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THE AUTOMAT CVIM FOR BIG DATA ANALYSIS

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Abstract

In past years, internet of things[IOT] has been introduced within the automotive production. The info is processed through Common Vehicle data Model[CVIM] and communicated among the merchandise. CVIM is AutoMat's information model that permits the exchange of consonant and brand-independent vehicle massive information. The CVIM permits a standard understanding and generic illustration, brand-independent throughout the entire information worth and process chain. massive information describe a group of information that's immense in size and growing exponentially with time. The massive information permits to create the marketplace so as to leverage and exploit crowd sourced detector information.

Keywords*—Internet of Things (IoT), Big Data, Controller Area Network (CAN) and Common Vehicle Data Model (CVIM).*

I. INTRODUCTION

With the growing integration of connectivity and data services into vehicles, cars are becoming an increasingly important part of the IoT. To make things straightforward objects are connected to IoT, With interconnected devices you'll be able to higher prepare your life and be a lot of productive, safer, smarter and knowledgeable than ever before. For instance, When you enter a house the coffee maker automatically prepares a coffee for your favour and the heater in the bathroom automatically starts to heat itself according to your body favour, These are some of the applications of IoT.

An individual vendor details was been shared to service provider, hence in this project we are developing a common protocol to find the details of nearest vehicles, If a group of cars are connected to IoT, hence for sharing data we need to capture the id and give request in the IoT server and get the details, here Big Data is used to monitor Iot and used to collect car status details. This type of project can be implemented in electric vehicles and at present it can be implemented in Europe and in India it can be implemented for tollgate purposes. In this project we are going to develop a common protocol which will be useful for traffic management in vehicles. Here both hardware and software are used such that the hardware which include Node MCU, ARDUINOUNO, Infrared, Engine Control Unit, Buzzer, Lm35(temperature sensor) and software which include HADOOP, Mango db, Python3, Apache 2.0, Proteus.

II. EXISTING SYSTEM

Traditionally, the vehicle has been the extension of the man's ambulant system, docile to the driver's commands. Recent advances in communications, controls and embedded systems have modified this model, paving the thanks to the Intelligent Vehicle Grid. The automobile is currently a formidable device platform, interesting info from the setting and feeding it to drivers and infrastructure to help in safe navigation, pollution management and traffic management. Even though property services are introduced in several of the foremost recent automobile models, every car owners share their individual vendor details to each service provider to pass

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the informations of the vehicle.Although property services are existed.Nowadays,Automobiles has been introduced to the several foremost serving IoT. Automobiles that create wide range of platform and has large amount of information in huge networking range. In order to exploit this so far unexcavated treasure and provide an unhindered and unrestricted access-platform, the Horizon 2020 project AutoMat1 created a vehicle big data marketplace. Car manufacturer and providers can participate in the market place. It provides open and standardized interfaces for data access and offers.

Data is stored inside private data storage vaults. Vehicle users need to give their consent in order to allow the marketplace brokering the data. The AutoMat ecosystem enables new types of crowd sourced services. One possible application is the road roughness detection using the sensors of millions of cars in Europe in order to detect potholes and improve the quality of streets.

Especially in areas, with a low density of professional weather stations, where traditional models are not accurate, a significant impact can be achieved. One possible application is the road roughness detection using the sensors of millions of cars in Europe in order to detect potholes and improve the quality of streets.

III. PROPOSED SYSTEM

Unified ModelingLanguageTM (UML) is used for the high-level data modeling. The detailed data model is described in text form, while orientating at the “JSON Schema” data modeling language.

In addition, the data model is implemented in the Software Development Kit, in the programming language agnostic and machine-readable format "JSON Schema" and is publicly available via the automat GitHub repository. The CVIM documentation in text form orientates at the JSON Schema definition and provides examples using JavaScript Object Notation (JSON).

Aggregation method of signals is defined by measurement of channels.On the highest layer square measure the CVIM information Packages. They contain the particular aggregative vehicle sensing element information.

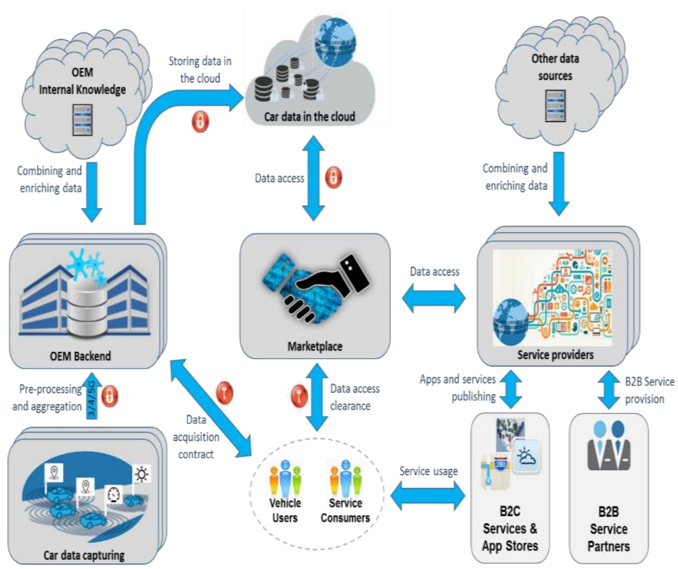

Figure 1.1 The AutoMat Ecosystem

Next to the harvested time-series or histograms, they contain descriptive meta information, CVIM supports time-series and bar chart aggregation strategies.

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1) Common Vehicle Information Model[CVIM]

The bottom layer contains Signals. Signals are the information providers within vehicles. They are the heart of the automobiles and it is their main duty to detect physical phenomenon and chemical quantities. They observe the environment and generate data that is exchangeable atAutoMat's Marketplace. They are one of the core components within AutoMat.The next layer is the Measurement Layer. Measurement and data aggregation from Signals is described in detail in the form of Measurement Channels. As the raw, aggregated sensor data exceeds by far the available storage and transferring capacities, the data needs to be pre-processed. CVIM supports the methods of down-sampling and histograms to reduce the size of data. Measurement Channels provide detailed information about the applied method.

The top layer is the data layer. Aggregated data will be stored in the data packages, that are store- and transferable. One data package contains data from exactly one signal measured with one Measurement Channel. In addition to the actual data, Data Packages contain header information (“meta data”). This header information provides ownership of the data and gives quality of signal indications by OEM signatures or describes parameters of the measurement (e.g. time, rough position estimate, etc.).

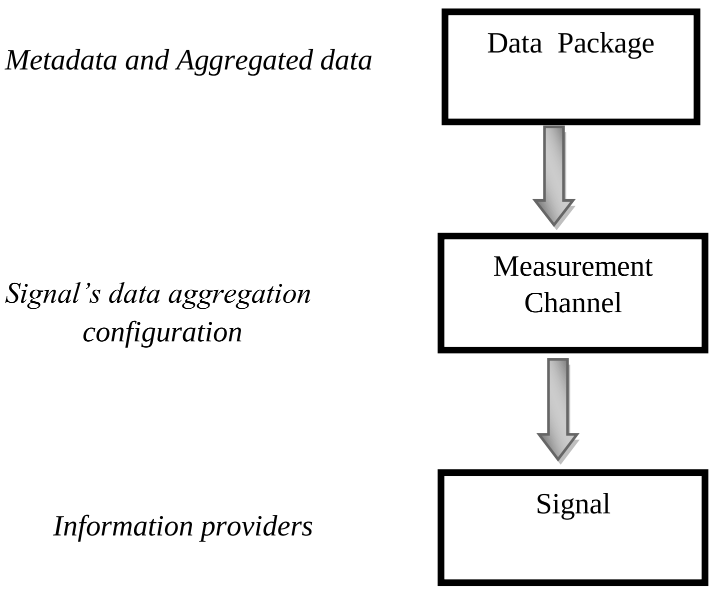

Figure 1.2:Layered High-level View of CVIM

Inside recent vehiclesupto 4000 signals with up to 100 times per second are processed. Further, diagnose information can be queried from up to 50 ECU's each providing up to 1000 signals in addition. CAN bus, MOST, Flex Ray or Ethernet networks transport this data. Table 2 shows the volume of data processed inside current vehicle’s data buses for each network type. Typically, in modern cars four to twelve CAN bus are used producing 12 GB of data per day. When data of a whole fleet of 1000 cars is mined the volume increases to 12 TB per day or 4.3 PB per year. In addition, the other network types provide even more bandwidth resulting in even larger data volume.

On the one hand, the major Big Data potential of the AutoMat project is represented by large amount of gathering vehicle. On the other hand, as the project as a whole need to be scalable and data transfer capacity from vehicles to the back end is limited, a pre-processing of the data within the vehicles needs to be done. As

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some of the data is redundant or strongly correlated to other information, it may be dropped and the maximum data volume reduced. Inside vehicles, computing power is limited and complex data encoding are therefore not feasible.

2) BIN CONFIGURATION

The CVIM data format supports different types of bin configuration properties for histogram based Vehicle Big Data pre-processing:

- **Lower Bound (LB)**: Defines the lower bound of the histogram
- **Upper Bound (UB)**: Defines the upper bound of the histogram
- **Number of Bins (NB)**: Defines the number of bins between upper and lower bound.
- **Bin Type**: defines how the bins are distributed between upper and lower bound. Following types are supported:

Linear bin type: Bins are distributed linearly between upper and lower bound,

e.g. with LB=0, UB=3 and NB=3 the resulting bins are 0-1, 1-2 and 2-3.
Logarithmic bin type: Bins are distributed logarithmically to the base of 10 between upper and lower bound, e.g. with LB=1, UB=1000 and NB=3 the resulting bins are 1-10, 10-
100 and 100-1000 .
Custom: The bin configurations need to be defined manually and do not have equal width.

3) DATA AGGREGATION DURATION

Histograms may be created over different time ranges. In CVIM, the duration of recording of one histogram is referred to as "Capture Interval". Histograms with Capture Intervals in the dimension of days, months or even per car lifetime are called long-term histograms, e.g., how often has the door been opened and closed. While reduced time durations histograms are called short-term histograms with sensor data aggregation for time spawns below one hour. This allows, in comparison to long-term histograms, a correlation of the measurement to the time it was aggregated or the space (see also Geo-histograms).

4) DOWN SAMPLING METHOD

CVIM data format supports presentation of the following down sampling methods (The variable ***x*** refers to the decimation factor):
Last-Known-Value/Decimation: The decimation down sampling method keeps only every ***x***th sample of all samples. All other samples are dropped and thereby lost.
Minimum: From ***x*** consecutive samples only the sample with the lowest (minimum) value is kept. All other samples are dropped and thereby lost.
Maximum: From ***x*** consecutive samples only the sample with the highest (maximum) value is kept. All other samples are dropped and thereby lost.
Average: From **x** consecutive samples the average (arithmetic mean) is obtained.

In the following Table an example for every method is given. There are 12 samples of one arbitrary signal

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given that are reduced using a decimation factor of x=3 that results in 4 samples.

Time [s]	1	2	3	4	5	6	7	8	9	10	11	12
Signal [1]	9	10	8	7	6	5	5	6	7	3	9	3
Decimation / Last	-	-	8	-	-	5	-	-	7	-	-	3
Known Value **Minimum**	-	-	8	-	-	5	-	-	5	-	-	3
Maximum	-	-	10	-	-	7	-	-	7	-	-	9
Average	-	-	9	-	-	6	-	-	6	-	-	5

Table 1.1: Example Signal Downsampling

5) HISTOGRAMS

Another approach of Vehicle Big Data Pre-processing is the storage of sensor data in value distributions, also called ***histograms*****.**Histograms describe a classification of data into bins. They count the number of observations that fall into each of the disjoint categories. Those bins are value ranges of the data signal (intervals) that may have equal or variable sizes. The edges of those bins need to be adjacent and non-overlapping.The Common Vehicle Information Model (CVIM) supports a wide variety of signals.Time Series is a sequence of data recordings (sample) from a signal in a time order. Each data sample is assigned to a specific point in time.

IV. CONCLUSION

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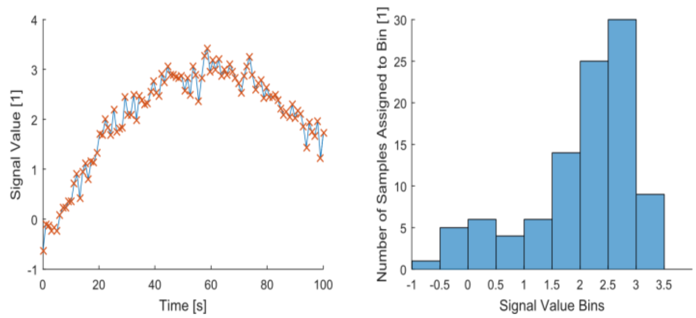

Figure 1.3: Example Signal (left plot) and its histogram (right plot)

Histograms can be created using the following two steps:

a. Split the total value range into bins.
b. Determine bin frequency f_i: For each bin i count the number of observations n_i that lie inside its value range.

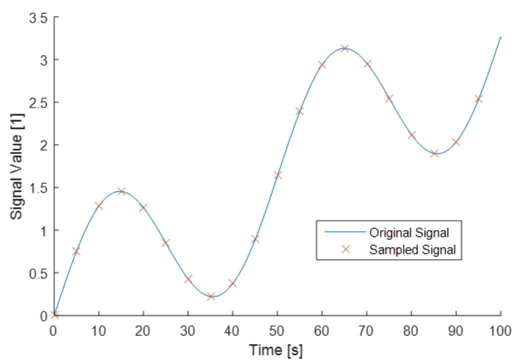

Figure 1.4: Time Series Example

Sensors in vehicles are often sampled several thousand times per second thus creating an enormous amount of data as indicated in the previous section. One approach to reduce the aggregated data volume is to down sample the rate of a sensor signal. Down sampling is done using an integer or rational fraction factor greater than one. The data volume created decreases linearly with this factor. For example, when a 1000 Hz signal is down sampled by a factor of 100, its target signal rate is 10 Hz.

In this proposed system, the embedded system is being concentrated and the protocol is being designed before the data is being stored in the big data.The government sectors got benefited by this project such that they can access and control all the vehicles in the particular area.

In this proposed system, we can communicate one vehicle to another and share information of vehicles to each other.This project can be more useful for electric cars in the future. IoT has a wide range that involves in everyday life of a human being.IoT plays a vital role and performs as the artificial intelligence to help the human life.

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