

Eradicating Accidents Using Management Information System

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Abstract: According to a recent World Health Organization report, India has highest number of road death in the world: 105, 725 died last year on road, followed by China, US and Russia. Worldwide, 1.3 million lives were lost. India loses \$20 billion due to road accident which is enough to feed 50% of the nation's malnourished children. "We need to further step up efforts to bring down the number of road accidents" CP Joshi, India's Road Minister said. "Road traffic crashes are a growing health and development concern affecting all nations," said Dr. Margaret Chin, WHO's director general, suggesting that it is important to have an action plan for an intensified response. So I came up with the plan that the root cause of an accident is time, people break rules just to save their few minutes, hence we make a penalty of those people who break rules as to waste their time by making them watch a video of an accident. Operation Research Technique is implemented so that manager can decide what and how much penalty should be given to minimize the accidents. This technique will bring 100% eradication of an accident because it is affecting the main root cause of problem.

1. INTRODUCTION

In India, an accident happens every 60 seconds and every 3.7 minutes, to be precise; a road mishap snuffs out a life. Although, globally, 88 countries have reduced the number of road fatalities between 2008 and 2013, India roads have over this time become more deadly. Driver's fault accounted for a whopping 77.5% of the total road accidents while pedestrian and cyclist's fault accounted for a mere 3.7%. In another disturbing trend, of the total number of road accidents, 53.5% were reported from rural areas, reflecting a rising tide of motorization in rural India. The WHO report states that another 20 to 50 million sustained non-fatal injuries as a result of road traffic crashes. The report says that there are five risk factors – which is speed, drunk-driving, helmets, seat-belts and child restraints. India has a dismal record on all five fronts. Although the country has speed limits for all types of roads and well-defined norms for alcohol content in blood for all drivers, detection of violation is very much low. A country with huge two-wheeler population, India has scored poorly on the compliance with helmets law. The global report points out that only 50% of drivers wear seat belts and it's less than 10% in case of passengers. Road traffic injuries are the eighth leading cause of death globally, and the leading cause of death

for young people aged 15- 20. More than a million people die each year on the world's roads, and the cost of dealing with the consequences of these road traffic crashes runs to billions of dollars. India's former Home Secretary, G K Pillai points out that road accidents and fatalities have never grabbed attention, while 2, 000 people dying annually in terrorist acts become a national issue. Hence I have proposed the whole Management Information system Technique to tackle the problem of road accidents.

1.1 Management

The most important thing is the management without which no matter how much strong is the strategy or planning but it fails. So for these purpose there should be at least three traffic police at each traffic signal which manages the record for public making crime of not following the rules. The main strategy used in the management is that the traffic police make a penalty of people doing crime as to watch a video of an accident and not to take only money from the public and let them go.

1.1.1 Strategy

As the majority of road accidents occurs because of the people saving their few minutes and are just in a rush to reach earlier at their destination. So we will make an arrangement of a CCTV camera at every traffic signal and also a computer lab exactly at the front of it so that anyone who is caught by making a crime he/she are ordered to watch a video of an accident, time limit of an accident depends upon the crime made by the person. Those decisions are taken by the Manager that up to what limit the person has to watch video depending upon the whole record of previous and present crimes made by that person. Special technologies of cameras are available so that no bribe is taken by traffic police because everything is recorded in camera.

1.2 Technology

An information technologist makes a database management system of the people making a crime and stores it. That can affect the people in many ways as if the person is having an

account in any bank than 20% of his/her money gets transferred to government on every transaction, these thing happens five times on one crime made by any person. Operation Research technique which is implemented for managers, have a software by which we can get an optimal table.

1. Convert a given linear equation into a standard form.(i.e. by adding surplus or slack variable)
2. Convert the equation into canonical form.(i.e. An equation must contain a basic variable)
3. Introduce an Artificial variable in an equation to convert it to canonical form and form a table representing the data.(Value of Artificial Variable is very small.)
4. Optimality condition: For a problem of minimization type if for all ($C_j - Z_j$) ≥ 0 the solution is reached and it is the most optimal solution for a given equation.

1.3 Organization

All the data obtained from the database management are organized according to a group of people making a similar crime, so same penalty to all people making same crime but the penalty increases with the increase in number of crime of the same person. There is a continuous revised database for every two hour and this whole record is send to the manager to make a decision.

1.4 Information System

It is a combination of Management, Technology and Organization. All together are used for the purpose of analysis of any problem which is the most important role of a Manager because through analyzing these data we get the best decision from a manager. Record of the vehicles passing through the road is carried out for 2 hour on the traffic signal of Surat. Using operation research technique algorithm we have achieved the goal of minimizing the number of crimes attained by the persons. As we saw so many reasons for the road accidents that are speed, drunk-driving, not wearing helmets and seat-belts out of which crime 3 is drink and drive, crime 2 is not having driving license and rest all crimes come under crime1 as breaking all driving rules i.e. not following the rules like wearing helmets or seat belts.

2. PROPOSED ALGORITHM

The method used to solve the Linear Programming Problem is Big-M Method.

Function for a given Linear Programming Problem (LPP):

$$\text{Mini Cr} = \sum_{j=1}^n C_j * x_j$$

$$\text{Sto: } \sum_{j=1}^n a_{ij} > b_i \quad i=1, 2, 3 \\ j=1, 2, 3$$

Non negativity
Restriction : $x_j \geq 0$

Equation of LPP:

Types of vehicles	Cr1	Cr2	Cr3	Resource Availability
3 wheeler	60	80	40	100
2 wheeler	100	80	80	200
4 wheeler	40	80	100	160
Penalty per 2 hour	60	72	100	

$$\text{Mini Cr} = 60x_1 + 72x_2 + 100x_3$$

Sto:

$$60x_1 + 80x_2 + 40x_3 \geq 100$$

$$100x_1 + 80x_2 + 80x_3 \geq 200$$

$$40x_1 + 80x_2 + 100x_3 \geq 160$$

Nonnegative restriction:

$$x_1, x_2, x_3 \geq 0$$

Cr1= Breaking the driving rules

Cr2= without driving license

Cr3= Drink and drive

b1=number of 3 wheeler passing on duration of 2 hours

b2= number of 2 wheeler passing on duration of 2 hours

b3= number of 4 wheeler passing on duration of 2 hours

a_{ij} = penalty of time duration of watching video per crime

x_{ij} = number of person making crime

Observation Table

Using Big-M method we have solved given Linear Programming Problem and obtained optimal table, using this manager can take the crucial decisions for minimizing the crime. Using sensitive analysis manager can get the idea about which are the majority of crimes happening due to which many number of death occurs and how can it be reduced.

3.1 Optimal Table of given problem is:

Cj		60	72	100	0	0	0	M	M	M	solu
CBi	B	x1	x2	x3	S1	S2	S3	A1	A2	A3	
60	x1	1	0	-1/3	0	-1/3	1/3	-1/6	1/3	-1/3	2/3
0	S1	0	0	8/3	1	-1/3	-2/3	-7/6	1/3	2/3	11/3
72	x2	0	1	17/12	0	1/6	-5/12	1/12	-1/6	5/12	5/3
Zj		60	72	82	0	-8	0	-4	8	10	
Cj - Zj		0	0	18	0	8	0	M+4	M-8	M-10	

3.2 Observation

We get the value of $x_1=2/3$, $x_2=5/3$, $x_3=0$

Indicating that the more number of crimes occurs because of cr1 and cr2 i.e. Crime for breaking driving rules and without driving license is more in number. So we do the sensitive analysis for getting the range for time limit of video allocated for each crime.

3.2.1 Sensitivity Analysis

Changes in the objective function:

Range for time limit for Cr1:

$$60 \leq c_1 \leq 114$$

So, the time limit for cr1 is of (60, 114) minutes.

Range for time limit for Cr2:

$$59.294 \leq c_2 \leq 72$$

So, the time limit for cr2 is of (59.3, 72) minutes.

Range for time limit for Cr3:

$$c_3 \geq 82$$

So, the time limit for cr3 is of greater than or equal to 82 minutes.

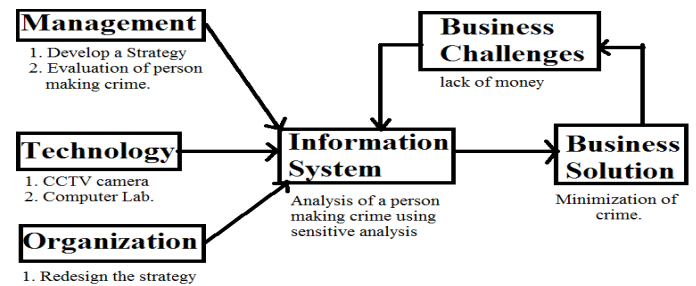
3. RESULT

According to Operation Research Technique we have obtained the optimal solution for a given Linear Programming Problem and optimal table is obtained using Big-M method and this is done for every 2 hours on each traffic signal and the results that we obtain by applying this method is

1. We can increase the time limit of watching accident video for the people breaking driving rules as up to 114 minutes or between 60 to 114 minutes.
2. Time limit for people making a crime of driving without driving license is between 60 to 72 minutes.

3. Time limit for people making crime of drink and drive is greater than or equal to 82 minutes.
4. There are two people who did the crime of driving without driving license.
5. There is no one making crime of drink and drive.
6. All the values of $(C_j - Z_j) \geq 0$.

4. CONCLUSION



Information System consist of a combination of Management, Organization and Technology where in Management we obtain strategy to make the people follow rules and regulation as we are applying in our case as wasting the time of people making crime as a strategy. In organization we organize the whole data of people making crime using database management system and using latest Technology we obtain the clear image of public who are not following rules and this entire thing together makes an Information System. Using Information System manager takes the decision to attain Business solution which is minimization of crime but there is also Business challenge which is lack of money, so for that we are applying a technique of taking 20% of money on each transaction made by the people on one crime for at least five times as a penalty so that all money goes to government and not to police directly. Hence we get a successful way for Eradicating Accidents using Management Information System.

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