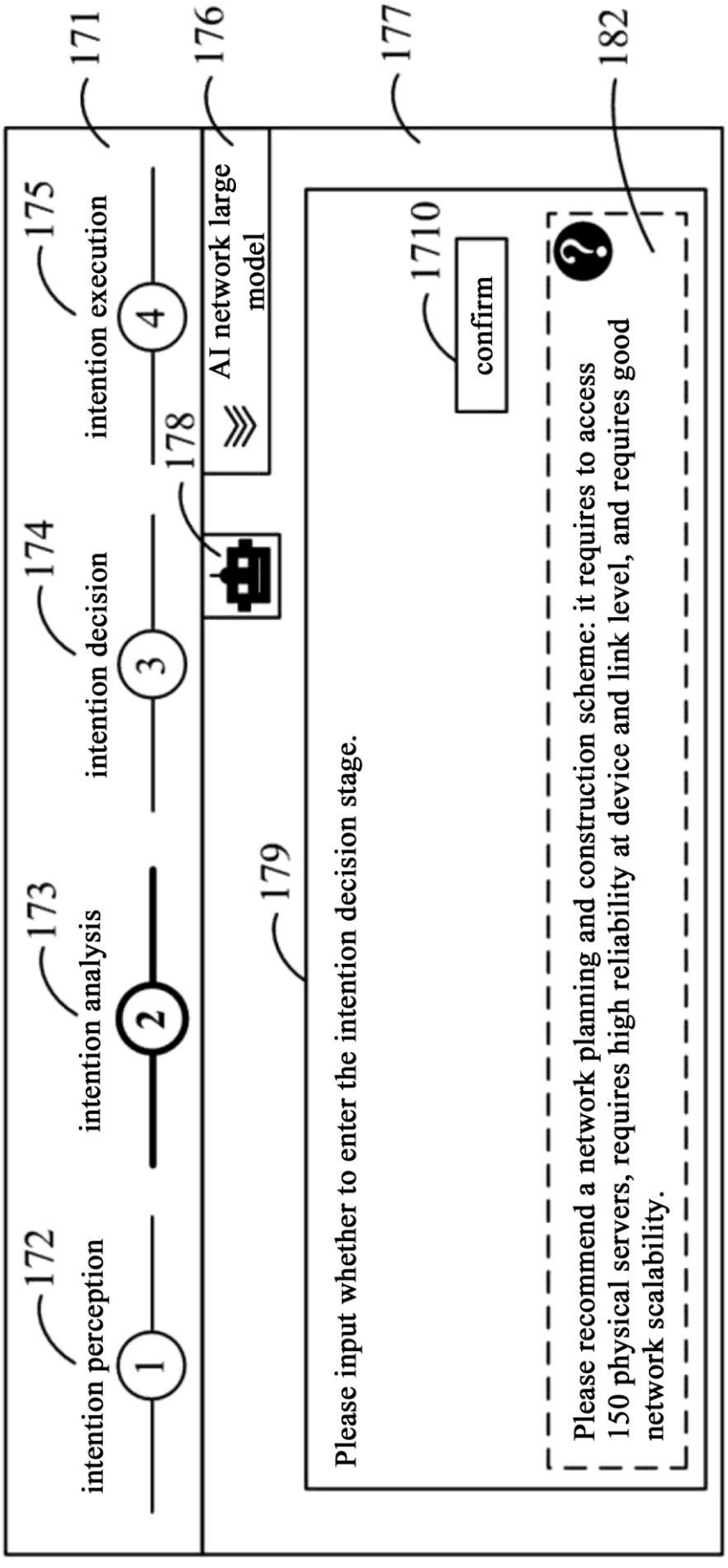

171
176
177
182
172
intention perception
173
intention analysis
174
intention decision
175
intention execution
AI network large model
178
179
Please input whether to enter the intention decision stage.
1710
confirm
Please recommend a network planning and construction scheme: it requires to access 150 physical servers, requires high reliability at device and link level, and requires good network scalability.

FIG. 18b

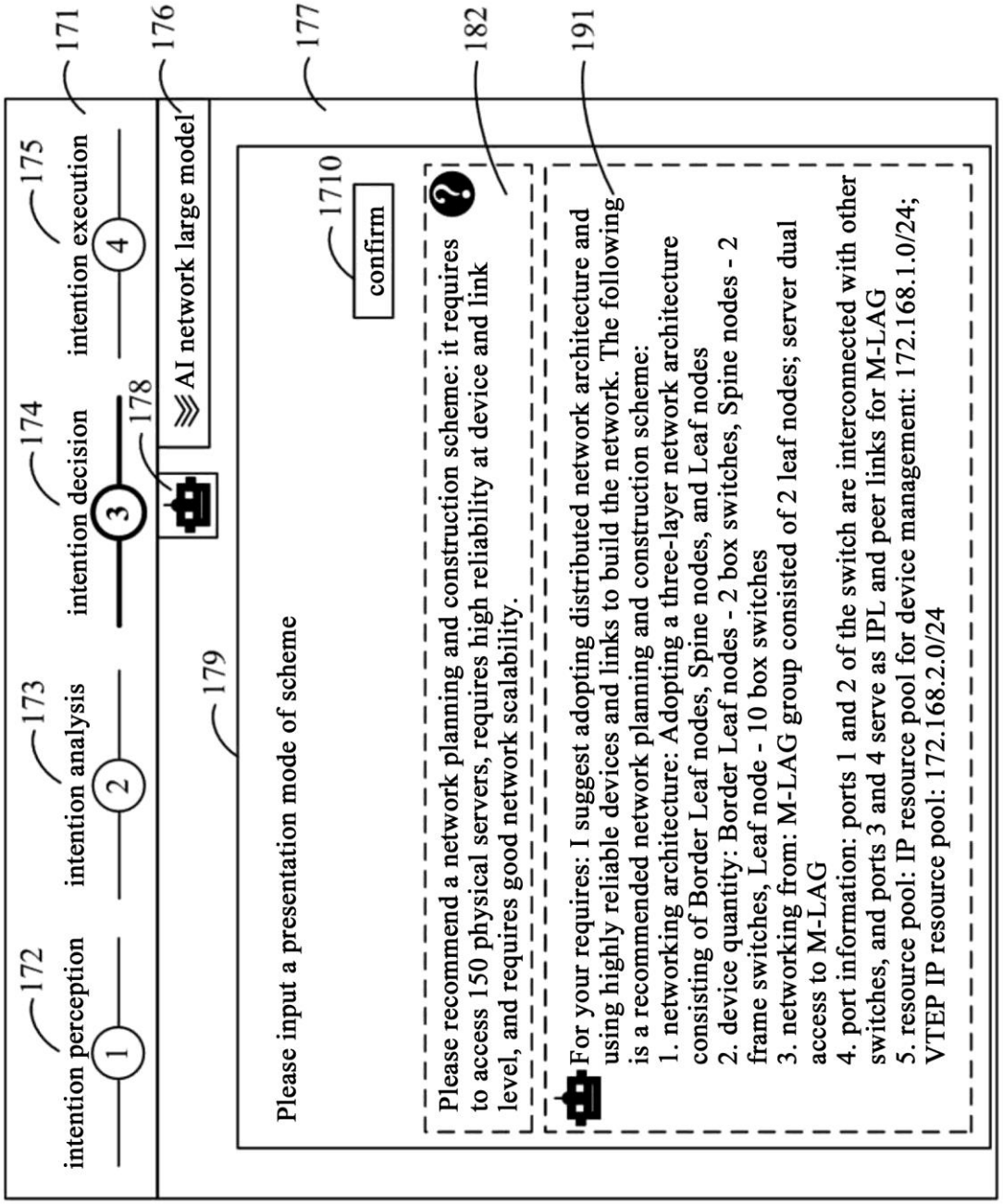

172
intention perception
1
173
intention analysis
2
174
intention decision
3
175
intention execution
4
171
176
AI network large model
178
177
179
Please input a presentation mode of scheme
1710
confirm
182
Please recommend a network planning and construction scheme: it requires to access 150 physical servers, requires high reliability at device and link level, and requires good network scalability.
191
For your requires: I suggest adopting distributed network architecture and using highly reliable devices and links to build the network. The following is a recommended network planning and construction scheme:
1. networking architecture: Adopting a three-layer network architecture consisting of Border Leaf nodes, Spine nodes, and Leaf nodes
2. device quantity: Border Leaf nodes - 2 box switches, Spine nodes - 2 frame switches, Leaf node - 10 box switches
3. networking from: M-LAG group consisted of 2 leaf nodes; server dual access to M-LAG
4. port information: ports 1 and 2 of the switch are interconnected with other switches, and ports 3 and 4 serve as IPL and peer links for M-LAG
5. resource pool: IP resource pool for device management: 172.168.1.0/24; VTEP IP resource pool: 172.168.2.0/24

FIG. 19a

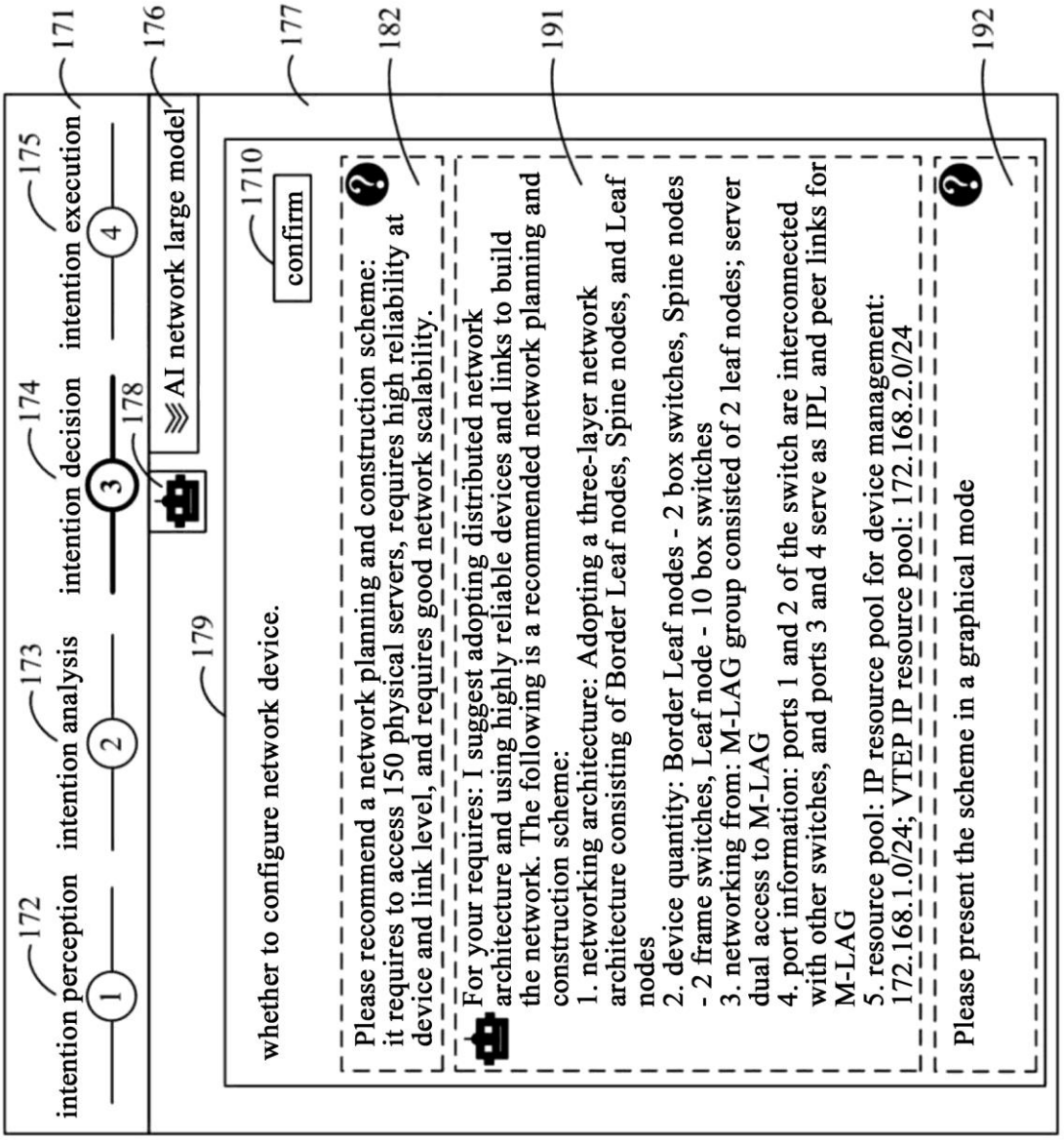

intention perception
intention analysis
intention decision
intention execution
AI network large model
whether to configure network device.
confirm
Please recommend a network planning and construction scheme: it requires to access 150 physical servers, requires high reliability at device and link level, and requires good network scalability.
For your requires: I suggest adopting distributed network architecture and using highly reliable devices and links to build the network. The following is a recommended network planning and construction scheme:
1. networking architecture: Adopting a three-layer network architecture consisting of Border Leaf nodes, Spine nodes, and Leaf nodes
2. device quantity: Border Leaf nodes - 2 box switches, Spine nodes - 2 frame switches, Leaf node - 10 box switches
3. networking from: M-LAG group consisted of 2 leaf nodes; server dual access to M-LAG
4. port information: ports 1 and 2 of the switch are interconnected with other switches, and ports 3 and 4 serve as IPL and peer links for M-LAG
5. resource pool: IP resource pool for device management: 172.168.1.0/24; VTEP IP resource pool: 172.168.2.0/24
Please present the scheme in a graphical mode
172
173
174
175
171
176
177
182
191
192
179
1710
178

FIG. 19b

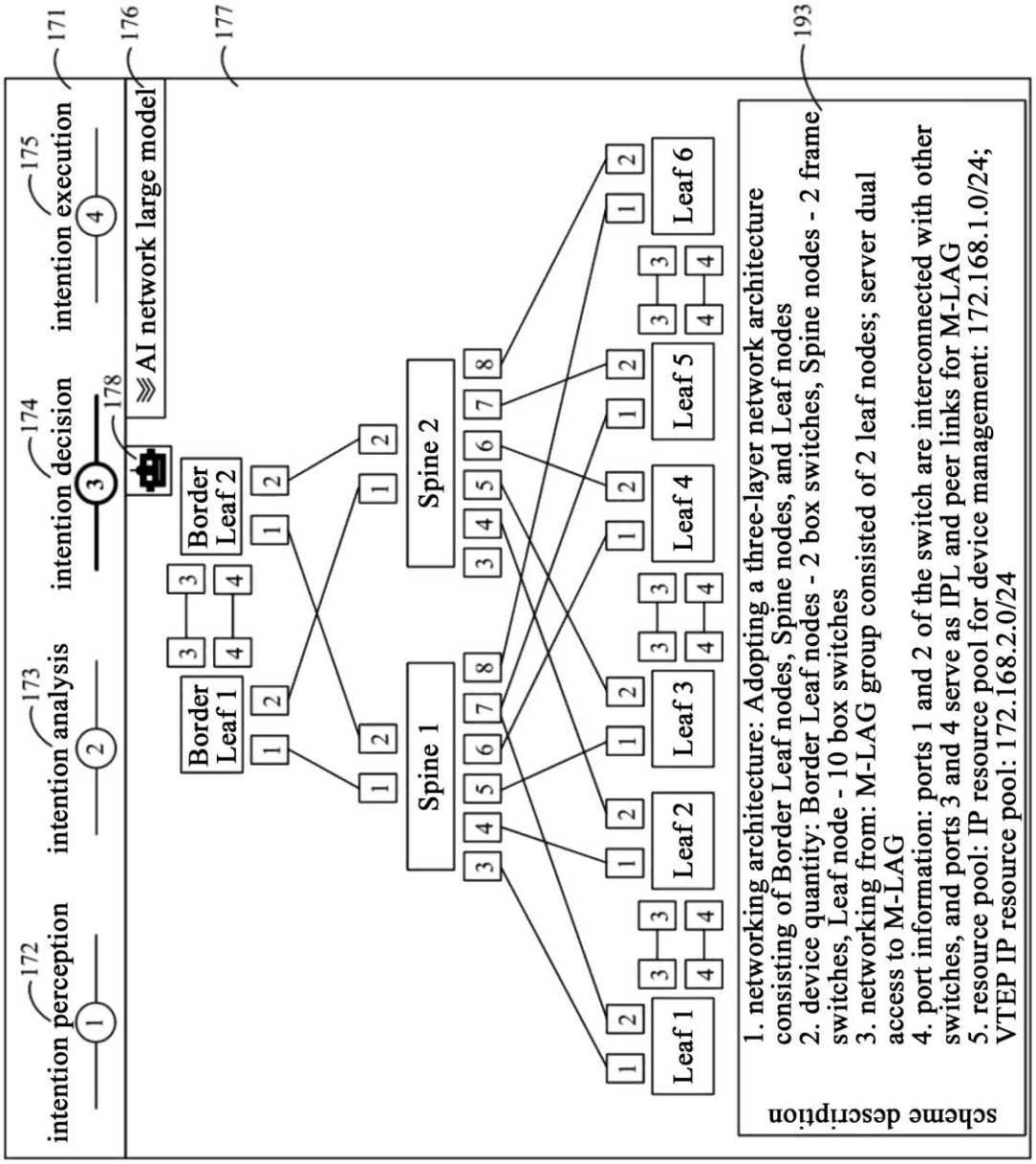

intention perception
intention analysis
intention decision
intention execution
AI network large model
Border Leaf 1
Border Leaf 2
Spine 1
Spine 2
Leaf 1
Leaf 2
Leaf 3
Leaf 4
Leaf 5
Leaf 6
scheme description
1. networking architecture: Adopting a three-layer network architecture consisting of Border Leaf nodes, Spine nodes, and Leaf nodes
2. device quantity: Border Leaf nodes - 2 box switches, Spine nodes - 2 frame switches, Leaf node - 10 box switches
3. networking from: M-LAG group consisted of 2 leaf nodes; server dual access to M-LAG
4. port information: ports 1 and 2 of the switch are interconnected with other switches, and ports 3 and 4 serve as IPL and peer links for M-LAG
5. resource pool: IP resource pool for device management: 172.168.1.0/24; VTEP IP resource pool: 172.168.2.0/24

FIG. 19c

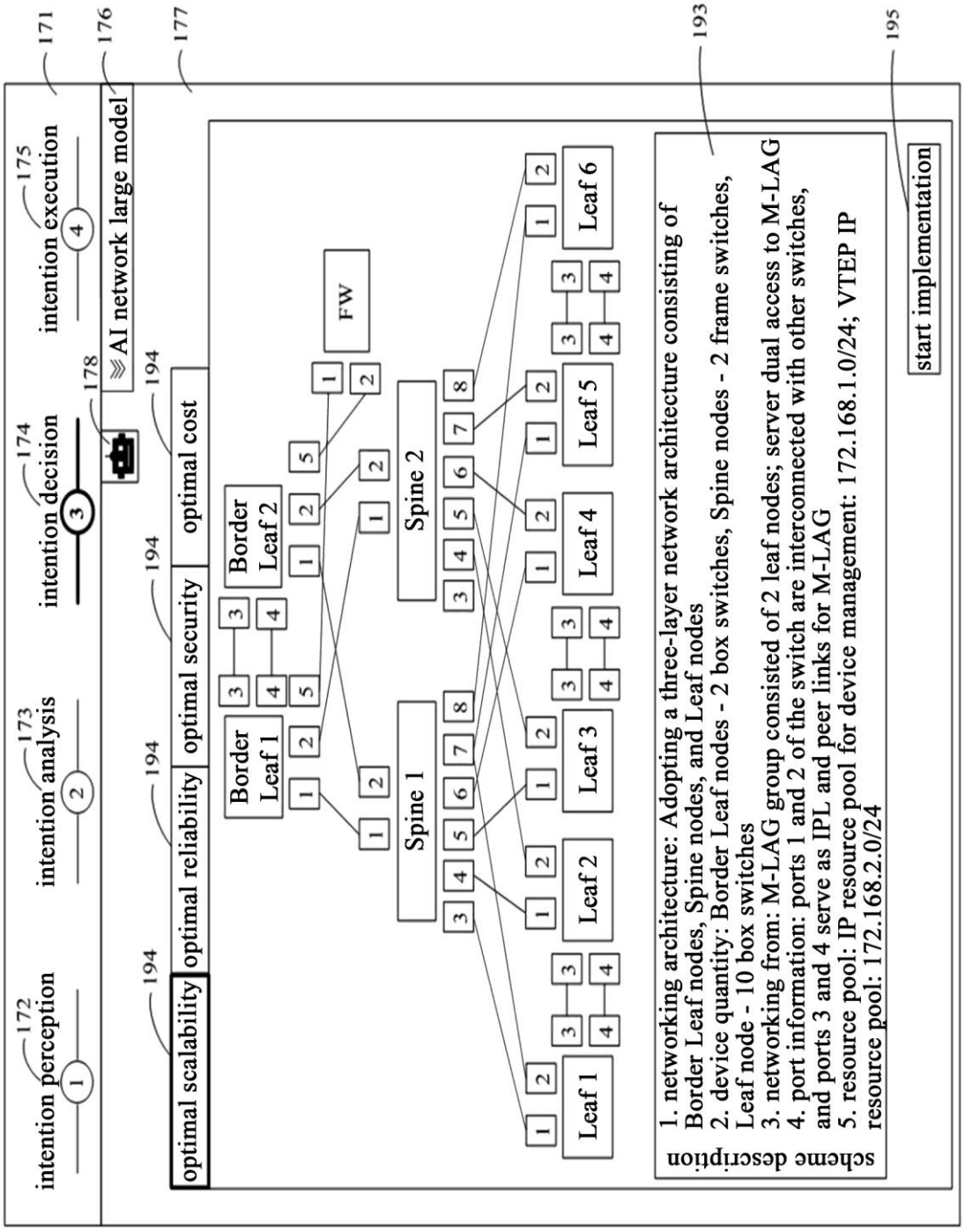

intention perception
intention analysis
intention decision
intention execution
AI network large model
optimal scalability
optimal reliability
optimal security
optimal cost
Border Leaf 1
Border Leaf 2
Spine 1
Spine 2
Leaf 1
Leaf 2
Leaf 3
Leaf 4
Leaf 5
Leaf 6
FW
scheme description
1. networking architecture: Adopting a three-layer network architecture consisting of Border Leaf nodes, Spine nodes, and Leaf nodes
2. device quantity: Border Leaf nodes - 2 box switches, Spine nodes - 2 frame switches, Leaf node - 10 box switches
3. networking from: M-LAG group consisted of 2 leaf nodes; server dual access to M-LAG
4. port information: ports 1 and 2 of the switch are interconnected with other switches, and ports 3 and 4 serve as IPL and peer links for M-LAG
5. resource pool: IP resource pool for device management: 172.168.1.0/24; VTEP IP resource pool: 172.168.2.0/24
start implementation

FIG. 19d

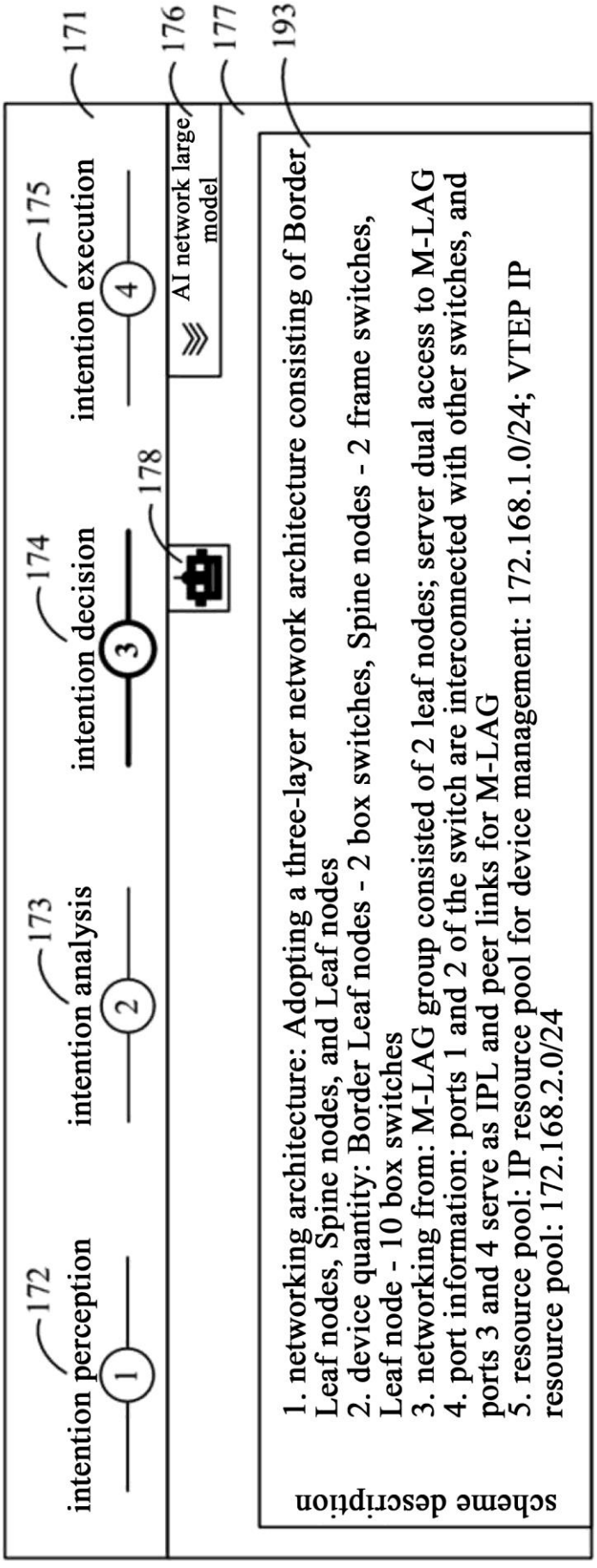

171
172
intention perception
1
173
intention analysis
2
174
intention decision
3
175
intention execution
4
176
AI network large model
177
178
193
scheme description
1. networking architecture: Adopting a three-layer network architecture consisting of Border Leaf nodes, Spine nodes, and Leaf nodes
2. device quantity: Border Leaf nodes - 2 box switches, Spine nodes - 2 frame switches, Leaf node - 10 box switches
3. networking from: M-LAG group consisted of 2 leaf nodes; server dual access to M-LAG
4. port information: ports 1 and 2 of the switch are interconnected with other switches, and ports 3 and 4 serve as IPL and peer links for M-LAG
5. resource pool: IP resource pool for device management: 172.168.1.0/24; VTEP IP resource pool: 172.168.2.0/24

FIG. 19e

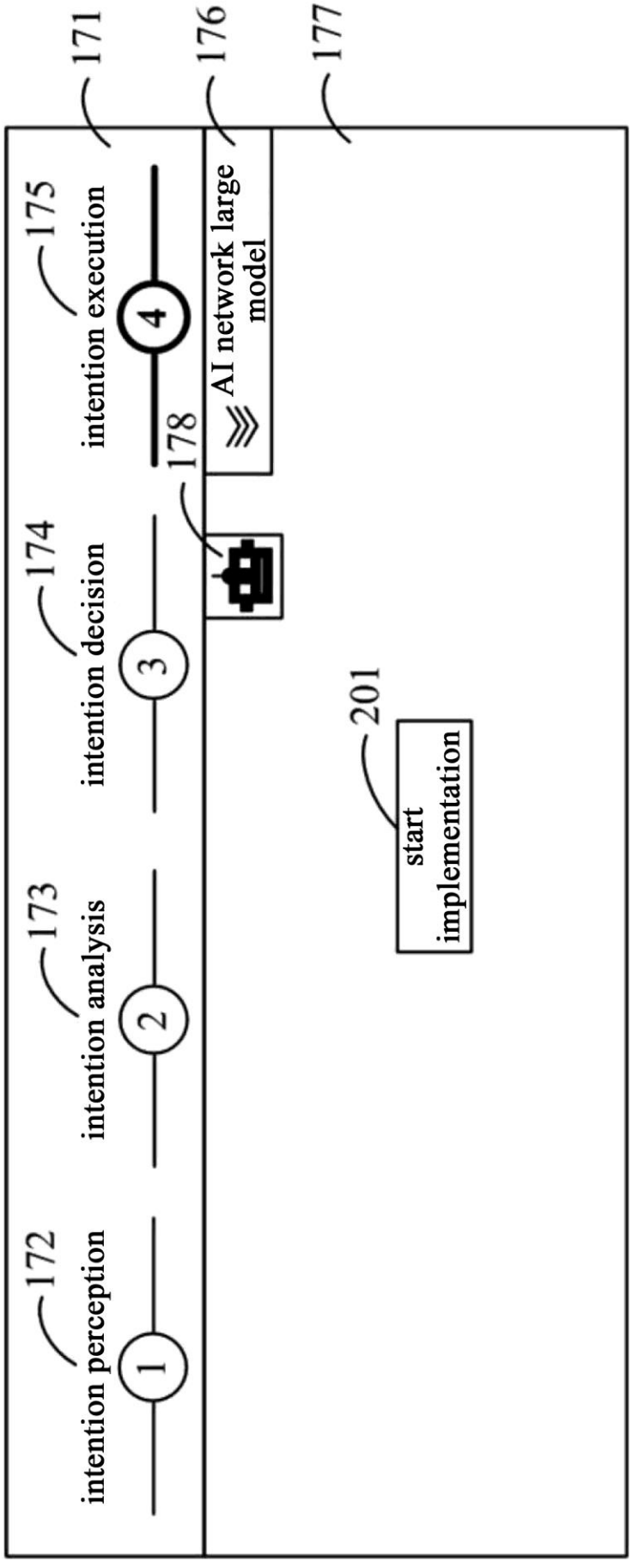

171
176
177
175
intention execution
4
AI network large model
178
174
intention decision
3
201
start implementation
173
intention analysis
2
172
intention perception
1

FIG. 20a

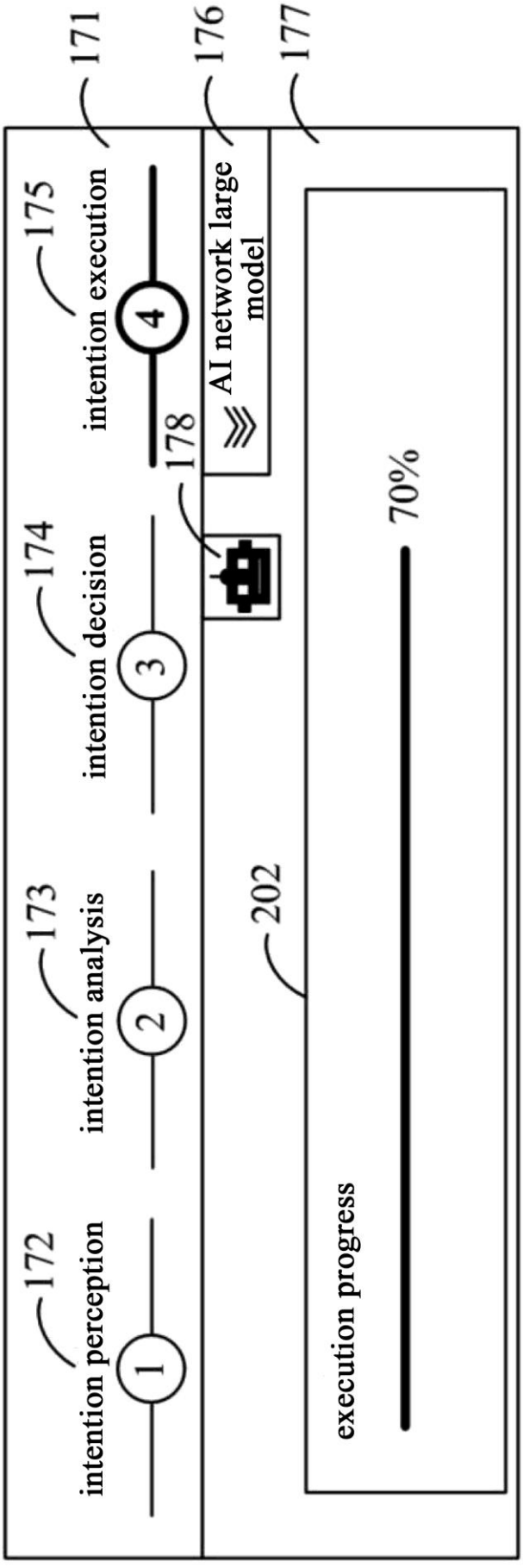

171
176
177
175
intention execution
AI network large model
178
174
intention decision
70%
173
intention analysis
202
172
intention perception
execution progress
1
2
3
4

FIG. 20b

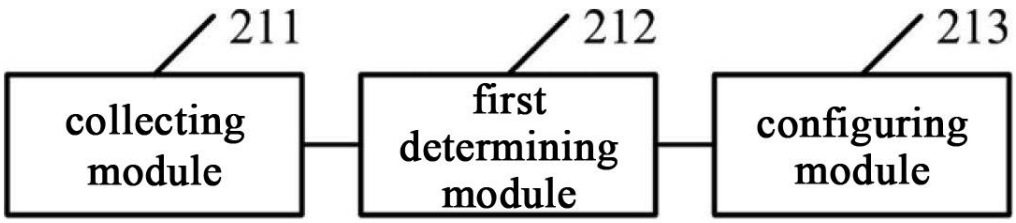

211
212
213
collecting module
first determining module
configuring module

FIG. 21

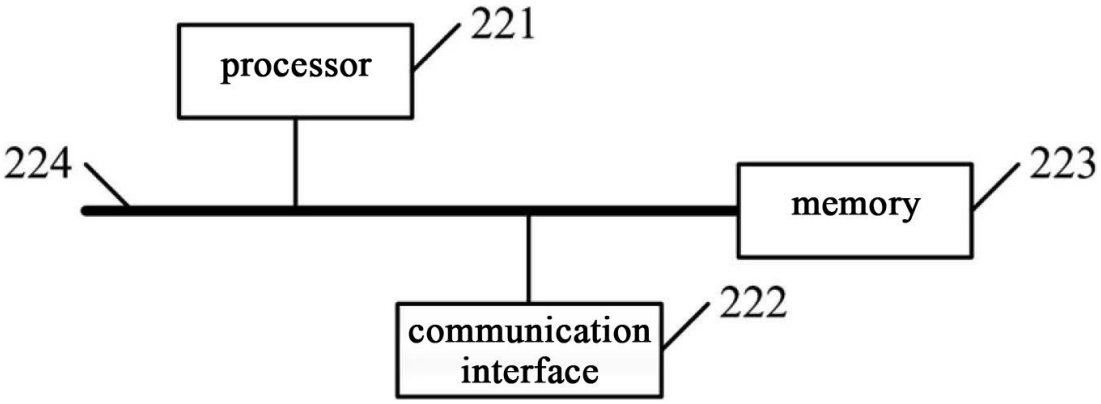

221
processor
224
223
memory
222
communication interface

FIG. 22