

# Intervention Model used for Telematics

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**Abstract**— Telematics refers to the use of wireless devices and “black box” technologies to transmit data in real time back to an organization. Typically, it's used in the context of automobiles, whereby installed devices collect and transmit data on vehicle use, maintenance requirements or automotive servicing. Telematics is a general term that refers to any device which merges telecommunications and informatics. Telematics includes anything from GPS systems to navigation systems with software installed for transmitting the vehicle data. [1] To manage the records of insured policy holders, a computer system for telematics solution would like to identify and communicate to policy holders, who consistently speed above the prescribed road speed. Ultimately the insurance company associated with telematics may choose to cancel the policies of continuous speeders. Initially the telematics system will extract data to identify what level of speeding that they wish to target for communication in the case of over speeding drivers in the case of harsh events. Telematics solutions can be built for client dashboard to include the details of over speeding per road speed category (speed limit set). The information can then be used in an intervention model to alert the driver about maintaining the prescribed speed. [2] In the present investigation, an attempt was made to develop an Intervention Model used for telematics industries to determine the over speeding behavior of driver by measuring the vehicle speed. Here a module was developed to extract vehicle data summary to be built, whilst this is a single extract to help telematics system to establish some rules which likely that they want it to populate each day for over speeding events to communicate it to driver for safety measures.

**Key words:** Intervention Model, Telematics, GPS System, Harsh events

## I. INTRODUCTION

### A. Intervention Model:

Intervention model is a technique used to get the speed details (called speed events) of the vehicle from the telematics device fitted to the car which indicates the behavior of the driver while driving. This is to check whether the driver is driving safely or not in the prescribed road speed category/limit. This can be achieved by measuring the speed of the vehicle for a particular speed category. If the driver is driving safely within the specified limit, then the amount for his policy renewal will be less. But if the driver is driving harshly, the harsh data/events are collected from the telematics device of the vehicle and will be communicated in the case of harsh driving. The driver needs to pay more for policy premium renewal in the case of harsh driving. So an intervention model is developed to predict behavior of the driver while driving and this data can be used to calculate the insurance premium renewal. If the driver's behavior is harsh and continuous, his policy will be cancelled considering his over speeding behavior of the vehicle (car).

The telematics device fitted to the vehicle (car) will send the information to a telematics system (like vehicle speed, speed limit/category, latitude, longitude, mileage, area details and impact details if any). The telematics system receives data from the device and turns it into information and knowledge which can be used for data analysis purpose.

An Insurance Telematics solution can be developed to identify and determine the risk model that uses base data as well as telematics data to better understand risk and predict adverse events to drive towards a healthier portfolio of clients. The risk grading in the model indicates the deviance a policy holder shows from the expected distributions. To achieve this, the risk model built dynamically uses and evaluates a continuous flow of data from the telematics devices to predict how driver behavior impacts the risk of an individual. This intervention model data can be useful in the following ways. [2]

- Delivering meaningful high frequency data for analysis
- Turning the data into bespoke Management information (MIS reports)
- Reporting this back to your customer, or underwriters and pricing teams
- Monitoring driving styles, behaviors and recording mileage
- Transforming driving scores into risk rating factors suitable to your proposition

### B. Telematics:

Telematics enables wireless data communication and opens up a huge range of possibilities. It can enable you to have wireless television and internet on your vehicle. Telematics is essentially a range of different features, options and devices that are brought together by a single principle – data and communication. Through telematics we can enjoy many benefits in our vehicle on a daily basis such as roadside assistance and remote unlocking of your vehicle. Telematics is also used heavily in fleet tracking and management. More and more fleet owners are finding huge savings by adopting telematics technology. [3]

Telematics is the use of technology to measure the three-dimensional movement of an object. More specifically, vehicle telematics utilize mobile or other devices which access or contain accelerometers, magnetometers, gyroscopes and GPS to measure specific driving actions. The devices gather information from these sensors to accurately calculate driving trends, including factors such as mileage, hard breaking and accelerating, turns, time of day driven, and significantly more in depth information on the vehicle's movement.[4]

## II. OBJECTIVE OF INTERVENTION MODEL DEVELOPMENT

The main objective of this module/function is to provide over speeding events for each vehicle per speed zone/limit per day. The events will be recorded according to a pre-defined configuration set in the system.

The main purpose of this module is to extract over speeding data events from the telematics device fitted to the vehicle which help the telematics solution systems to establish some rules which likely those Organizations want to populate each day for over speeding events or harsh events as intervention model. This helps to monitor the driving styles and communicate the same to the drivers in the case of harsh events occurred.

### III. REQUIREMENT CONSIDERATIONS

- Build an extract from a table summarized by day, policy, deviceId and Roadspeed. (The DeviceMessage table has all the data of the vehicle like Policy Id, vehicle speed, speed category, mileage, road, area code etc)
- The details need to be extracted from live data.
- There will be 7 rows of data for each policy per day: For speed categories (Mph): 20, 30, 40, 50, 60, 70, 99 (i.e other than 20, 30, 40, 50, 60, 70).
- Each speed other than 0 which is an absolute should contain a count of number of seconds (messages) which have speeds over previous speed and up to the speed stated.
- Store the results in the database.
- Output table headings are defined as follows
  - PolicyID
  - Deviceid
  - RiskDate
  - Roadspeed
  - Speed 0
  - Speed5
  - Speed10
  - Speed15
  - Speed20
  - Speed25
  - Speed30
  - Speed35
  - Speed40
  - Speed45
  - Speed50
  - Speed55
  - Speed60
  - Speed65
  - Speed70
  - Speed75
  - Speed80
  - Speed85
  - Speed90
  - Speed95
  - Speed100
  - Speed105
  - Speed110
  - Speed115
  - Speed120
  - Speed125
  - Speed130
  - Speed135

### IV. SOLUTION IMPLEMENTATION DETAILS

The proposed solution for the above requirement is as follows:

- 1) Build DeviceMessage table which contains the entire vehicle data received from the telematics device. Extract the following data from the DeviceMessage Table
  - PolicyID
  - DeviceID
  - MessageTime
  - RoadSpeed
  - Speed
- 2) For a particular day and device IDs/policy IDs, get message count for the defined speed category.
- 3) Develop a function to store intervention data in to the database. This can be achieved by developing the worker role as mentioned follows:
  - Include this intervention piece of code in to the existing worker role "RiskRating (at the end of Risk rating worker Role)
  - The new piece of code will calculate the data for previous day on daily basis and post to table ("SpeedBreakdown").
- 4) The table should contain details of all devices/policies for a particular day – Speed and the count for a particular device and day.

### V. PROCESS INTERVENTION LOGIC

- 1) For the RoadSpeed data table add the following columns
  - MessageDate
  - PolicyId
  - AnotherRoadSpeed
  - AnotherSpeed
  - Speed0
  - Speed5mph
  - Speed10mph
  - Speed15mph
  - Speed20mph
  - Speed25mph
  - Speed30mph
  - Speed35mph
  - Speed40mph
  - Speed45mph
  - Speed50mph
  - Speed55mph
  - Speed60mph
  - Speed65mph
  - Speed70mph
  - Speed75mph
  - Speed80mph
  - Speed85mph
  - Speed90mph
  - Speed95mph
  - Speed100mph
  - Speed105mph
  - Speed110mph
  - Speed115mph
  - Speed120mph
  - Speed125mph
  - Speed130mph

- SpeedG130mph
- 2) UpdateMessageDate for Road Speed Table
  - MessageDate = MessageTime
- 3) Update policy Id
  - Get DeviceId
  - From the deviceId, get the policy Id
- 4) Initialize all the Road speeds to zero value (Speed0, Speed5mph....)
- 5) AlignRoadSpeeds
  - Create 7 rows for Road Speeds 20, 30, 40, 50, 60 , 70 and 99
  - For Road Speed 99: the category is : Speed <>40, <>50, <>60, <>70
- 6) AlignRoadSpeedCategory
  - Create a data table “dtSpeedCategories”
  - Add columns for “SpeedLimitMph” and “SpeedCategoryValue”.
  - Connect to 1055
  - Get the values for SpeedLimitMph and SpeedCategoryValue from the table SpeedCategoryValue.
  - Populate the rows for SpeedLimitMph and SpeedCategoryValue.
  - For the RoadSpeed, assign the SpeedCategoryValue for the RoadSpeed 20, 30, 40, 50, 60, 70 and 100.
  - Return table dtRoadSpeed
- 7) Align Speeds
  - Convert the speed in KMPH to MPH
  - For Speed5mph, set the values between 0.01 to 4.99
  - For Speed10mph, set the values between 5.00 to 9.99
  - For Speed15mph, set the values between 10.00 to 14.99
  - For Speed20mph, set the values between 15.00 to 19.99
  - For Speed25mph, set the values between 20.00 to 24.99
  - For Speed30mph, set the values between 25.00 to 29.99
  - For Speed35mph, set the values between 30.00 to 34.99
  - For Speed40mph, set the values between 35.00 to 39.99
  - For Speed45mph, set the values between 40.00 to 44.99
  - For Speed50mph, set the values between 45.00 to 49.99
  - For Speed55mph, set the values between 50.00 to 54.99
  - For Speed60mph, set the values between 55.00 to 59.99
  - For Speed65mph, set the values between 60.00 to 64.99
  - For Speed70mph, set the values between 65.00 to 69.99
  - For Speed75mph, set the values between 70.00 to 74.99
  - For Speed80mph, set the values between 75.00 to 79.99
  - For Speed85mph, set the values between 80.00 to 84.99
  - For Speed90mph, set the values between 85.00 to 89.99
  - For Speed95mph, set the values between 90.00 to 94.99
  - For Speed100mph, set the values between 95.00 to 99.99
  - For Speed105mph, set the values between 100.00 to 104.99
  - For Speed110mph, set the values between 105.00 to 109.99
  - For Speed115mph, set the values between 110.00 to 114.99
  - For Speed120mph, set the values between 115.00 to 119.99
  - For Speed125mph, set the values between 120.00 to 124.99
  - For Speed130mph, set the values between 125.00 to 129.99
  - For SpeedG130mph, values will be >=130 Mph
  - Return the data table dtRoadSpeed
- 8) Create the table dtCorrectedRoadSpeeds
  - Add the following counms
    - MessageId
    - DeviceId
    - MessageTime
    - OriginalRoadSpeed
    - NewRoadSpeed
    - AnotherSpeed
  - Add the rows for the above columns
- 9) Call intervention worker role function to insert the Road Speed correction data
- 10) From the table “dtRoadSpeed”, calculate the intervention as follows
  - Populate the values of DeviceId, PolicyId, RiskDate and RoadSpeed from the dtRoadSpeed
  - For all the Speed values (Speed0, Speed5mph, Speed10mph....SpeedG130mph), get the total count. (The table should contain details of all devices/policies for a particular day – Speed and the count for a particular device and day).
- 11) Create the datatable “dtSpeedBreakDown”. Update the rows of this table with the speed values calculated (Speed0, Speed5mph, Speed10mph....SpeedG130mph).
- 12) The design for the data obtained for intervention model is mentioned below. This is for a particular device/Policy Id and for a particular day.

DeviceId	PolicyID	MessageDay	RoadSpeed	Speed0	Speed 5mph	Speed 10mph	Speed15 mph	Speed 20mph	Speed 25mph	Speed 30mph	Speed 35mph	Speed 40mph	Speed 45mph	Speed 50mph	Speed 55mph	Speed 60mph
862193026605048	12285769	2015-12-28	20	75	50	20	12	0	11	7	7	6	4	0	0	0
862193026605048	12285769	2015-12-28	30	535	159	159	216	222	512	622	565	452	134	0	0	2
862193026605048	12285769	2015-12-28	40	0	6	7	8	10	22	36	88	85	63	32	0	1
862193026605048	12285769	2015-12-28	50	0	0	0	0	0	0	0	0	1	0	0	0	0
862193026605048	12285769	2015-12-28	60	0	0	0	0	0	0	0	2	0	0	0	0	0
862193026605048	12285769	2015-12-28	70	12	2	6	6	5	6	2	5	11	8	40	174	107
862193026605048	12285769	2015-12-28	99	4	4	4	9	4	2	2	2	3	8	0	0	0
862193026605048	12285769	2015-12-29	20	18	10	0	0	1	10	5	3	5	2	0	0	0
862193026605048	12285769	2015-12-29	30	308	93	89	150	160	546	446	511	463	79	0	0	2
862193026605048	12285769	2015-12-29	40	0	0	0	1	5	13	71	81	61	78	27	0	0
862193026605048	12285769	2015-12-29	50	0	0	0	0	0	0	0	1	1	0	0	0	0
862193026605048	12285769	2015-12-29	60	0	0	0	0	0	0	0	1	0	0	0	0	0
862193026605048	12285769	2015-12-29	70	0	18	3	3	4	2	3	7	16	14	35	101	174
862193026605048	12285769	2015-12-29	99	13	4	4	2	1	1	2	2	3	11	0	0	0

DeviceId	Speed 65mph	Speed 70mph	Speed 75mph	Speed 80mph	Speed 85mph	Speed 90mph	Speed 95mph	Speed 100mph	Speed 105mph	Speed 110mph	Speed 115mph	Speed 120mph	Speed 125mph	Speed 130mph	Speed 130mph
862193026605048	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
862193026605048	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
862193026605048	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
862193026605048	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
862193026605048	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
862193026605048	147	11	0	0	0	0	0	0	0	0	0	0	0	0	0
862193026605048	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
862193026605048	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
862193026605048	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
862193026605048	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
862193026605048	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
862193026605048	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
862193026605048	157	0	0	0	0	0	0	0	0	0	0	0	0	0	0
862193026605048	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

From the results got, determine the over speeding events for each road speed category. If these events crosses values more than 500, this will be considered as over speeding category. Inform the driver about the over speeding event behavior.

### VI. CONCLUSION

Intervention model is built by creating the worker role using C# code /Visual Studi IDE and insert the data in to the SQL database. This data is used to predict the behavior of the driver in the case of overspending events by calculating the speed for each speed category (speed limit). Finally this data can be used for policy renewal and to cancel the insurance policy of the vehicle in the case of overspending of the vehicle.

### REFERENCES

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