

METHOD AND DEVICE FOR ACQUIRING DISTRIBUTED DURATION FOR TRAFFIC LIGHTS

The present application claims priority to Chinese Patent Application No. 201110194673.1 filed to the Chinese Patent Office on July 12, 2011 entitled "METHOD AND DEVICE FOR ACQUIRING DISTRIBUTED DURATION FOR TRAFFIC LIGHTS", the entire content of which is hereby incorporated by reference in this present application.

Field of the Invention

The present invention relates to the field of intelligent transportation systems, and particularly to a method and a device for acquiring a distributed duration for traffic lights.

Background of the Invention

The Urban Traffic Control System (UTCS) is an important part of the intelligent transportation systems, and the traffic capacity of the intersection is the key to determine the road traffic. The traffic pressure of the congestion area can be relieved through a coordinated optimization control of the intersection signal control system of the urban transportation network, so that the distribution of traffic flows in the whole city is more reasonable, thereby reducing or eliminating the bottleneck effect on the road, and improving the road traffic capacity and service level.

The traffic scheduling at the intersection is mainly performed through the real-time intelligent timing of the traffic lights. Thus, in order to accurately calculate the distributed duration for the traffic lights at each intersection in real time, the technical solution of the prior art firstly installs an induction detector at each intersection to calculate the traffic intensity of each phase according to the flow and time occupancy ratio of the phase at the intersection detected by the induction detector; then calculates a sum of traffic intensities of all the phases at the intersection; calculates the traffic signal cycle length at the intersection according to the sum of traffic intensities at the intersection; and calculates the distributed duration for the traffic lights at the intersection according to the

time occupancy ratio and flow information at the intersection.

In the process of implementing the present invention, the inventor finds that the prior art at least has the following problem: although the above technical solution can calculate the distributed duration for the traffic lights, the induction detector needs to be installed at each intersection, and the hardware cost is high.

Summary of the Invention

The embodiments of the present invention provide a method and a device for acquiring a distributed duration for traffic lights, which achieves the calculation of the distributed duration for the traffic lights while reducing the hardware cost.

The embodiments of the present invention adopt the following technical solutions:

A method for acquiring a distributed duration for traffic lights, comprising:

when the number of floating cars passing through a given intersection within a given time based on statistical data is larger than or equal to a preset threshold, calculating effective delay times and effective driving times of the floating cars passing through the given intersection based on the statistical data;

according to driving loci of the floating cars, sorting the floating cars passing through the given intersection based on the statistical data into three classes: turning left, turning right and going straight;

setting a red light duration of a go straight traffic light at the given intersection as a maximum of the effective delay times of the floating cars in the state of going straight, and setting a green light duration of the go straight traffic light at the given intersection as a maximum of the effective driving times of the floating cars in the state of going straight;

setting a red light duration of a left-turn traffic light at the given intersection as a maximum of updated delay times of all the floating cars in the state of turning left, wherein the updated delay time of the floating car is a sum of the effective delay time of the floating car and driving time spent for a specified displacement range, and setting a green light duration of the left-turn traffic light at the given intersection as a maximum of the effective driving times of all the floating cars in the state of turning left;

setting a red light duration of a right-turn traffic light at the given intersection as a maximum of updated delay times of all the floating cars in the state of turning right, wherein the updated delay time of the floating car is a sum of the effective delay time of the floating car and driving time spent for a specified displacement range, and setting a green light duration of the right-turn traffic light at the given intersection as a maximum of the effective driving times of all the floating cars in the state of turning right.

A device for acquiring a distributed duration for traffic lights, comprising:

a calculating unit configured to calculate effective delay times and effective driving times of floating cars passing through a given intersection based on statistical data, when the number of the floating cars passing through the given intersection within a given time based on the statistical data is larger than or equal to a preset threshold;

a sorting unit configured to sort, according to driving loci of the floating cars, the floating cars passing through the given intersection based on the statistical data into three classes: turning left, turning right and going straight;

a going straight time acquiring unit configured to set a red light duration of a go straight traffic light at the given intersection as a maximum of the effective delay times of the floating cars in the state of going straight, and set a green light duration of the go straight traffic light at the given intersection as a maximum of the effective driving times of the floating cars in the state of going straight;

a turning left time acquiring unit configured to set a red light duration of a left-turn traffic light at the given intersection as a maximum of updated delay times of all the floating cars in the state of turning left, wherein the updated delay time of the floating car is a sum of the effective delay time of the floating car and driving time spent for a specified displacement range, and set a green light duration of the left-turn traffic light at the given intersection as a maximum of the effective driving times of all the floating cars in the state of turning left;

a turning right time acquiring unit configured to set a red light duration of a right-turn traffic light at the given intersection as a maximum of updated delay times of all the floating cars in the state of turning right, wherein the updated delay time of the floating car is a sum of the effective delay time of the floating car and driving time spent for a

specified displacement range, and set a green light duration of the right-turn traffic light at the given intersection as a maximum of the effective driving times of all the floating cars in the state of turning right.

The method and device for acquiring distributed duration for traffic lights provided by the embodiments of the present invention firstly calculate effective delay times and effective driving times of floating cars passing through a given intersection based on statistical data; then according to driving loci of the floating cars, sort the floating cars passing through the given intersection based on the statistical data into three classes: turning left, turning right and going straight; and finally, calculate the distributed duration for the traffic lights according to the effective delay times and the effective driving times of the floating cars passing through the given intersection based on the statistical data. The technical solution of the prior art has to install an induction detector at each intersection to calculate the distributed duration for the traffic lights, while the embodiment of the present invention can achieve the calculation of the distributed duration for traffic lights without installing the induction detector, thereby reducing the hardware cost.

Brief Description of the Drawings

In order to describe the technical solutions more clearly according to the embodiments of the present invention, the drawings to be used in the descriptions of the embodiments or the prior art are briefly introduced as follows. Obviously, the following drawings described just illustrate some embodiments of the present invention, and a person skilled in the art can obtain other drawings from these drawings without paying any creative work.

Fig. 1 is a flowchart of a method for acquiring a distributed duration for traffic lights provided by Embodiment 1 of the present invention;

Fig. 2 is a structure diagram of a device for acquiring a distributed duration for traffic lights provided by Embodiment 1 of the present invention;

Fig. 3 is a flowchart of a method for acquiring a distributed duration for traffic lights provided by Embodiment 2 of the present invention; and

Fig. 4 is a structure diagram of a device for acquiring a distributed duration for traffic lights provided by Embodiment 2 of the present invention.

Detailed Description of the Preferred Embodiments

The technical solutions in the embodiments of the present invention will be clearly and completely described as follows with reference to the drawings in the embodiments of the present invention. Obviously, the embodiments described herein are just a part of embodiments of the present invention, rather than all embodiments. Based on the embodiments of the present invention, any other embodiment obtained by a person skilled in the art without paying any creative work shall fall within the protection scope of the present invention.

In order to make the advantages of the technical solutions clearer according to the present invention, the present invention will be detailedly described as follows in conjunction with the drawings and the embodiments.

Embodiment 1

The embodiment provides a method for acquiring a distributed duration for traffic lights. As illustrated in Fig. 1, the method includes:

101: When the number of floating cars passing through a given intersection within a given time based on statistical data is larger than or equal to a preset threshold, calculating effective delay times and effective driving times of the floating cars passing through the given intersection based on the statistical data.

102: According to driving loci of the floating cars, sorting the floating cars passing through the given intersection based on the statistical data into three classes: turning left, turning right and going straight.

The driving loci of the floating cars are location information of the floating cars obtained through the Global Positioning System (GPS).

103: Setting a red light duration of a go straight traffic light at the given intersection as a maximum of the effective delay times of the floating cars in the state of going straight, and setting a green light duration of the go straight traffic light at the given intersection as a maximum of the effective driving times of the floating cars in the state

of going straight.

104: Setting a red light duration of a left-turn traffic light at the given intersection as a maximum of updated delay times of all the floating cars in the state of turning left, wherein the updated delay time of the floating car is a sum of the effective delay time of the floating car and driving time spent for a specified displacement range, and setting a green light duration of the left-turn traffic light at the given intersection as a maximum of the effective driving times of all the floating cars in the state of turning left.

105: Setting a red light duration of a right-turn traffic light at the given intersection as a maximum of updated delay times of all the floating cars in the state of turning right, wherein the updated delay time of the floating car is a sum of the effective delay time of the floating car and driving time spent for a specified displacement range, and setting a green light duration of the right-turn traffic light at the given intersection as a maximum of the effective driving times of all the floating cars in the state of turning right.

The embodiment of the present invention further provides a device for acquiring a distributed duration for traffic lights, through which the above method for acquiring a distributed duration for traffic lights can be implemented. As illustrated in Fig. 2, the device includes: a calculating unit 21, a sorting unit 22, a going straight time acquiring unit 23, a turning left time acquiring unit 24 and a turning right time acquiring unit 25.

The calculating unit 21 is configured to calculate effective delay times and effective driving times of floating cars passing through a given intersection based on the statistical data when the number of the floating cars passing through the given intersection within a given time based on the statistical data is larger than or equal to a preset threshold.

The sorting unit 22 is configured to sort, according to driving loci of the floating cars, the floating cars passing through the given intersection based on the statistical data into three classes: turning left, turning right and going straight.

The driving loci of the floating cars are location information of the floating cars obtained through the Global Positioning System (GPS).

The going straight time acquiring unit 23 is configured to set a red light duration of a go straight traffic light at the given intersection as a maximum of the effective delay

times of the floating cars in the state of going straight, and set a green light duration of the go straight traffic light at the given intersection as a maximum of the effective driving times of the floating cars in the state of going straight.

The turning left time acquiring unit 24 is configured to set a red light duration of a left-turn traffic light at the given intersection as a maximum of updated delay times of all the floating cars in the state of turning left, wherein the updated delay time of the floating car is a sum of the effective delay time of the floating car and driving time spent for a specified displacement range, and set a green light duration of the left-turn traffic light at the given intersection as a maximum of the effective driving times of all the floating cars in the state of turning left.

The turning right time acquiring unit 25 is configured to set a red light duration of a right-turn traffic light at the given intersection as a maximum of updated delay times of all the floating cars in the state of turning right, wherein the updated delay time of the floating car is a sum of the effective delay time of the floating car and driving time spent for a specified displacement, and set a green light duration of the right-turn traffic light at the given intersection as a maximum of the effective driving times of all the floating cars in the state of turning right.

The method and device for acquiring distributed duration for traffic lights provided by the embodiments of the present invention firstly calculate effective delay times and effective driving times of floating cars passing through a given intersection based on statistical data; then according to driving loci of the floating cars, sort the floating cars passing through the given intersection based on the statistical data into three classes: turning left, turning right and going straight; and finally, calculate the distributed duration for the traffic lights according to the effective delay times and the effective driving times of the floating cars passing through the given intersection based on the statistical data. The technical solution of the prior art has to install an induction detector at the intersection to calculate the distributed duration for the traffic lights, while the embodiments of the present invention can achieve the calculation of the distributed duration for traffic lights without installing the induction detector, thereby reducing the hardware cost.

Embodiment 2

The embodiment provides a method for acquiring a distributed duration for traffic lights. As illustrated in Fig. 3, the method includes:

200: Judging whether the number of floating cars passing through a given intersection within a given time based on the statistical data is less than a preset threshold.

201: When the number of the floating cars passing through the given intersection within the given time based on the statistical data is less than the preset threshold, firstly extending the given time until the number of the floating cars passing through the given intersection based on the statistical data is larger than or equal to the preset threshold, then calculating effective delay times and effective driving times of the floating cars passing through the given intersection based on the statistical data.

202: When the number of the floating cars passing through the given intersection within the given time based on the statistical data is larger than or equal to the preset threshold, calculating the effective delay times and the effective driving times of the floating cars passing through the given intersection based on the statistical data.

The process of calculating the effective delay time includes: taking information (v_{bp}, v_{ep}, d, t) within each GPS cycle of the floating cars as effective features, sorting the effective features, and calculating effective delay time of a single car in a single cycle respectively according to the sorting result, wherein v_{bp} and v_{ep} are instantaneous speeds of the car at two GPS matching points, d is the length of a driving path between the two GPS matching points, and t is the driving time.

For relevant records of all the floating cars in each time stamp (for example it is 5 minutes herein), corresponding effective delay times of adjacent GPS cycles are merged to obtain an uninterrupted effective delay time which is more accurate.

The steps of calculating the effective driving time include: taking information (v_{bp}, v_{ep}, d, t) within each GPS cycle of the floating cars as effective features, sorting the effective features, and calculating an effective driving speed of a single car in a single cycle respectively according to the sorting result.

The effective driving time is calculated according to $T_e = d/V_e$, wherein $T_e^{T_e}$ is the

effective driving time, V_e is the effective driving speed, and d is the driving distance within the cycle.

For relevant records of all the floating cars in each time stamp (for example it is 5 minutes herein), corresponding effective driving times of adjacent GPS cycles are merged to obtain an uninterrupted effective driving time which is more accurate.

203: According to driving loci of the floating cars, sorting the floating cars passing through the given intersection based on the statistical data into three classes: turning left, turning right and going straight.

The sorting process is matching location information of related GPS points of a floating car to corresponding links, when the angle between the adjacent links is larger than 45° , the floating car is turning left or right, and when the angle between the adjacent links is less than 45° , the floating car is going straight.

204: Setting a red light duration of a go straight traffic light at the given intersection as a maximum of the effective delay times of the floating cars in the state of going straight, and setting a green light duration of the go straight traffic light at the given intersection as a maximum of the effective driving times of the floating cars in the state of going straight.

205: Acquiring driving times spent by all the floating cars in the state of turning left for a specified displacement range, and setting a red light duration of a left-turn traffic light at the given intersection as a maximum of updated delay times of all the floating cars in the state of turning left, wherein the updated delay time of the floating car is a sum of the effective delay time of the floating car and the driving time spent for the specified displacement range.

Setting a green light duration of the left-turn traffic light at the given intersection as a maximum of the effective driving times of all the floating cars in the state of turning left.

The specified displacement range refers to a distance from the start line to the finish line of a turn-left waiting area. In the embodiment of the present invention, the specified displacement range is 30 meters, and it may be variable depending on different intersections.

206: Acquiring driving times spent by all the floating cars in the state of turning right for a specified displacement range, and setting a red light duration of a right-turn traffic light at the given intersection as a maximum of updated delay times of all the floating cars in the state of turning right, wherein the updated delay time of the floating car is a sum of the effective delay time of the floating car and the driving time spent for the specified displacement range.

Setting a green light duration of the right-turn traffic light at the given intersection as a maximum of the effective driving times of all the floating cars in the state of turning right.

The specified displacement range refers to a distance from the start line to the finish line of a turn-right waiting area. In the embodiment of the present invention, the specified displacement range is 30 meters, and it may be variable depending on different intersections.

The embodiment of the present invention further provides a device for acquiring a distributed duration for traffic lights. As illustrated in Fig. 4, the device includes a calculating unit 41, a sorting unit 42, a going straight time acquiring unit 43, a turning left time acquiring unit 44 and a turning right time acquiring unit 45.

Wherein, the calculating unit 41 is configured to calculate effective delay times and effective driving times of floating cars passing through a given intersection based on the statistical data, when the number of the floating cars passing through the given intersection within a given time based on the statistical data is larger than or equal to a preset threshold.

When the number of the floating cars passing through the given intersection within the given time based on the statistical data is less than the preset threshold, invoking an adjusting unit 46.

The adjusting unit 46 is configured to extend the given time when the number of the floating cars passing through the given intersection within the given time based on the statistical data is less than the preset threshold.

When the adjusting unit extends the given time until the number of the floating cars passing through the given intersection based on the statistical data is larger than or

equal to the preset threshold, the calculating unit calculates the effective delay times and the effective driving times of the floating cars passing through the given intersection based on the statistical data.

The process of calculating the effective delay time includes: taking information (v_{bp}, v_{ep}, d, t) within each GPS cycle of the floating cars as effective features, sorting the effective features, and calculating effective delay time of a single car in a single cycle respectively according to the sorting result, wherein v_{bp} and v_{ep} are instantaneous speeds of the car at two GPS matching points, d is the length of a driving path between the two GPS matching points, and t is the driving time.

For relevant records of all the floating cars in each time stamp (for example it is 5 minutes herein), corresponding effective delay times of adjacent GPS cycles are merged to obtain an uninterrupted effective delay time which is more accurate.

The steps of calculating the effective driving time include: taking information (v_{bp}, v_{ep}, d, t) within each GPS cycle of the floating cars as effective features, sorting the effective features, and calculating an effective driving speed of a single car in a single cycle respectively according to the sorting result.

The effective driving time is calculated according to $T_e = d/V_e$, wherein T_e is the effective driving time, V_e is the effective driving speed, and d is the driving distance within the cycle.

For relevant records of all the floating cars in each time stamp (for example it is 5 minutes herein), corresponding effective driving times of adjacent GPS cycles are merged to obtain an uninterrupted effective driving time which is more accurate.

For relevant records of all the floating cars in each time stamp (for example it is 5 minutes herein), corresponding effective driving times of adjacent GPS cycles are merged to obtain an uninterrupted effective driving time which is more accurate.

The sorting unit 42 is configured to sort, according to driving loci of the floating cars, the floating cars passing through the given intersection based on the statistical data into three classes: turning left, turning right and going straight.

The sorting process is matching location information of related GPS points of a floating car to corresponding links, when the angle between the adjacent links is larger

than 45° , the floating car is turning left or right, and when the angle between the adjacent links is less than 45° , the floating car is going straight.

The going straight time acquiring unit 43 is configured to set a red light duration of a go straight traffic light at the given intersection as a maximum of the effective delay times of the floating cars in the state of going straight, and setting a green light duration of the go straight traffic light at the given intersection as a maximum of the effective driving times of the floating cars in the state of going straight.

The turning left time acquiring unit 44 is configured to set a red light duration of a left-turn traffic light at the given intersection as a maximum of updated delay times of all the floating cars in the state of turning left, wherein the updated delay time of the floating car is a sum of the effective delay time of the floating car and driving time spent for a specified displacement range, and set a green light duration of the left-turn traffic light at the given intersection as a maximum of the effective driving times of all the floating cars in the state of turning left.

The turning left time acquiring unit 44 is further configured to acquire the driving times spent by all the floating cars in the state of turning left for the specified displacement range.

The specified displacement range refers to a distance from the start line to the finish line of a turn-left waiting area. In the embodiment of the present invention, the specified displacement range is 30 meters, and it may be variable depending on different intersections.

The turning right time acquiring unit 45 is configured to set a red light duration of a right-turn traffic light at the given intersection as a maximum of updated delay times of all the floating cars in the state of turning right, wherein the updated delay time of the floating car is a sum of the effective delay time of the floating car and driving time spent for a specified displacement range, and set a green light duration of the right-turn traffic light at the given intersection as a maximum of the effective driving times of all the floating cars in the state of turning right.

The turning right time acquiring unit 45 is further configured to acquire the driving times spent by all the floating cars in the state of turning right for the specified

displacement range.

The specified displacement range refers to a distance from the start line to the finish line of a turn-right waiting area. In the embodiment of the present invention, the specified displacement range is 30 meters, and it may be variable depending on different intersections.

The method and device for acquiring distributed duration for traffic lights provided by the embodiments of the present invention firstly calculate effective delay times and effective driving times of floating cars passing through a given intersection based on statistical data; then according to driving loci of the floating cars, sort the floating cars passing through the given intersection based on the statistical data into three classes: turning left, turning right and going straight; and finally, calculate the distributed duration for the traffic lights according to the effective delay time and the effective driving time of the floating cars passing through the given intersection based on the statistical data. The technical solution of the prior art has to install an induction detector at each intersection to calculate the distributed duration for the traffic lights, while the embodiments of the present invention can achieve the calculation of the distributed duration for traffic lights without installing the induction detector, thereby reducing the hardware cost.

The device for acquiring a distributed duration for traffic lights provided by the embodiments of the present invention can implement the method embodiments provided as above. For the detailed function implementations, please refer to the descriptions in the method embodiments, and herein are omitted. The method and device for acquiring a distributed duration for traffic lights provided by the embodiments of the present invention are suitable for, but not limited to, the intelligent transportation system.

A person skilled in the art shall appreciate that all or a part of the flows for implementing the method embodiments may be completed by instructing relevant hardware through a computer program that may be stored in a computer readable storage medium. When the program is executed, the flows of the method embodiments are carried out. Wherein the storage medium may be a magnetic disc, an optical disc, a

Read-Only Memory (ROM) or a Random Access Memory (RAM), etc.

The above descriptions are just specific embodiments of the present invention, and the protection scope of the present invention is not limited thereto. Any change or replacement easily conceivable to a person skilled in the art within the technical scope disclosed by the present invention shall fall within the protection scope of the present invention. Therefore, the protection scope of the present invention shall be determined by the protection scope of the claims.

WHAT IS CLAIMED IS:

1. A method for acquiring a distributed duration for traffic lights, comprising:

when the number of floating cars passing through a given intersection within a given time based on statistical data is larger than or equal to a preset threshold, calculating effective delay times and effective driving times of the floating cars passing through the given intersection based on the statistical data;

according to driving loci of the floating cars, sorting the floating cars passing through the given intersection based on the statistical data into three classes: turning left, turning right and going straight;

setting a red light duration of a go straight traffic light at the given intersection as a maximum of the effective delay times of the floating cars in the state of going straight, and setting a green light duration of the go straight traffic light at the given intersection as a maximum of the effective driving times of the floating cars in the state of going straight;

setting a red light duration of a left-turn traffic light at the given intersection as a maximum of updated delay times of all the floating cars in the state of turning left, wherein the updated delay time of the floating car is a sum of the effective delay time of the floating car and driving time spent for a specified displacement range, and setting a green light duration of the left-turn traffic light at the given intersection as a maximum of the effective driving times of all the floating cars in the state of turning left;

setting a red light duration of a right-turn traffic light at the given intersection as a maximum of updated delay times of all the floating cars in the state of turning right, wherein the updated delay time of the floating car is a sum of the effective delay time of the floating car and driving time spent for a specified displacement range, and setting a green light duration of the right-turn traffic light at the given intersection as a maximum of the effective driving times of all the floating cars in the state of turning right.

2. The method for acquiring a distributed duration for traffic lights according to claim 1, further comprising:

when the number of the floating cars passing through the given intersection within the given time based on the statistical data is less than the preset threshold, firstly extending the given time until the number of the floating cars passing through the given intersection based on the statistical data is larger than or equal to the preset threshold, then calculating the effective delay times and the effective driving times of the floating cars passing through the given intersection based on the statistical data.

3. The method for acquiring a distributed duration for traffic lights according to claim 1, further comprising:

acquiring the driving times spent by all the floating cars in the state of turning left for the specified displacement range;

acquiring the driving times spent by all the floating cars in the state of turning right for the specified displacement range.

4. A device for acquiring a distributed duration for traffic lights, comprising:

a calculating unit configured to calculate effective delay times and effective driving times of floating cars passing through a given intersection based on statistical data when the number of the floating cars passing through the given intersection within a given time based on the statistical data is larger than or equal to a preset threshold;

a sorting unit configured to sort, according to driving loci of the floating cars, the floating cars passing through the given intersection into based on the statistical data three classes: turning left, turning right and going straight;

a going straight time acquiring unit configured to set a red light duration of a go straight traffic light at the given intersection as a maximum of the effective delay times of the floating cars in the state of going straight, and set a green light duration of the go straight traffic light at the given intersection as a maximum of the effective driving times of the floating cars in the state of going straight;

a turning left time acquiring unit configured to set a red light duration of a left-turn traffic light at the given intersection as a maximum of updated delay times of all the floating cars in the state of turning left, wherein the updated delay time of the floating

car is a sum of the effective delay time of the floating car and driving time spent for a specified displacement range, and set a green light duration of the left-turn traffic light at the given intersection as a maximum of the effective driving times of all the floating cars in the state of turning left;

a turning right time acquiring unit configured to set a red light duration of a right-turn traffic light at the given intersection as a maximum of updated delay times of all the floating cars in the state of turning right, wherein the updated delay time of the floating car is a sum of the effective delay time of the floating car and driving time spent for a specified displacement range, and set a green light duration of the right-turn traffic light at the given intersection as a maximum of the effective driving times of all the floating cars in the state of turning right.

5. The device for acquiring a distributed duration for traffic lights according to claim 4, further comprising:

an adjusting unit configured to extend the given time when the number of the floating cars passing through the given intersection within the given time based on the statistical data is less than the preset threshold;

when the adjusting unit extends the given time until the number of the floating cars passing through the given intersection based on the statistical data is larger than or equal to the preset threshold, the calculating unit calculates the effective delay times and the effective driving times of the floating cars passing through the given intersection based on the statistical data.

6. The device for acquiring a distributed duration for traffic lights according to claim 4, wherein the turning left time acquiring unit is further configured to acquire the driving times spent by all the floating cars in the state of turning left for the specified displacement range.

7. The device for acquiring a distributed duration for traffic lights according to claim 4, wherein the turning right time acquiring unit is further configured to acquire the driving

times spent by all the floating cars in the state of turning right for the specified displacement range.