

use of resources such as dock capacities, resulting in reduction of congestion around the venue, while the participating retailers will have their service requirements met. The government will expect reduced carbon footprints as well as traffic congestion around the malls and warehouses to be further improved.

### **SUMMARY OF THE INVENTION**

[012] According to one aspect of the present invention, it provides a system for generating one or more coordinated logistics schedules for a plurality of users, including:

at least one generic information management module, configured to store and manage generic information that is non-confidential to any user of the system;

at least one private optimizing module, configured to work privately for each user of the system, so that after a user inputs information to the at least one private optimizing module the information input by the user is kept confidential to the user itself;

at least one generic optimizing module, configured to work on a generic basis, so that it coordinates schedules among multiple users based on the non-confidential generic information stored at the at least one generic information management module;

wherein the one or more coordinated logistics schedules are generated through the below steps:

- (1) the at least one private optimizing module generates one or more initial schedules for each user based on information input by such user, and transmits the one or more initial schedules to the at least one generic optimizing module;
- (2) after receiving the one or more initial schedules, the at least one generic optimizing module generates one or more uncoordinated joint schedules based on the received one or more initial schedules, taking into consideration the generic information from the at least one generic information management module, and transmits the one or more uncoordinated joint schedules to the at least one private optimizing schedule for the respective users;
- (3) after receiving the one or more uncoordinated joint schedules, the at least one private optimizing module generates one or more coordinated schedules for each user based on the one or more uncoordinated joint schedules, taking into consideration each user's input, and forwards the one or more coordinated schedules to the at least one generic optimizing module;
- (4) after receiving one or more coordinated schedules, the at least one generic optimizing module generates one or more optimized schedules based on the one or more

coordinated schedules, taking into consideration the generic information from the at least one generic information management module;

- (5) repeat steps (3) and (4) by transmitting the one or more optimized schedules from the at least one generic optimizing module to the at least one private optimizing module for it to process as uncoordinated joint schedules, until terminating conditions are met and provide the current optimized schedules to the respective users as the one or more coordinated logistics schedules.

[013] According to another aspect of the present invention, it provides a method for generating one or more coordinated logistics schedules for a plurality of users, using the system, wherein the one or more coordinated logistics schedules are generated through the below steps:

- (1) using at least one private optimizing module to generate one or more initial schedules for each user based on information input by such user, and transmit the one or more initial schedules to at least one generic optimizing module;
- (2) after receiving the one or more initial schedules, using the at least one generic optimizing module to generate one or more uncoordinated joint schedules based on the received one or more initial schedules, taking into consideration generic information from at least one generic information management module, and transmit the one or more uncoordinated joint schedules to the at least one private optimizing schedule for the respective users;
- (3) after receiving the one or more uncoordinated joint schedules, using the at least one private optimizing module to generate one or more coordinated schedules for each user based on the one or more uncoordinated joint schedules, taking into consideration each user's input, and transmit the one or more coordinated schedules to the at least one generic optimizing module;
- (4) after receiving one or more coordinated schedules, using the at least one generic optimizing module to generate one or more optimized schedules based on the one or more coordinated schedules, taking into consideration the generic information from the at least one generic information management module;
- (5) repeating steps (3) and (4) by transmitting the one or more optimized schedules from the at least one generic optimizing module to the at least one private optimizing module for it to process as uncoordinated joint schedules until terminating conditions are met and providing the current optimized schedules to the respective users as the one or more coordinated logistics schedules.

## CLAIMS

1. A system for generating one or more coordinated logistics schedules for a plurality of users, including:

at least one generic information management module, configured to store and manage generic information that is non-confidential to any user of the system;

at least one private optimizing module, configured to work privately for each user of the system, so that after a user inputs information to the at least one private optimizing module the information input by the user is kept confidential to the user itself;

at least one generic optimizing module, configured to work on a generic basis, so that it coordinates schedules among multiple users based on the non-confidential generic information stored at the at least one generic information management module;

wherein the one or more coordinated logistics schedules are generated through the below steps:

- (1) the at least one private optimizing module generates one or more initial schedules for each user based on information input by such user, and transmits the one or more initial schedules to the at least one generic optimizing module;
- (2) after receiving the one or more initial schedules, the at least one generic optimizing module generates one or more uncoordinated joint schedules based on the received one or more initial schedules, taking into consideration the non-confidential generic information from the at least one generic information management module, and transmits the one or more uncoordinated joint schedules to the at least one private optimizing schedule for the respective users;
- (3) after receiving the one or more uncoordinated joint schedules, the at least one private optimizing module generates one or more coordinated schedules for each user based on the one or more uncoordinated joint schedules, taking into consideration each user's input, and forwards the one or more coordinated schedules to the at least one generic optimizing module;
- (4) after receiving one or more coordinated schedules, the at least one generic optimizing module generates one or more optimized schedules based on the one or more coordinated schedules, taking into consideration the non-confidential generic information from the at least one generic information management module;
- (5) repeat steps (3) and (4) by transmitting the one or more optimized schedules from the at least one generic optimizing module to the at least one private optimizing module for it to process as uncoordinated joint schedules, until terminating conditions are met and provide the current optimized schedules to the respective users as the one or more coordinated logistics schedules.

2. The system according to claim 1, wherein the system further includes at least one data synchronizing module, configured to retrieve external data manually or automatically and transmit such external data to the at least one generic information management module.

3. The system according to claim 2, wherein the external data includes real-time traffic data and/or real-time weather data.
4. The system according to claim 2 or 3, wherein if the external data affects the one or more coordinated logistics schedules, then step (1) is activated manually or automatically.
5. The system according to any of the preceding claims, wherein the one or more users include logistics service providers, retailers, and mall and/or warehouse operators.
6. The system according to claim 5, wherein the one or more coordinated logistics schedules generated for the logistics service providers, retailers, mall and/or warehouse operators include one or more vehicle routing schedules, one or more parcel tracking schedules and one or more dock appointment schedules.
7. The system according to claim 5 or 6, wherein when optimizing schedules for a logistics service provider, the at least one private optimizing module takes into consideration human factors of executing the schedules.
8. The system according to any of the preceding claims, wherein the terminating conditions include:
  - no improvement can be obtained to resulting schedules;
  - a given time limit exceeds; and/or
  - a maximum number of iterations has been reached.
9. The system according to any of the preceding claims, wherein the information input by a user to the at least one private optimizing module includes capacity of the user's resources, the user's intended rules, information of delivery requests, and/or the user's initial proposed schedule.
10. The system according to any of the preceding claims, wherein during the step (1) and/or the step (3), a payoff is calculated for each schedule, wherein the payoff is to be minimized for the purpose of optimizing schedules.
11. The system according to claim 10, the payoff is calculated by computing a weighted sum of the total travel time, the total wait time, and the total time violation, or by computing a weighted sum of total travel distance and number of vehicles.

12. A method for generating one or more coordinated logistics schedules for a plurality of users, using the system according to any of claims 1-11, wherein the one or more coordinated logistics schedules are generated through the below steps:

- (1) using at least one private optimizing module to generate one or more initial schedules for each user based on information input by such user, and transmit the one or more initial schedules to at least one generic optimizing module;
- (2) after receiving the one or more initial schedules, using the at least one generic optimizing module to generate one or more uncoordinated joint schedules based on the received one or more initial schedules, taking into consideration non-confidential generic information from at least one generic information management module, and transmit the one or more uncoordinated joint schedules to the at least one private optimizing schedule for the respective users;
- (3) after receiving the one or more uncoordinated joint schedules, using the at least one private optimizing module to generate one or more coordinated schedules for each user based on the one or more uncoordinated joint schedules, taking into consideration each user's input, and transmit the one or more coordinated schedules to the at least one generic optimizing module;
- (4) after receiving one or more coordinated schedules, using the at least one generic optimizing module to generate one or more optimized schedules based on the one or more coordinated schedules, taking into consideration the non-confidential generic information from the at least one generic information management module;
- (5) repeating steps (3) and (4) by transmitting the one or more optimized schedules from the at least one generic optimizing module to the at least one private optimizing module for it to process as uncoordinated joint schedules, until terminating conditions are met and providing the current optimized schedules to the respective users as the one or more coordinated logistics schedules.

13. The method according to claim 12, wherein the method further includes using at least one data synchronizing module to retrieve external data manually or automatically.

14. The method according to claim 13, wherein the external data includes real-time traffic data and/or real-time weather data.

15. The method according to claim 13 or 14, wherein if the external data affects the one or more coordinated logistics schedules, then step (1) is activated manually or automatically.

16. The method according to any of claims 12-15, wherein the one or more users include logistics service providers, retailers, and mall and/or warehouse operators.

17. The method according to any of claims 12-16, wherein the one or more coordinated logistics schedules generated for the logistics service providers, retailers, mall and/or warehouse operators

include one or more vehicle routing schedules, parcel tracking schedules and dock appointment schedules.

18. The method according to claim 16 or 17, wherein when optimizing schedules for a logistics service provider, the at least one private optimizing module takes into consideration human factors of executing the schedules.

19. The method according to any of claims 12-18, wherein the terminating conditions include:

- no improvement can be obtained to resulting schedules;
- a given time limit exceeds; and/or
- a maximum number of iterations has been reached.

20. The method according to any of claims 12-19, wherein the information input by a user to the at least one private optimizing module includes capacity of the user's resources, the user's intended rules, information of delivery requests, and/or the user's initial proposed schedule.

21. The method according to any of claims 12-20, wherein during the step (1) and/or the step (3), a payoff is calculated for each schedule, wherein the payoff is to be minimized for the purpose of optimizing schedules.

22. The system according to claim 21, the payoff is calculated by computing a weighted sum of the total travel time, the total wait time, and the total time violation, or by computing a weighted sum of total travel distance and number of vehicles.

23. A computer program comprising instructions which, when the program is executed by a computer, cause the computer to carry out the method according to any one of claims 12-22.

24. A computer-readable medium comprising instructions which, when executed by a computer, cause the computer to carry out the method according to any one of claims 12-22.