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Electronic toll collection in Niyayesh tunnel and Sadr bridges

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Abstract

Pricing passages efficiently manage travel demand is one of the solutions which is widely used. Due to the high construction's cost of Niyayesh tunnel and Shahid Sadr bridge operations that were satisfied by Tehran Municipality Part of the costs can be done with electronic toll collection and sale of daily and weekly using the route after obtaining the relevant licenses on the price effects of the Tehran city council and the governor, will be compensated. According to existing infrastructure such as fiber-optic network, use of ITS technologies in all input and output of the project to inventory, Image Processing which can provide new solutions for the municipal authorities. Electronic toll collection using the ETC system can be done by the municipality.

Keywords: Electronic toll collection, Niyayesh tunnel, Sadr bridges

Introduction:

Pricing passages efficiently manage travel demand is one of the solutions that is widely used[1]. Today, a variety of strategies to manage urban travel demand has been developed that can be used to increase the efficiency of the transport system in the manner, time and road travel have an important role. In this type of strategy, pricing strategy, which is one of the most important factor has a significant role in traffic management. In this methodology, the appropriate parameters, including time, travel time (If you use the facilities of Niyayesh tunnel and Shahihd Sadr bridges) and alternative available ways, the time value of people, access to public transport and other systems are considered and use of this facility is determined based on a reasonable price. So for a specified crossing the road, crossing the toll it is determined that users must pay duties.

Pricing can involve several different ways depending on the type of technology and infrastructure available, each with different performance capabilities are. Obviously, uses any of these methods can have different effects and possibility of using various strategies in order to manage congestion on urban roads provide. However, the ideal approach for a reasonable pricing in relation to the density of urban streets will be as follows.

1. Administratively affordable and easy to use.

2. Tolls are reasonable.

3. For every travel that is charged and ongoing users should not be discounted. (This is incompatible with the purposes of traffic demand management)
4. Pricing should demand management strategies with other passengers for travel options that much more motivated to use different methods to be combined in one region.

5. Prices predictable as possible.

Niyayesh tunnel with a length of 7.6 km on the highway commute top and then it Shahihd Sadr bridges and all ramps and loops with a length of 10,252 meters has been constructed to solve the traffic problem area.

Under favorable conditions after the implementation of a project to build Niyayesh tunnels and Shahid Sadr bridges has emerged:

1. Reduce air pollution and prevent air pollution by controlling emissions of 75 million trips annually in Tehran.
2. Increase travel safety and minimize traffic
3. Transportation facilities
4. Reduce anxiety and mental concerns drivers and users
5. Daily traffic statistics, Breakdown by type of vehicle and traffic information.... for use in future projects and other metropolises
6. Reduce the distance traveled by providing better direction and speed
7. Reduce downtime
8. Reducing noise pollution
9. Outgoing traffic from the urban fabric

Due to the high construction's cost of Niyayesh tunnel and Shahid Sadr bridge operations, who were satisfied by Tehran Municipality, Part of the costs can be done with electronic toll collection and sale of daily and weekly using the route after obtaining the relevant licenses on the price effects of the Tehran city council and the governor, will be compensated. According to existing infrastructure such as fiber-optic network, use of ITS technologies in all input and output of the project to inventory, Image Processing which can provide new solutions for the municipal authorities. Vehicle toll collection can be done by the municipality. Intelligent transportation systems, The system is said Using automated tools and programs carried out on them, Some control operations (control the flow of traffic, traffic regulations or conditions, etc.) or information (statistics, informing the drivers, and data collection.) are doing in the field of transport and traffic. These systems using new technologies such as: Electronics and communication and control systems can improve safety and efficiency and are inexpensive transportation. [2]

For this purpose it should take all the inputs and outputs of the top bridge and tunnel system camera license plate reader prayer and electronic toll collection system based on image processing technology equipped.

According to the description, the project implementation is achieved with the following results:

1. The increase citizen satisfaction: Toll now creates dissatisfaction of the citizens. While creating a new management system in order to get the effects of this will solve many problems of the citizens. In addition, for some citizens who want to be one of the top bridge or tunnel their prayer, Creates new ones? The creations of citizens' grievances in some of the measures are removed.
2. Effective control and traffic improvements topped bridges and tunnels prayer (traffic management): With the introduction of the new system, the prevention of illegal traffic, a significant data mining system that can be used in many municipal decisions.
3. Revenue for the municipality and the City (increase revenue): Besides implementing technical systems and information necessary to control and toll collection, the pricing system is very important. For example, consider the current system pricing Metro.

Proper pricing is combined toll could:

3.1. Increase Tehran municipality revenues.

3.2. The total increase in citizen satisfaction.

3.3. More fluid Traffic in the Shahid Sadr bridge and tunnel Niyayesh is created and to reduce air pollution.

3.4. Admitted to welcome more and the development of public transport is created.

4. Create a platform for future development of city transport: The urban management is a major feature in many urban services operation. The implementation of this project is the ability to control the direction and technology, of the toll system and provides management direction. In this case, take advantage of this ability in the management of other departments of transportation also occur. For example, we can mention the following:

4.1. Used in similar projects: Having the ability to control the pathways and roads, this feature creates in Transportation Management and Lead to better decisions.

4.2. One of the advantages is that using electronic toll collection capabilities of this system in other parts of the city can be very useful and valuable statistics obtained.

5. Registration of all traffic and build databases for scientific studies: Access control and electronic toll collection capabilities, Possibilities for the development of the transport sector, especially with the help of the private sector. For example, consider the case let's build a city or inter-city route with permission to exploit it for a specified period, say 10 years was privatized and In this way, the funds and the performance of the private sector for the development of the transport operation.

6. The administration of justice in the use of resources, treasury**.**

7. Reduce pollution

8. Law enforcement**.**

9. Security interests, social: Undoubtedly control over the movement of vehicles, Apart from the issue of traffic control will be another dimension. For example, the security can be considered. The beneficiary of the project next to the police, the judiciary executive officers, and other security devices will also be considered as stakeholders.

Project execution will have Social and behavioral outcomes on society [3]. Feeling that traffic is monitored in one hand causes a feeling of security and safety for citizens and on the other hand leads to a sense of insecurity for more Abuse and evil. Since the scheme and similar schemes in many countries of the world use and with regard to the specific social and cultural conditions of our country, it is important that studies on social and cultural effects of such a regulatory scheme to be done.

(EXPERIMENTAL SECTION)

Electronic obtaining a method of toll roads and toll roads so that the car does not stop at the toll and pay the toll electronically will be for his account. Electronic toll collection system for the adaptation of the military system detects enemy of friends which aims to eliminate delays in the collection of road tolls using electrical system is available.

In 1959, Nobel Economics Prize winner William Vickrey[1] was the first person that ETC system for the Metropolitan Washington[2] bid; this means that each machine can be equipped with a transmitter. The signal for each transmitter, When the car passes through the toll, Removed and then sent to a central computer the computer calculation of the charge for each tag and the toll is calculated according to the time passage and adds to the billing machine.

In the 1960s and 1970s, making non-stop toll system (Free Flow Tolling) by fixed transmitter[1] devices under vehicles and Readers that were located below the surface of the highway, was tested. Norway is the world leader in the widespread implementation of this system. ETC implemented for the first time in 1986, in Bergen[2] next to the tollbooth traditionally. In 1991, Trondheim's[1] first global use of electronic payment system introduced complications without reducing speed. In 1995, Portugal was the first country as a totally integrated system for all duties performed Via Verde in addition to the electronic payment side, fuel and parking fees paid by the system. United States of America is another country that in different parts of the increasing pace of ETC system is used; it should be noted that in America many highways that are equipped with this system, Continue to collect duties have maintained manually.

In Japan for the first time it was introduced in 2001. Use of this system has been prevalent in Japan so that in 2006 about 12 million users and by default the system as a standard option on the machines to be installed. At the beginning of the implementation of the system in 2001, its implementation has been difficult the reduction of costs resulting from the use of ETC and the use of stimulus packages designed to encourage increased use of the highway, drivers using the system since 2003 to be attracted. It is worth mentioning according to 60 percent of the system used to pay the toll, there has been a significant

reduction in vehicular traffic congestion. All roads in the country are also subject to complications, is equipped with ETC and daily six million transactions carried out in these systems. [4]

System ETC, using electronic equipment such as DSRC tags or RFID tags or license plate reader cameras, auto detected and if the vehicle is not registered or toll amount is not paid, through cameras, license plate readers is fine. The system of highways, bridges and tunnels used city.

1. system components

Three major components required to implement a road ETC system are as follows:

1.1 Vehicle Detection System (AVI)

AVI: refers to the system all necessary actions to identify the vehicle and its owner to perform charging process for the client side as well as create a mechanism to collect data in order to manage traffic plays a variety of strategies. AVI's technologies can be divided into two main sections:

1-1-1 Using Image Processing

1-1-2 (RF) radio frequency

1.2 Classification system tools (AVC)

AVC: refers to all devices and processes auto body by which the right side is used to determine the amount of charge. Preliminary categories such as passenger cars truck and bus to get into complications. Containing a large number of factors to determine the physical characteristics of a car is necessary that is why the number of devices installed on track for this part is true. The use of an automatic system for determining the height of the vehicle, detection of axles and gain weight class of vehicle is necessary for the correct diagnosis.

Determining factors for the detection of vehicle classes:

1.2.1 Number of axles or wheels

1.2.2 dimensions, such as height, length of the vehicle

1.2.3 weight

1.3-executive video surveillance system (VES)

VES: refers to all the components and processes using picture or pictures of cars that payment can be done or not done to be achieved.

VES is to obtain picture cars use single ETC path, but they are not valid or does not exist. Then the image was used to obtain the license plates of offending vehicles that can be used for follow-up. [5]

So with the launch of an electronic toll collection system (ETC) considerable savings in time and consequently fuel consumption will be It is very difficult to calculate the exact savings and given the variety of car as well as traffic conditions is very difficult.

Approximate calculation method of reducing fuel consumption in the ETC as follows:

- Average fuel consumption for each vehicle when slowing down or speeding (parameter FC1)

- Average fuel consumption for each vehicle stop time (parameter FC2)

- Average fuel consumption for each vehicle passes through the toll at normal speed (parameter FC3)

The reduction in fuel consumption (FCr) for each vehicle will be equal to:

FC3 -FC2 + FC1 = FCr
According to field research conducted, total distance traveled to decrease or increase speed (stopping the move back up to speed in the tolls and free way) Approximately 700 meters. When arriving at the toll-free road speed of 80 km per hour is assumed. The average speed for a distance of 40 kilometers per hour will be 700 meters in the traditional way and the DTC method with the same speed of 80 km from the toll passes are done.

In this way fuel consumption will be equal to:

FCms * T = FCm
FCm: The fuel consumption to move in T s

FCms: Average fuel consumption in a second move
If the average fuel consumption of 8 liters in an hour (Based on information from manufacturers of automobiles and is determined based on the average car) be considered, in a second 0.002222 liter average fuel consumption will be.

Time travel 700 meters in the traditional way (Average speed of 40 kilometers per hour) About 63 seconds. Therefore, the amount of fuel to travel 700 meters in the traditional way (FC1) is:

63 * .002222 = 0.14 liters

The average waiting time and stop to pay the toll is about 180 seconds. Average fuel consumption of about 0.000333 liters per second stop is considered. The fuel consumption for 180 seconds stop (FC2) will be about 0.05994 liters. So fuel consumption is the traditional method:

0.19994 = 0.14 + 0.05994
ETC payment method distance of 700 meters at an average speed of 80 kilometers per hour and during the non-stop. The time it takes to travel 700 meters will be around 31.5 seconds, the fuel consumption per vehicle ETC method is:

31.5 * .002222 = 0.07 liters

Thus, assuming daily traffic of 7,000 vehicles from a booth ETC in about 1000 liters of fuel savings will be made and taking into account fuel subsidies allocated by the government, the savings from a shuttle ETC at a toll will be about 10 billion riyals annually.

Discussion and conclusion:
According to a study conducted and evaluated following results were obtained:

1. Due to the high cost of operations worship tunnel and bridge construction project class martyr Sadr, who were satisfied by Tehran Municipality can be accepted as part of the cost of the electronic toll collection, be compensated.

2. According to existing infrastructure such as fiber-optic network, IDS technologies in all input and output of the project to inventory, image analysis (Image Processing) and ... can provide new solutions in front of the municipal authorities.

3. Electronic toll collection system using the ETC, which aims to eliminate delays in toll collection using the electronic system is provided, a good way to Niyayesh tunnel and Shahid Sadr bridge toll collection.

4. With the launch of the electronic toll collection system (ETC), because the car does not stop and the amount of toll electronically will be for his account, substantial savings in time and consequently fuel consumption will be done.

5. In addition to the above, the most important thing is to reduce the costs of environmental pollution the effects of which are significant in the long run. [6]

6. According to the explanations provided and the experiences of other countries and the benefits considered for the operation of the scheme and its implementation, require the support of the relevant authorities.

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