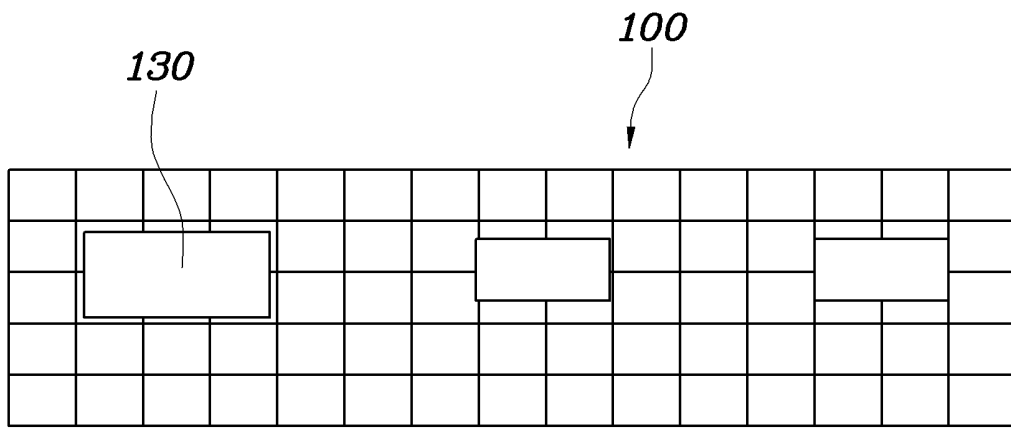
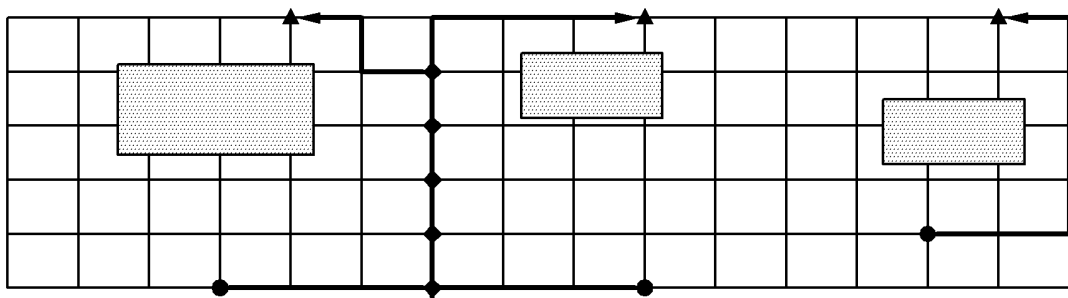


[FIG.1]

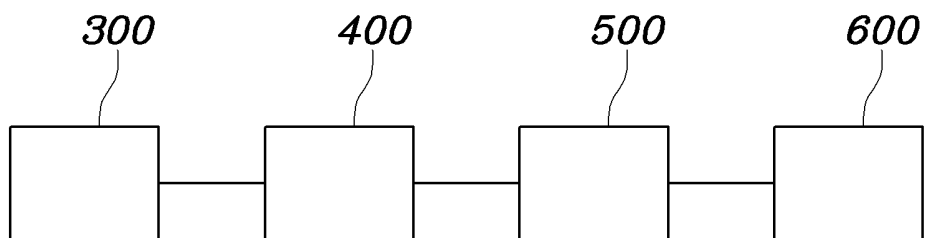


[FIG.2]

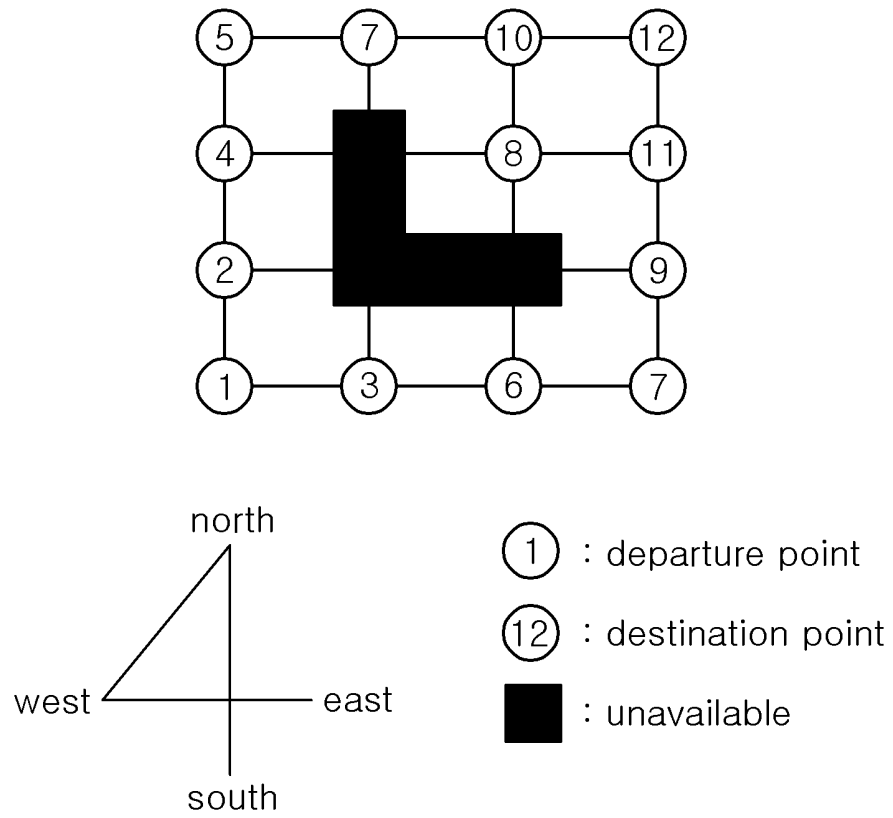
- : departure node
- ▲ : destination node
- ◆ : overlapping node
- : existing path
- : node available for logistics robot
- : node unavailable for logistics robot



[FIG. 3]



[FIG. 4]

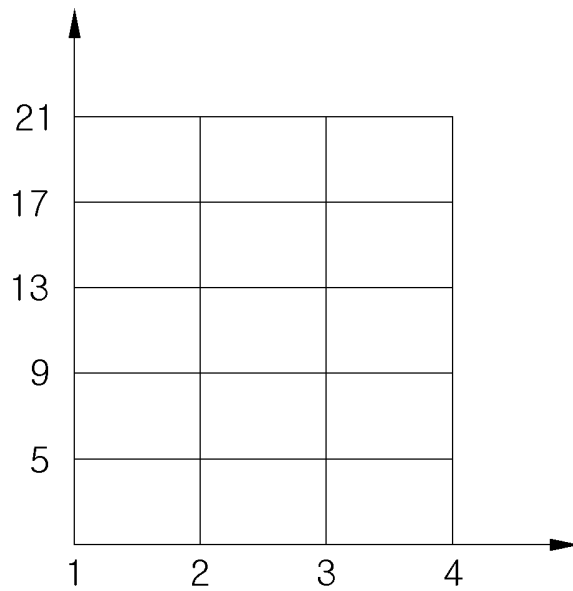


[FIG.5]

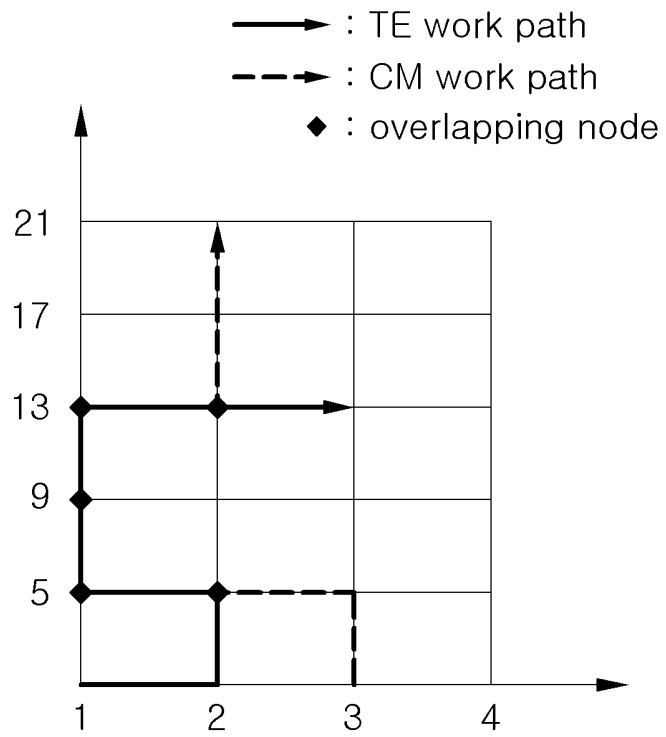
process sequence	vehicle number	work	start time	departure node	destination node
1	first vehicle	TE work	xx : xx	1	15
2	first vehicle	CM work	xx : xx	3	22
3	first vehicle	FE work	yy : yy	4	24
4	second vehicle	TE work	yy : yy	1	15
5	second vehicle	CM work	zz : zz	3	22
6	second vehicle	FE work	zz : zz	4	24
...	...	...	...	...	...

[FIG. 6]

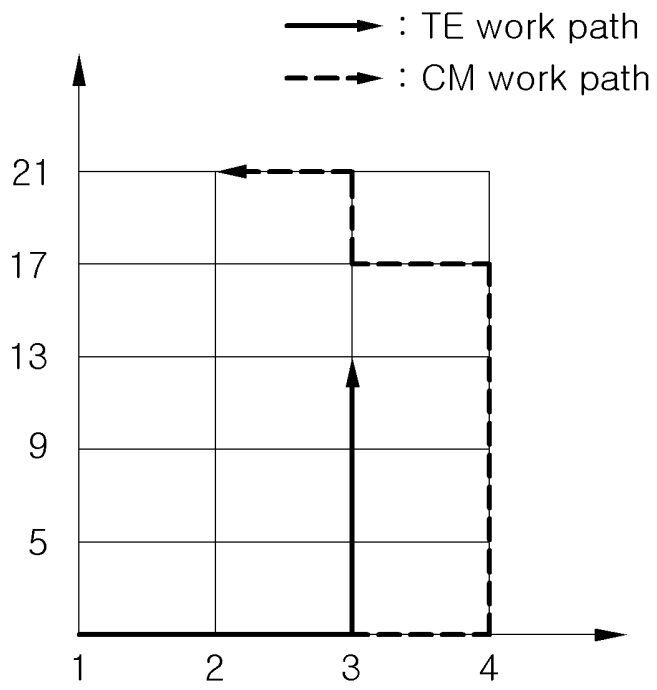
work	start time	departure node	destination node
TE work	09 : 00	1	15
CM work	09 : 00	3	22
...	...	...	...



[FIG. 7]



[FIG. 8]



[FIG.9]

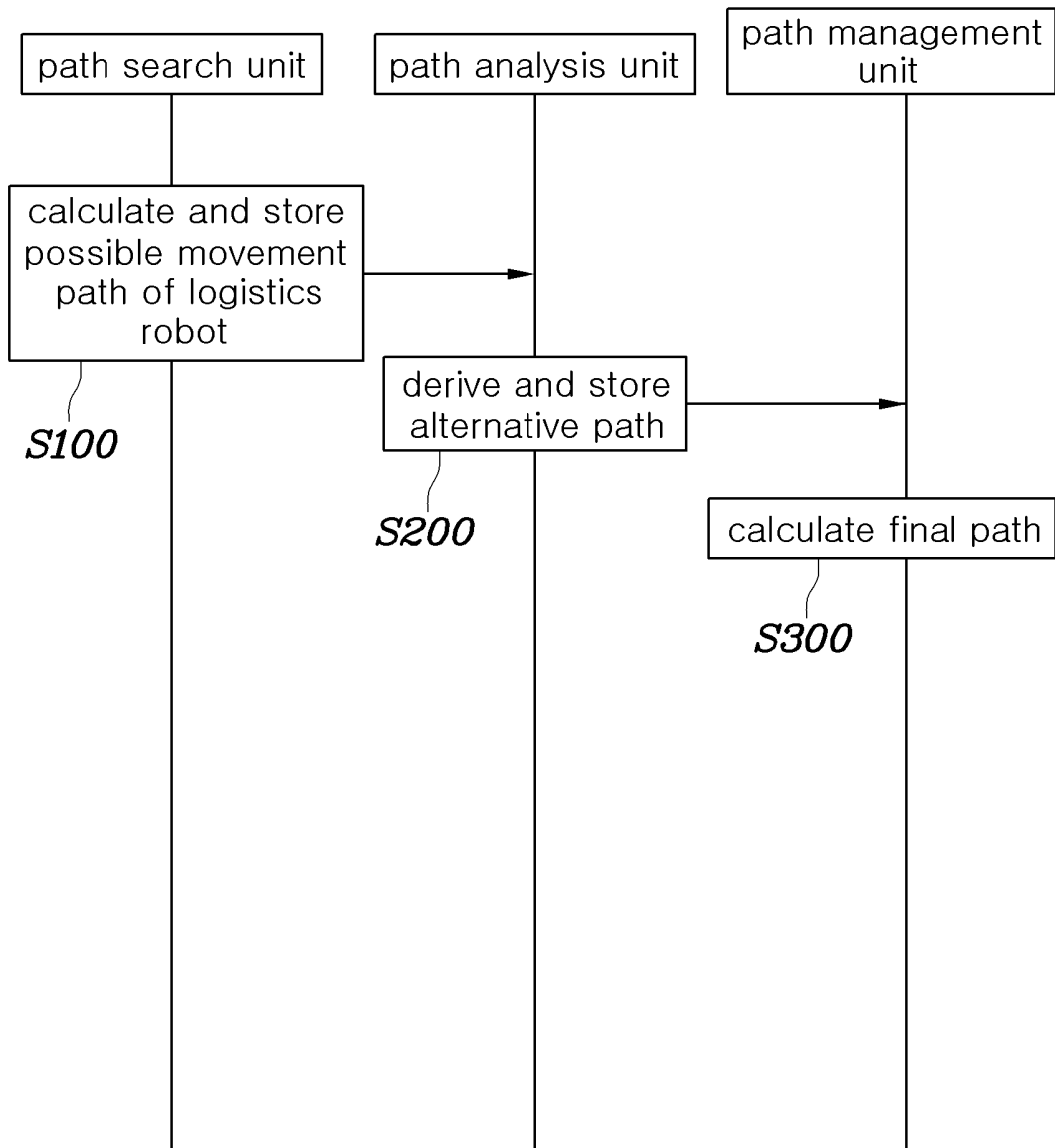
process sequence	work	path list												
		path number	1	2	3	4	5	6	7	8	9	10	11	...
1	TE	1	1	2	6	5	9	13	14	15				
1	...	...												
1	TE	10	1	2	3	7	11	15						
2	CM	1	3	7	6	5	9	13	14	13	22			
2	...	...												
2	CM	20	3	4	8	12	15	20	19	23	22			

process sequence group	path combination	degree of overlapping	movement distance
1-2	1-1(FIG. 7)	5	17
1-2	...	...	
1-2	1-20	0	17
1-2	10-1	0	15
1-2	...	...	
1-2	10-20(FIG. 8)	0	13

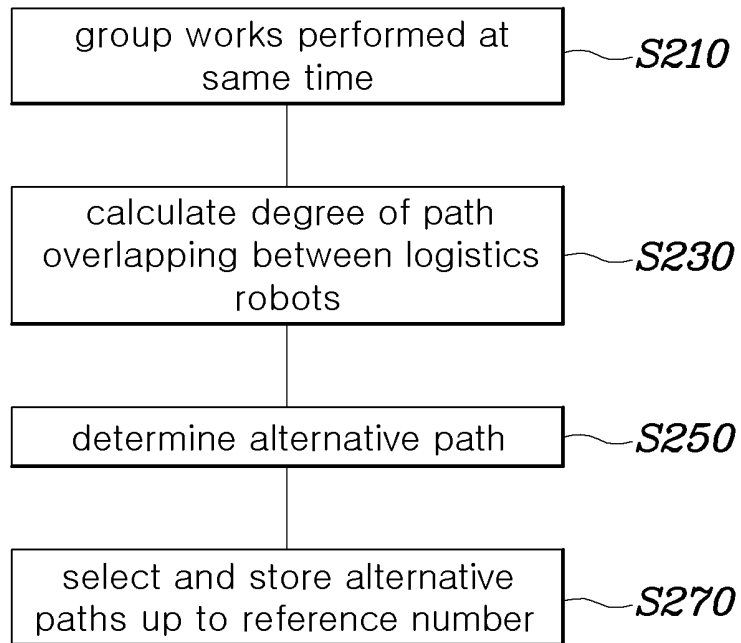
[FIG.10]

process sequence	vehicle number	work	start time	reference path	alternative path 1	...	alternative path 20
1	first vehicle	TE work	09:00		1	...	2
2	first vehicle	CM work	09:00		10	...	10
3	first vehicle	FE work	09:30		2	...	4
4	second vehicle	TE work	09:30		8	...	9
5	second vehicle	CM work	10:00		3	...	2
6	second vehicle	FE work	10:00		10	...	12
total execution time				3h49m	3h20m	...	3h30m

[FIG.11]



[FIG.12]



[FIG.13]

