Abstract: The present invention discloses a navigation device (10) for guiding a vehicle such that the expenditure on toll along the travel route is maintained within a maximum limit that can be set by the user. This invention helps to determine a route as per the requirements of the user which is an optimum combination of tolled road segments and non-tolled road segments to suit the user budget.
Field of the invention:

The invention relates to navigation systems for vehicles. Particularly the invention relates to user defined parameters for optimal route selection.

Background of the invention:

Navigation devices which calculate route based on various parameters. Navigation devices which calculate route between the start and destination such that there is no toll road included in the travel are known in the present state of art. Further there are navigation devices which determine the routes which require least expenditure on toll.

Patent publication US20050107951 describes a navigation device which can determine cost related information of different routes and furnish the same along with the calculated routes. The cost information is only as additional information to the user and not a constraint or criteria for selection of the route.

Thus, presently there is a need for a navigation system which can intelligently choose a combination of tolled and non-tolled route segments and maintain the toll expenditure within users set limit.

Object of the invention:

It is an object of the invention to provide a method for route calculation using a navigation device wherein the selected route has the expenditure on toll for road segments within limit set by a user.

Another object of the invention is to determine an optimal route with combination of tolled road and non tolled roads.
Brief Description of the drawings:

Fig. 1 shows a schematic of a navigation device in accordance with this invention; and

Fig. 2 illustrates a flowchart for the method of determining a travel route using a navigation device in accordance with this invention.

Detailed description of the drawings:

Fig. 1 shows a schematic of a navigation device (10). The navigation device (10) is provided with input means (12) by which the user can configure the settings and set his preferences. An output means (14), typically a display, gives the user a visual indication of the settings, and the route map information. The device includes a database (16) of the route information and a route calculating means (18) that calculates a route based on the inputs provided by the user. The database (16) has the information about the different toll routes and the toll value (20) for each of these toll roads.

The input means (12) could be a keypad, or a touch screen interface using which the user can enter the desired data in the navigation device. The output means (14) could be a conventional LCD on which the maps and the route guidance instructions are displayed. The LCD could be touch screen which can operate as the input means (12) and the output means (14) together.

Fig. 2 shows a flowchart illustrating the method of determining a travel route using a navigation device (10) in accordance with this invention. The user selects the destination of his travel. The user gives the maximum amount of toll he/she is ready to pay as input to reach the selected destination. Also the user selects Route Options in a separate screen wherein the options like "Fast Route", "Short route", "Economic Route", "Scenic Route" etc. are displayed. These route options are combined with the other parameters entered by the user to calculate an appropriate route preferred by
the user. The primary criterion for calculation of the route is the maximum toll limit as entered by the user, according to this invention.

The route calculating means (18) takes into consideration the maximum toll amount limit set by a user to calculate the route. The navigation device (10) provides the user with all the routes for which the toll is less than the limit set by him/her. If there is no route which satisfies the toll limit criteria, then an error message is given to the user informing him that there is no route which has the toll value below the limit entered by him/her. In such case the user would have to increase his limit on toll value or select a route without using the toll value limit criteria. In case of multiple routes being present which satisfy the toll limit set by the user, a route can be selected based on the route options selected by the user at the beginning. Based on the route options and the toll limit set by the user, the multiple routes which satisfy the user preferences are displayed. The user can have an option to select any route of his choice. The user may also have preselected preferences for selecting a route from a plurality of routes which satisfy the maximum toll limit.

Advantages of the invention:

The navigation device selects an optimum route to suit the budget of the traveler.

The routes calculated by the navigation system can have a combination of tolled and non-tolled road segments such that the user can travel on good tolled roads as much as his budget allows as the toll limit is the primary criteria for route calculation.
We claim,

1. A navigation device (10) for guiding a vehicle, said navigation device (10) comprising a database (16) of route information, said navigation device (10) characterized in that the database (16) includes information regarding the toll roads and the toll values for said toll roads (20), a route calculating means (18) to determine an optimal route for which the total toll value is less than a maximum limit set by a user.

2. A navigation device as claimed in claim (1) wherein, said maximum toll limit is entered in the navigation system using an input means (12).

3. A navigation device as claimed in claim (1) wherein, said device is provided with an output means (14).

4. A method for calculating a route in a navigation device, said method comprising the following steps:
   - obtaining a maximum value for the toll user is ready to pay;
   - obtaining route options for other criteria for route calculation;
   - determining routes to destination and calculating the total toll amount for each route; and
   - determining the routes which have toll amount within said maximum value obtained from the user.

5. A method as claimed in claim (5) wherein, if only one route satisfies the maximum toll value limit set, it is automatically selected.

6. A method as claimed in claim (5) wherein, if no route satisfies the maximum toll criteria, an error message informs the same to the user.

7. A method as claimed in claim (5) wherein, said route options include short route, fast route, economical route, and the like.
Main Menu

Select Destination

Maximum Toll Query
(Timeout Based/preset value/override with new value)...criteria 1

Route Settings Screen
(User chooses settings for preferred route calculation from Fast Route, Short Route, Eco Friendly road, Toll Road etc)...criteria 2

Error Display

Route Calculation
Routes shall be calculated first based on criteria 1

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Routes?

User the Route for Guidance

Criteria 2 to be used to determine 1 route of the n routes

Fig. 2