

Claims

1. A processing apparatus for traffic management of a network of roads, comprising a processor and a memory, the apparatus being configured, under control of the processor to execute instructions in the memory to:
- 5 process data corresponding to the network of roads to identify an incoming road and an outgoing road intersecting at an intersection node of the network, the incoming road being for incoming traffic leading to the intersection node and the outgoing road being for outgoing traffic leading away from the intersection node;
- 10 determine, based on the data corresponding to the network, whether there is a bypass road to allow the incoming traffic from the incoming road to bypass the intersection node and flow to the outgoing road via the bypass road; and
- if it is determined that there is the bypass road, generate data indicative of a turn restriction for communicating to road users of restriction of flow of the incoming traffic to the outgoing road via the intersection node.
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2. The apparatus as claimed in claim 1, further configured to process the data corresponding to the network of roads to identify an entry node for a first segment of the incoming road and an exit node for a second segment of the outgoing road;
- 20 wherein, for determining whether there is the bypass road, the apparatus is configured to:
- determine, based on the data corresponding to the network, whether there is a connecting road connected to the entry node and the exit node; and
- 25 if there is the connecting road, generate data indicative of the connecting road being the bypass road.
3. The apparatus as claimed in claim 1, wherein the data corresponding to the network comprises data indicative of a geometrical layout of the network, and, for determining whether there is the bypass road, the apparatus is configured to
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determine whether there is the bypass road based on the data indicative of the geometrical layout of the network.

4. The apparatus as claimed in claim 3, wherein, for determining whether there
5 is the bypass road, the apparatus is configured to:

determine, based on the data indicative of the geometrical layout, an angular relationship between the outgoing road and a candidate road connected to the incoming road and the outgoing road; and

10 generate data indicative of the candidate road being the bypass road if the angular relationship satisfies an angular condition for designating the candidate road as the bypass road.

5. The apparatus as claimed in claim 4, wherein the angular condition comprises a reflex angle of about 310° or more between the outgoing road and the candidate
15 road.

6. The apparatus as claimed in any one of claims 3 to 5, being further configured to:

20 determine, based on the data indicative of the geometrical layout, an angular relationship between the incoming road and the outgoing road; and

generate data indicative of a directional flow of the incoming traffic through the bypass road based on the angular relationship between the incoming road and the outgoing road.

25 7. The apparatus as claimed in claim 6, wherein, if the angular relationship between the incoming road and the outgoing road is determined, starting from the incoming road to the outgoing road in an anti-clockwise direction, to be a reflex angle of between about 220° and about 305° , the apparatus is configured to, for generating the data indicative of the directional flow, generate data indicative of a
30 left directional flow.

8. The apparatus as claimed in claim 6, wherein, if the angular relationship between the incoming road and the outgoing road is determined, starting from the incoming road to the outgoing road in a clockwise direction, to be a reflex angle of
5 between about 220° and about 305°, the apparatus is configured to, for generating the data indicative of the directional flow, generate data indicative of a right directional flow.
9. The apparatus as claimed in any one of claims 1 to 8,
10 wherein the intersection node comprises an intersection node with a traffic light, and
wherein, for processing the data corresponding to the network of roads, the apparatus is configured to process the data corresponding to the network of roads to identify an incoming road and an outgoing road intersecting at the intersection
15 node with the traffic light.
10. The apparatus as claimed in any one of claims 1 to 9,
wherein the intersection node comprises an intersection node where at least two incoming roads and at least two outgoing roads intersect, and
20 wherein, for processing the data corresponding to the network of roads, the apparatus is configured to process the data corresponding to the network of roads to identify an incoming road out of the at least two incoming roads and an outgoing road out of the at least two outgoing roads.
- 25 11. The apparatus as claimed in any one of claims 1 to 10, further configured to add the data indicative of the turn restriction to the data corresponding to the network of roads.
12. The apparatus as claimed in any one of claims 1 to 11, further configured to,
30 in response to a request from a road user to access data associated with the

intersection node, communicate the data indicative of the turn restriction to a device of the road user for communicating the turn restriction to the road user.

13. The apparatus as claimed in any one of claims 1 to 12, further configured to process the data indicative of the turn restriction to generate visual information for communicating the turn restriction to the road users.

14. The apparatus as claimed in any one of claims 1 to 13, further configured to process data indicative of a digital map representative of the network of roads and the data indicative of the turn restriction for displaying the digital map with information corresponding to the turn restriction.

15. A method for traffic management of a network of roads, the method comprising:

15 processing data corresponding to the network of roads to identify an incoming road and an outgoing road intersecting at an intersection node of the network, the incoming road being for incoming traffic leading to the intersection node and the outgoing road being for outgoing traffic leading away from the intersection node;

20 determining, based on the data corresponding to the network, whether there is a bypass road to allow the incoming traffic from the incoming road to bypass the intersection node and flow to the outgoing road via the bypass road; and

if it is determined that there is the bypass road, generating data indicative of a turn restriction for communicating to road users of restriction of flow of the incoming traffic to the outgoing road via the intersection node.

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16. The method as claimed in claim 15, further comprising processing the data corresponding to the network of roads to identify an entry node for a first segment of the incoming road and an exit node for a second segment of the outgoing road;

30 wherein determining whether there is the bypass road comprises:

determining, based on the data corresponding to the network, whether there is a connecting road connected to the entry node and the exit node; and

5 if there is the connecting road, generating data indicative of the connecting road being the bypass road.

17. The method as claimed in claim 15,
wherein the data corresponding to the network comprises data indicative of a geometrical layout of the network, and
10 wherein determining whether there is the bypass road comprises determining whether there is the bypass road based on the data indicative of the geometrical layout of the network.

18. The method as claimed in claim 17, wherein determining whether there is the
15 bypass road comprises:

determining, based on the data indicative of the geometrical layout, an angular relationship between the outgoing road and a candidate road connected to the incoming road and the outgoing road; and
generating data indicative of the candidate road being the bypass road if the
20 angular relationship satisfies an angular condition for designating the candidate road as the bypass road.

19. The method as claimed in claim 18, wherein the angular condition comprises a reflex angle of about 310° or more between the outgoing road and the candidate
25 road.

20. The method as claimed in any one of claims 17 to 19, further comprising:
determining, based on the data indicative of the geometrical layout, an angular relationship between the incoming road and the outgoing road; and

generating data indicative of a directional flow of the incoming traffic through the bypass road based on the angular relationship between the incoming road and the outgoing road.

- 5 21. The method as claimed in claim 20, wherein, if the angular relationship between the incoming road and the outgoing road is determined, starting from the incoming road to the outgoing road in an anti-clockwise direction, to be a reflex angle of between about 220° and about 305° , generating the data indicative of the directional flow comprises generating data indicative of a left directional flow.

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22. The method as claimed in claim 20, wherein, if the angular relationship between the incoming road and the outgoing road is determined, starting from the incoming road to the outgoing road in a clockwise direction, to be a reflex angle of between about 220° and about 305° , generating the data indicative of the directional flow comprises generating data indicative of a right directional flow.

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23. The method as claimed in any one of claims 15 to 22,
wherein the intersection node comprises an intersection node with a traffic light, and

- 20 wherein processing the data corresponding to the network of roads comprises processing the data corresponding to the network of roads to identify an incoming road and an outgoing road intersecting at the intersection node with the traffic light.

- 25 24. The method as claimed in any one of claims 15 to 23,
wherein the intersection node comprises an intersection node where at least two incoming roads and at least two outgoing roads intersect, and
wherein processing the data corresponding to the network of roads comprises processing the data corresponding to the network of roads to identify an

incoming road out of the at least two incoming roads and an outgoing road out of the at least two outgoing roads.

25. The method as claimed in any one of claims 15 to 24, further comprising
5 adding the data indicative of the turn restriction to the data corresponding to the network of roads.

26. The method as claimed in any one of claims 15 to 25, further comprising, in
response to a request from a road user to access data associated with the
10 intersection node, communicating the data indicative of the turn restriction to a device of the road user for communicating the turn restriction to the road user.

27. The method as claimed in any one of claims 15 to 26, further comprising
processing the data indicative of the turn restriction to generate visual information
15 for communicating the turn restriction to the road users.

28. The method as claimed in any one of claims 15 to 27, further comprising
processing data indicative of a digital map representative of the network of roads
and the data indicative of the turn restriction for displaying the digital map with
20 information corresponding to the turn restriction.

29. A computer program or a computer program product comprising instructions
for implementing the method as claimed in any one of claims 15 to 28.

25 30. 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 15 to 28.