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Role of Facilities Scrap Old Cars in the Game Theory Approach

Amin Roshani

Department of Mathematical, Payam Noor University, Tehran, Iran

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ABSTRACT

Air pollution and high consumption of energy carriers led plans which the government to scrap old cars in recent years. In this study, we mentioned the plan, be expressed in terms of game theory. Therefore, we investigated role of government facility in old car in the form of a static game with complete information in a game with three players include auto manufacturer transportation, fuel, owners of old cars. Then, play two-player game into a car by removing auto manufacturer with specific strategies by each player. Three equilibrium players of old cars and car owners tend to balance out their old cars. However, the state facility for this project is low and by removing the balance of the car where the car owner is willing to outdate and implementation planning. However, the payment facility is low. Therefore, more facility needs for complete success of plan.

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INTRODUCTION

Transport sector as a provider of transportation services, in addition to the direct costs of the operation (like network and fleet maintenance costs and depreciation) impose cost to society indirectly. Much of these costs include environmental pollution caused by fossil fuel consumption. These costs can be included of accidents. Population leads urban development and changes in lifestyle create major problems in large cities. The big cities are facing with many problems such as air pollution, lack of green space, increase traffic, increase of population. Perhaps one of the most important issues related to the transportation system, reduce the adverse effects. The planning and management of transportation systems is raising efficiency and reducing the negative effects of its control. Environmental affects of air pollution in general and specifically as one of the negative consequences of a proposed urban transport systems. Different options for air pollution control strategies is due to the transport system, according to the characteristics of the transport system gives different results. For optimum utilization of the air pollution control solutions should also identify the different parameters of the transport system apply single method to evaluate different strategies.

In most work on multi-player game theory, payoffs are represented in tabular form: if n agents play a game in which each player has (say) two actions available, the game is given by n matrices, each of size 2^n, specifying the payoffs to each player under any possible combination of joint actions. For game-theoretic approaches to scale to large multi-agent systems, compact yet general representations must be explored, along with algorithms that can efficiently manipulate them.

In this work, we introduce graphical models for multiplayer game theory, and give powerful algorithms for computing their Nash equilibria in certain cases. An n-player game is given by an undirected graph on n vertices and a set of n matrices. The interpretation is that the payoff to player i is determined entirely by the actions of player *I* and his neighbors in the graph, and thus the payoff matrix for player *i* is indexed only by these players. We thus view the global n-player game as being composed of interacting local games, each involving (perhaps many) fewer players.

Each player's action may have global impact, but it occurs through the propagation of local influences.

Literature review:

Algorithms for computing Nash equilibria are well-studied. McKelvey and McLennan (1996) survey a wide variety of algorithms covering 2- and n-player games; Nash equilibria and refinements; normal and extensive forms; computing either a sample equilibrium or exhaustive enumeration; and many other variations. They note

Corresponding Author: Amin Roshani, Department of Mathematical, Payam Noor University, Tehran, Iran

that n-player games are computationally much harder than 2-player games, in many important ways. The survey discusses approximation techniques for finding equilibria in n-player games.

Several of the methods described are not globally convergent, and hence do not guarantee an equilibrium. A method based on simplicial subdivision is described that converges to a point with equilibrium-like properties, but is not necessarily near an equilibrium or an approximate equilibrium.

In contrast, for the restricted cases we consider, our algorithms provide running time and solution quality guarantees, even in the case of general-sum, n-player games.

Nash (1951), in the paper that introduces the notion of Nash equilibria, gives an example of a 3-player, finite-action game, and shows it has a unique Nash equilibria. Although all payoffs are rational numbers, Nash shows that the players' action probabilities at the equilibrium are irrational.

This suggests that no finite algorithm that takes rational payoffs and transforms them using addition, subtraction, multiplication, and division will be able to compute exact equilibrium policies in general Thus, the existence of an exact algorithm for finding equilibria in games with tree structured interactions shows that these games are somewhat simpler than general n-player games. It also suggests that approximation algorithms are probably unavoidable for general n-player games.

Several authors have examined graphical representations of games. Koller and Milch (2001) describe an extension of influence diagrams to representing n-player games, and suggest the importance of exploiting graphical structure in solving normal-form games. La Mura (2000) describes a closely related representation, and provides globally convergent algorithms for finding Nash equilibria.

Methodology:

Theoretical base of this research is game theory. Game theory is science of studying game and it is going to show when people are facing with game how they can decide? Games wantprinciples and decision rules in terms of interactive games to players of a game. In fact, this research tried to seek effective behavior on removing old cars.

Static game:

Static games with complete information refer to games in which players simultaneously choose their own conduct and the outcome of the game for all players to be selected for each combination of public information. Static game in strategic form and Strategic form game can be demonstrated as follows:

Players Collection:

We identify three players in this research:

Set of Players = {Auto makers, Old Cars, Governments}

The government is the trustee of the plan is scraping old cars. If the government with the letter G owner of old cars with C and the letter A show automaker.

N= {G, C, A}

We explain about each three players as following:

Staff of fuel transportation management:

The committee as a representative of the government and therefore the government's interests is same as interests of staff. Staff to maximize their benefits by reducing fuel consumption and thereby reduce air pollution. The car scrap scheme worn by their support. Campaign in order to increase their profits, should the car owner is encouraged to wear their worn-out of the car. It is assumed that the way to stimulate the car owner chooses to scrap old cars is facility. In fact, committee hopes that the facility will reduce fuel costs, however, but it has cost the government. As a result, the headquarters of the dismantled car could be worn to stimulate car owners, through the facilities of the objectives that can be this facility low or high. Therefore, the strategy of the campaign can be written in the form of payment of high and low payment.

Strategy of fuel committee staff is as following:

SG= {H, L}

H indicates that strategy of high facility and L shows strategy of low facility.

Owner of old cars:

We know old car owners as someone who are seeking to maximize his benefits. Utility is maximized when the car owner that could cost the loss of old car and buy a new car with the facility's staff. Note that in the more old cars belonging to low income people and generally used as a means of generating income and in according to high cost of old cars, owners of expect that campaign of fuel consumption pays facility when they are going to replace their cars. When there is no sufficient facility and when campaign not fulfills its promises. Therefore, the risk of not being able to replace your worn car holder for the owner as well and car owner has two options:

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Willingness to participate in the study and takes his car out of his vehicle, or that the lack of participation in the plan will be phased out.

Strategy vehicle owner:

Sc= {O, N}

Staff of the payment to the car owner or does not do well with frequent delays and the slow pace.

However, two major auto companies are using our own funds, continue to follow the plan and act as surfacing last year. The increase in employment resulting from automotive scrap and recycling, strengthen the country's automotive industry sales growth of automobiles and steel scrap supply and reduce storage costs for automakers and stimulate manufacturers to participate in the Plan. Therefore, automakers have two options:

Vehicle is worn out or the car is not worn out:

Strategy of automakers:

Sa={O,N}

Where:

O shows automakers intend to remove old cars and N indicates that lack of willingness to remove old cars.

Strategy:

The strategy of each player is given by the set of strategies of the players. The strategies of players can be summarized as follows:

SG= {H, L} SC={O, N} SA={O,N}

The strategic form of the game can be written as following:

N= {S, C, A}

Players Strategy:

S_G{H, L} S_C{O, N} S_A{O, N}

$S= S_G * S_C * S_A$ = {H, L}* {O, N}* {O, N}

S= { (H, O, O), (H, O, N), (H, N, O), (H, N, N), (L, O,O), (L, O, N), (L, N, O), (L, N, N) }

Outcome of Players:

$u_G(H, O, O)=3$, $u_G(H, O, N)=4$, $u_G(H, N, O)=2$, $u_G(H, N, N)=2$,
$u_G(L, O, O)=5$, $u_G(L, O, N)=6$, $u_G(L, N, O)=2$, $u_G(L, N, N)=2$,
$u_C(H, O, O)=6$, $u_C(H, O, N)=6$, $u_C(H, N, O)=3$, $u_C(H, N, N)=3$,
$u_C(L, O, O)=5$, $u_C(L, O, N)=5$, $u_C(L, N, O)=4$, $u_C(L, N, N)=4$,
$u_A(H, O, O)=6$, $u_A(H, O, N)=2$, $u_A(H, N, O)=2$, $u_A(H, N, N)=2$,
$u_A(L, O, O)=5$, $u_A(L, O, N)=4$, $u_A(L, N, O)=3$, $u_A(L, N, N)=3$,

These games can be written in matrix form as follows in which player has been shown and each picture and corresponding to a player's strategy.

If we choose O and A players:

Table 1: O and A players

		Player C	
		O	N
Player G	H	3,6,6	2,3,2
	L	5,5,5	2,4,3

Table 2: Choose N by player A.

		Player C	
		O	N
Player G	H	2,3,2,	4,6,2
	L	2,4,3	6,5,4

The answer can be found by playing the Nash equilibrium. It gets the best response of each player earns a combination of strategies identified in the table above:

The best response of G player:

$B_G (S_{-G}=(O,O))=L$ $B_G (S_{-G}=(O,N))=L$ (1)

$B_G (S_{-G}=(N,N))=L,H$ $B_G (S_{-G}=(N,O))=L,H$ (2)

The best response of O player:

$B_C (S_{-C}=(H,O))=O$ $B_C (S_{-C}=(H,N))=O$ (3)

$B_C (S_{-C}=(L,O))=O$ $B_C (S_{-C}=(L,N))=O$ (4)

The best response of A player:

$B_A (S_{-A}=(H,O))=O$ $B_A (S_{-A}=(H,N))=O,N$ (5)

$B_A (S_{-A}=(L,O))=O$ $B_A (S_{-A}=(L,N))=O,N$ (6)

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The best response of each player identifies throughout drawing line and it is shown that Nash balance method is (L, O, O).

Two-player mode:

However, by removing the automaker's two-player game in terms of staff and transportation fuel, the car owner with the same old strategies as following:

S_G={H, L} S_C={O, N}

The strategy of each player is described as following:

Outcome of Players:

Each player must rank a set of possible states of the game therefore, each player can imagine four situations:

First Situation) One player use H strategy and another one use strategy O.

Second situation) One player use H strategy and another one use strategy N

Third situation) One player use strategy L and another one use strategy O

Fourth situation) One player use strategy L and another one use strategy N

Strategic form of each player is as following:

Sets of Players:

N= {G, C}

The strategy sets of players:

SG= {H, L}

SC= {O, N}

S = SG*SC = {H, L}* {O, N} = { (H, O), (H, N), (L, O), (L, N) }

Outcome of players:

uG(H, O)=3, uG(H, N)=2, uG(L, O)=4, uG(L, N)=2,

uC(H, O)=4, uC(H, N)=3, uC(L, O)=1, uC(L, N)=**2,**

Matrix form is a following:

Table 3: Outcome in two-player mode

		Player C	
		O	N
Player G	H	2,1	3,4
	L	2,2	4,3

Nash balance:

We can find Nash equilibrium in the game throughout the best answer. Therefore, the best response of each player is achieved by strategic of competitors.

The best response of G player:

B_G (S_{-C}=(H,O))=3 B_G (S_{-C}=(H,N))=2 (7)

B_G (S_{-C}= (L, N)) =2 B_G (S_{-C}=(L, O))=1 (8)

The best response of C player:

BC (S-G=(H,O))=4 BC (S-G=(H, N))=1 (9)

BC (S-G=(L, N))=3 BC (S-G=(L, O))=2 (10)

In Iran if we do not consider technical issues and assume that even automakers are going to make car with low consumption. In terms of supply of subsidized fuel consumption, no one pay attention to this factor. However, in recent years in according to plan of reducing subsidies and fuel subsidies. Generally, we search about fuel consumption when we are going to buy a car. Therefore, major owners of old cars tend to plan their old cars fuel consumption of these vehicles and subsidies. Due to main audience of owner old cars are member of low-income community; we must pay attention to appropriate facilities and providing cars with high quality and appropriate price.

The plan initially due to adequate funding at the time was in progress, after a time, public funds for the project slowly and generally since 2008 bank for payment out of the car and stopped delivery of new car. In fact, Phases 4 and 5 of this plan was the appropriate rate, however, Phase 6 of the project took so slowly that the project remains on schedule. It was supposed to phase six more than 200 thousand new cars replaced with old cars. But the case of six phases that must be closed in 2007 years with two years suspended and delayed until the end of 2008 years was left ajar. According to statistics obtained from the beginning of the project (2002), have more than 2.5 million vehicles until 2009 were to be phased out. However, so far only 35 percent of this

number is outdated. Collecting old cars is one of plan which is facing with several challenges in improving period and market recession and affected by bank facility and process of replacing is very slow. Apart from the problems that people have to get a car loan, the introduction of alternatives to the car for automotive applications as well as during the slow process and it seems this project will be growing trend.

Conclusion and discussion:

Installment plan for old cars from the government-wide benefits including reducing air pollution, use less fuel and save currency and government in order to achieve the objectives of policy incentives, grants, loans and subsidies paid in addition to policy limits and prohibit traffic generator is used. In this paper, we used game theory to examine the role of facilitator in the phase-out of old cars. Therefore, three players defined as transportation and fuel management staff and owners of old cars and related strategies. Then, Remove the two-player game with automakers was analyzed from a static perspective. Three players in the auto and homeowners tend to balance out their old cars, but the facilities for this project are low. In the balance two-player mode where owners of old cars are inclined to Scrap old cars; however, facilities are low. It is shown that the process of implementation is slow as well as the government do not fulfill its obligations. Vehicle owners tend to be the major reason is that due to high fuel subsidies of old cars and reduction of fuel subsidies force old owner cars in participating the plan. However, the withdrawal of old cars going slow and somewhat ambiguous, and if the current situation does not change, certainly to the extent that the government intended to leave old cars. The main reasons for owners of old cars, the lack of ability to convert their vehicles and their cars are sources of income. Therefore, government can increase the facility to speed up plans to deal with the disadvantages that these vehicles to the entire community.

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