Claims

1. A communications server apparatus for managing a request for transport-related services, comprising a processor and a memory, the communications server apparatus being configured, under control of the processor to execute instructions stored in the memory to:

in response to receiving user request data comprising a data field indicative of an origin location and a data field indicative of a destination location,

generate a data record comprising a plurality of transit point data fields having data for a corresponding plurality of transit points from the origin location to the destination location, the plurality of transit point data fields comprising a variable transit point data field having data corresponding to a variable transit point that is determined based on data associated with at least one transportation network-related parameter;

generate, in the data record, a plurality of trip section data fields for a corresponding plurality of trip sections defining navigation directions from the origin location to the destination location; and

wherein, for each trip section data field, the communications server apparatus is further configured to associate the trip section data field with a respective transit point data field of the plurality of transit point data fields, and further configured to, based on the data of the associated transit point data field, determine a respective transportation mode for the corresponding trip section and generate transit data in respect of the respective transportation mode.

2. The communications server apparatus as claimed in claim 1,

wherein the plurality of trip section data fields and the plurality of transit point data fields are generated to define a plurality of journey options from the origin location to the destination location,

wherein each journey option of the plurality of journey options is defined by at least two trip section data fields of the plurality of trip section data fields, and

wherein the at least two trip section data fields are for corresponding trip sections defining the navigation directions for a single journey starting from the origin location and ending at the destination location.

3. The communications server apparatus as claimed in claim 2, wherein the plurality of journey options comprise at least one multi-modal journey option.

4. The communications server apparatus as claimed in any one of claims 1 to 3, wherein the plurality of transit point data fields comprise a plurality of variable transit point data fields, each variable transit point data field of the plurality of variable transit point data fields having data corresponding to a respective variable transit point that is determined based on the data associated with the at least one transportation network-related parameter.

5. The communications server apparatus as claimed in claim 4, when dependent on claim 2 or 3, wherein the each variable transit point data field is associated with a trip section data field of the at least two trip section data fields of a respective journey option of the plurality of journey options.

6. The communications server apparatus as claimed in claim 2 or 3, wherein the communications server apparatus is further configured to identify, from the plurality of journey options, and based on the transit data corresponding to the at least two trip section data fields defining the each journey option, one or more pareto-optimal journey options.

7. The communications server apparatus as claimed in claim 6, wherein the communications server apparatus is further configured to, based on a defined epsilon

resolution value, control the number of pareto-optimal journey options to be identified.

8. The communications server apparatus as claimed in any one of claims 1 to 7, wherein a road network and, separately, a transit network, are stored in the memory, and wherein the plurality of transit point data fields and the plurality of trip section data fields are generated using data corresponding to the road network and the transit network.

9. The communications server apparatus as claimed in claim 8, wherein the communications server apparatus is further configured to provide data update to at least one of the road network or the transit network in real time.

10. The communications server apparatus as claimed in any one of claims 1 to 9, wherein the respective transportation mode for the trip section data field associated with the variable transit point data field comprises a ride-sharing transportation mode.

11. The communications server apparatus as claimed in any one of claims 1 to 9, wherein the respective transportation mode for the trip section data field associated with the variable transit point data field comprises a ride-hailing transportation mode.

12. The communications server apparatus as claimed in claim 11, wherein the data associated with the at least one transportation network-related parameter correspond to at least one of:

a supply of drivers,

accessibility to the user,

a fare surge-related parameter, or

a detour-related parameter.

13. The communications server apparatus as claimed in claim 12,

wherein the data associated with the at least one transportation network-related parameter correspond to the fare surge-related parameter, and

wherein the communications server apparatus is further configured to:

generate, in the data record, a plurality of initial variable transit point data fields for a corresponding plurality of initial variable transit points from the origin location to the destination location;

determine, for each initial variable transit point data field of the plurality of initial variable transit point data fields, a value for the fare surge-related parameter, and

if an initial variable transit point data field of the plurality of initial variable transit point data fields has the value above a threshold value indicative of high risk of fare surging, disregard the initial variable transit point corresponding to the initial variable transit point data field, and

if an initial variable transit point data field of the plurality of initial variable transit point data fields has the value below the threshold value, maintain the initial variable transit point corresponding to the initial variable transit point data field as a candidate for the variable transit point.

14. The communications server apparatus as claimed in claim 12 or 13,

wherein the data associated with the at least one transportation network-related parameter correspond to the detour-related parameter, and

wherein the communications server apparatus is further configured to:

generate, in the data record, a plurality of primary variable transit point data fields for a corresponding plurality of primary variable transit points from the origin location to the destination location;

determine, for each primary variable transit point data field of the plurality of primary variable transit point data fields, a value for the detour-related parameter, and

if a primary variable transit point data field of the plurality of primary variable transit point data fields has the value above a threshold value indicative of minimal detour, maintain the primary variable transit point corresponding to the primary variable transit point data field as a candidate for the variable transit point, and

if a primary variable transit point data field of the plurality of primary variable transit point data fields has the value below the threshold value, disregard the primary variable transit point corresponding to the primary variable transit point data field.

15. The communications server apparatus as claimed in any one of claims 1 to 14, wherein the communications server apparatus is further configured to:

update, in a trip section data field of the plurality of trip section data fields, a travel progress of the user through the corresponding trip section; and

provide an alert to the user, via the user's communication device, prior to the end of the corresponding trip section.

16. A method, performed in a communications server apparatus for managing a request for transport-related services, the method comprising, under control of a processor of the communications server apparatus:

in response to receiving user request data comprising a data field indicative of an origin location and a data field indicative of a destination location,

generate a data record comprising a plurality of transit point data fields having data for a corresponding plurality of transit points from the origin location to the destination location, the plurality of transit point data fields comprising a variable transit point data field having data corresponding to a variable transit point that is determined based on data associated with at least one transportation network-related parameter;

generate, in the data record, a plurality of trip section data fields for a corresponding plurality of trip sections defining navigation directions from the origin location to the destination location; and

wherein, for each trip section data field, associate the trip section data field with a respective transit point data field of the plurality of transit point data fields, and further, based on the data of the associated transit point data field, determine a respective transportation mode for the corresponding trip section and generate transit data in respect of the respective transportation mode.

17. The method as claimed in claim 16,

wherein the plurality of trip section data fields and the plurality of transit point data fields are generated to define a plurality of journey options from the origin location to the destination location,

wherein each journey option of the plurality of journey options is defined by at least two trip section data fields of the plurality of trip section data fields, and

wherein the at least two trip section data fields are for corresponding trip sections defining the navigation directions for a single journey starting from the origin location and ending at the destination location.

18. The method as claimed in claim 17, wherein the plurality of journey options comprise at least one multi-modal journey option.

19. The method as claimed in any one of claims 16 to 18, wherein the plurality of transit point data fields comprise a plurality of variable transit point data fields, each variable transit point data field of the plurality of variable transit point data fields having data corresponding to a respective variable transit point that is determined based on the data associated with the at least one transportation network-related parameter.

20. The method as claimed in claim 19, when dependent on claim 17 or 18, wherein the each variable transit point data field is associated with a trip section data field of the at least two trip section data fields of a respective journey option of the plurality of journey options.

21. The method as claimed in claim 17 or 18, further comprising identifying, from the plurality of journey options, and based on the transit data corresponding to the at least two trip section data fields defining the each journey option, one or more pareto-optimal journey options.

22. The method as claimed in claim 21, further comprising controlling, based on a defined epsilon resolution value, the number of pareto-optimal journey options to be identified.

23. The method as claimed in any one of claims 16 to 22, wherein the plurality of transit point data fields and the plurality of trip section data fields are generated from a road network and a transit network that are maintained separately.

24. The method as claimed in claim 23, further comprising providing data update to at least one of the road network or the transit network in real time.

25. The method as claimed in any one of claims 16 to 24, wherein the respective transportation mode for the trip section data field associated with the variable transit point data field comprises a ride-sharing transportation mode.

26. The method as claimed in any one of claims 16 to 24, wherein the respective transportation mode for the trip section data field associated with the variable transit point data field comprises a ride-hailing transportation mode.

27. The method as claimed in claim 26, wherein the data associated with the at least one transportation network-related parameter correspond to at least one of:

a supply of drivers,

accessibility to the user,

a fare surge-related parameter, or

a detour-related parameter.

28. The method as claimed in claim 27,

wherein the data associated with the at least one transportation network-related parameter correspond to the fare surge-related parameter, and

the method further comprises:

generating, in the data record, a plurality of initial variable transit point data fields for a corresponding plurality of initial variable transit points from the origin location to the destination location;

determining, for each initial variable transit point data field of the plurality of initial variable transit point data fields, a value for the fare surge-related parameter, and

if an initial variable transit point data field of the plurality of initial variable transit point data fields has the value above a threshold value indicative of high risk of fare surging, disregarding the initial variable transit point corresponding to the initial variable transit point data field, and

if an initial variable transit point data field of the plurality of initial variable transit point data fields has the value below the threshold value, maintaining the initial variable transit point corresponding to the initial variable transit point data field as a candidate for the variable transit point.

29. The method as claimed in claim 27 or 28,

wherein the data associated with the at least one transportation network-related parameter correspond to the detour-related parameter, and

the method further comprises:

generating, in the data record, a plurality of primary variable transit point data fields for a corresponding plurality of primary variable transit points from the origin location to the destination location;

determining, for each primary variable transit point data field of the plurality of primary variable transit point data fields, a value for the detour-related parameter, and

if a primary variable transit point data field of the plurality of primary variable transit point data fields has the value above a threshold value indicative of minimal detour, maintaining the primary variable transit point corresponding to the primary variable transit point data field as a candidate for the variable transit point, and

if a primary variable transit point data field of the plurality of primary variable transit point data fields has the value below the threshold value, disregarding the primary variable transit point corresponding to the primary variable transit point data field.

30. The method as claimed in any one of claims 16 to 29, further comprising:

updating, in a trip section data field of the plurality of trip section data fields, a travel progress of the user through the corresponding trip section; and

providing an alert to the user, via the user's communication device, prior to the end of the corresponding trip section.

31. A computer program product comprising instructions for implementing the method as claimed in any one of claims 16 to 30.

32. A computer program comprising instructions for implementing the method as claimed in any one of claims 16 to 30.

33. A non-transitory storage medium storing instructions, which, when executed by a processor, cause the processor to perform the method as claimed in any one of claims 16 to 30.

34. A communications system for managing a request for transport-related services, comprising a communications server apparatus, at least one user communications device and communications network equipment operable for the communications server apparatus and the at least one user communications device to establish communication with each other therethrough,

wherein the at least one user communications device comprises a first processor and a first memory, the at least one user communications device being configured, under control of the first processor, to execute first instructions stored in the first memory to:

in response to receiving first request data comprising a data field indicative of an origin location and a data field indicative of a destination location,

generate data corresponding to the origin location and the destination location; and

transmit the data for receipt by the communications server apparatus for processing; and

wherein the communications server apparatus comprises a second processor and a second memory, the communications server apparatus being configured, under control of the second processor, to execute second instructions stored in the second memory to:

in response to receiving second request data indicative of the data transmitted by the at least one user communications device,

generate a data record comprising a plurality of transit point data fields having data for a corresponding plurality of transit points from the origin location to the destination location, the plurality of transit point data fields comprising a variable transit point data field having data corresponding to a

variable transit point that is determined based on data associated with at least one transportation network-related parameter;

generate, in the data record, a plurality of trip section data fields for a corresponding plurality of trip sections defining navigation directions from the origin location to the destination location;

wherein, for each trip section data field, the communications server apparatus is further configured to associate the trip section data field with a respective transit point data field of the plurality of transit point data fields, and further configured to, based on the data of the associated transit point data field, determine a respective transportation mode for the corresponding trip section and generate transit data in respect of the respective transportation mode; and

transmit, for receipt by the at least one user communications device, data corresponding to the plurality of trip sections, and, for each trip section of the plurality of trip sections, data corresponding to a respective transit point associated with the trip section, data corresponding to a respective transportation mode for the trip section and the transit data in respect of the respective transportation mode.