

Real Life Optimization Problem using Excel and Solver

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Abstract: In this paper is concerned with real life problem were optimizing using via mathematical methods particularly we optimize the problem using operational research and find out a small solution to the problem. The objective is a road accident in certain causes. Furthermore, the outcome of any particular decision may also be uncertain. This paper provides an overview of this class of problems, proposes a linear programming problem framework, and the potential usefulness of operational research approaches for their solution.

Keywords: Road accident, Linear programming problem, Total no. of accidents.

1. Introduction

Road accident has become very common nowadays. As more and more people are buying automobiles, the incidences of road accidents are just increasing day by day. Furthermore, people have also become more careless now. Not many people follow the traffic rules. Especially in big cities, there are various modes of transports. Moreover, the roads are becoming narrower and the cities have become more populated.

Road accident is the reason that numerous deaths are caused each day. We need to ensure that we drive safely in order to save our life and the lives of the other people driving around us. It is better being late that to never reach, hence safe driving is necessary to ensure minimal road accidents.

A road traffic accident (RTA) is any injury due to crashes originating from, terminating with or involving a vehicle partially or fully on a public road. A road accident is when a vehicle, object, or person. These road accidents can lead to very horrible injuries and also death in some cases. When people break traffic rules, such as by jumping red lights, driving faster than the speed limit, etc., they can get into road accidents.

2. Causes of Road Accidents

Using the mobile phone while driving, breaking the traffic rules and entering from the wrong side driving, are some examples of carelessness. Furthermore, inexperienced and untrained drivers and those with poor eyesight who drive night are one of the major causes of escalating accident rate.

- Over speeding
- Drunken driving
- Distractions to driver

- Red light jumping
- Avoiding safety gears like seat belt and helmets
- Non-adherence to lane driving and overtaking in a wrong manner.

Various national and international researchers have found these as most common behavior of Road drivers, which leads to accidents.

3. Tips to Avoid an Accident

If you follow these common-sense steps, you will be taking the most important steps to ensuring you avoid an accident.

- Develop the right attitude about driving
- Get as much supervised practice driving as possible
- Always wear your safety belt
- Underage drinking and drug use is illegal
- Limit your passengers
- Limit your night driving
- Keep it slow and safe for starters
- Train for poor weather conditions
- Cell phones are for emergency use only on the road
- Drive a safe vehicle

4. Road Traffic Safety

Road traffic safety refers to the methods and measures used to prevent road users from being killed or seriously injured. Typical road users include pedestrians, cyclists, motorists, vehicle passengers, horse riders, and passengers of on-road public transport (mainly buses and trams).

A. *Important traffic rules to follow to ensure safety while driving*

- Always wear a seatbelt
- Avoid distractions
- Do not cross the speed limits
- Service your car regularly
- Follow traffic signals
- Maintain lane discipline
- Be careful during bad weather
- Maintain a safe distance
- Overtake from the right

- Give way for emergency vehicle

5. Linear Programming Problem

Aim:

- To formulate the given problem as a linear programming problem
- To solve the formulated linear programming problem using microsoft excel and solver.

Procedure:

- *Step 1:* Formulate the given problem as a Linear Programming Problem.
- *Step 2:* Install solver in Microsoft Excel.
- *Step 3:* Enter the problem in Excel sheet.
- *Step 4:* Fix the cell for decision variables and target cell.
- *Step 5:* Apply the ‘sumproduct’ formula in target cell and in the right-side column of the constraints.
- *Step 6:* Open ‘solver menu’ in the data tab.
- *Step 7:* Click the target cell in the ‘set target cell’ (or) ‘set objective option’.
- *Step 8:* Select the maximization or minimization option according to the problem.
- *Step 9:* Select the decision variable cells in ‘by changing cells’/‘by changing variable cells’ option.
- *Step 10:* Add all the constraints one by one in the ‘subject to the constraints’ option.
- *Step 11:* Click the LPP and Non-negative variables in the option menu.
- *Step 12:* Finally obtain the solution by clicking ‘solve’ option.

A. To covert the above data in linear programming problem

Let us assume that x_1 for fatal number of accident, x_2 for Grievous number of accidents, x_3 for Minor injury number of accidents and x_4 Non-injury number of accidents.

Linear Programming Problem is,

$$\text{Maximize } Z = \sum x_1 + \sum x_2 + \sum x_3 + \sum x_4$$

Subject to the Constraints

$$6694x_1 + 2482x_2 + 30585x_3 + 369x_4 \leq \sum 6694x_1$$

$$5x_1 + 3x_2 + 16x_3 \leq \sum 5x_1$$

$$18x_1 + 10x_2 + 70x_3 \leq \sum 18x_1$$

$$x_1 + 5x_3 \leq \sum x_1$$

$$7x_1 + x_2 + 10x_3 \leq \sum 7x_1$$

$$105x_1 + 8x_2 + 336x_3 \leq \sum 105x_1$$

And $x_1, x_2, x_3, x_4 \geq 0$

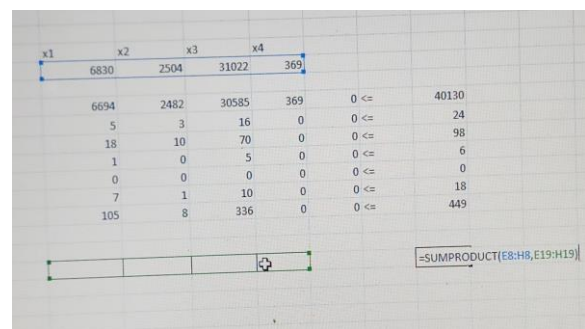
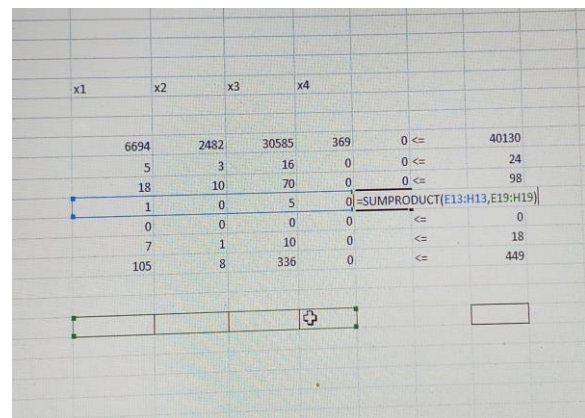
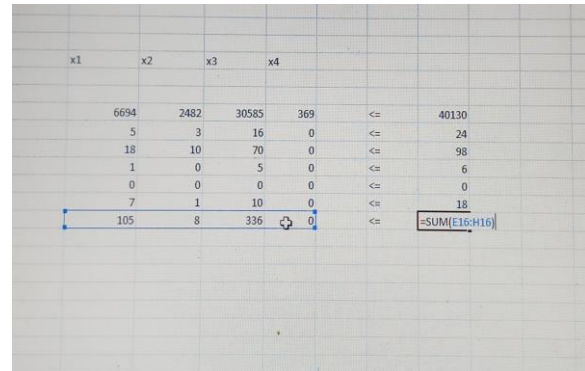


Table 1
Accidents according to causes up to November 2020

Types of Causes	Fatal No.of Accidents	Grievous Injury No.of Accidents	Minor Injury No.of Accidents	Non-Injury No.of Accidents
Fault of driver	6694	2482	30585	369
Fault of passenger other than driver	5	3	16	0
Fault of pedestrian	18	10	70	0
Fault of mechanical defect	1	0	5	0
Bad road	0	0	0	0
Bad weather	7	1	10	0
Others	105	8	336	0

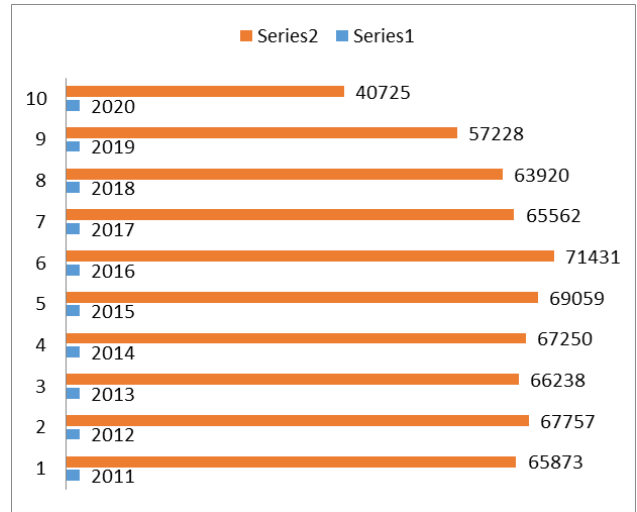
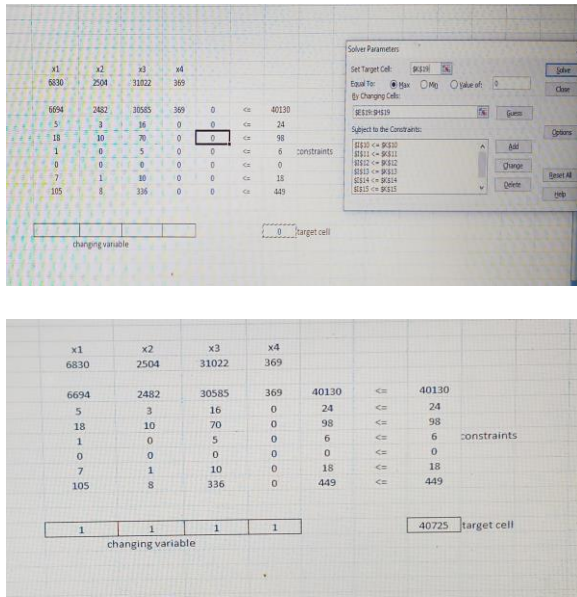


Fig. 1. Formulation of data in bar form during the year 2011 - 2020

In 2020 duration total No. of Accidents is 40725. The major cause for the accidents was fault of driver is 40130 out of 40725 which is (98.53%) which may be due to over speed, aggressive driving, using of cell phone etc.

Table 2
Accidents details in tamandu from 2011 – 2020

Years	Total accidents
2011	65873
2012	67757
2013	66238
2014	67250
2015	69059
2016	71431
2017	65562
2018	63920
2019	57228
2020	40725

A total of 40725 road accidents have been reported by the state in the calendar year 2020. The accidental death has reduced around -25. 62% during the year Nov 2020 and total accidents have been decreased by -23. 40% compared the previous year 2019.

6. Conclusion

As on November 2020 we have achieved the millennium goal on Road safety that the target of have the No. of deaths from road traffic accidents compared to base year 2016 as per the direction of the Road. Accidents will decrease if we increase road rules and regulations. Now total no. of accidents had decreases, so keep the rules. If we can convert the real-life problem in mathematical problem then solve it the solution.

References

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