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Presentation of The METRAS Method of Sequencing Events

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Urban Accident Analysis Systems

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Medición, Evaluación, Análisis y Procesamiento de Datos en Accidentes de Tráfico y Seguridad Vial





The METRAS method of Sequencing Events

The following work presents and explains the development of a method aimed to improve the procedure for the collection of information of an essential item in the statistical accident questionnaire: "the accident type".

METRAS method

[Introduction]

Limitations of the current classification of the accident type::

- "The accident type" as it appears to be in the statistical forms up until now, raises several complications and limitations that affect the information and the results of the researches carried out:
 - The accident typology only allows to identify one event. Selection of only one category.
 - The selection criterion of a category may change according to the moment, the location, the circumstance, the research interests and even the accident characteristics. It may also change depending on the observer and is consequently subjective and not much defined.
 - Difficult identification given the dynamic nature of the accident.
 - It does not allow a realistic knowledge of what happened during the course of the accident.
 - It does not differentiate the first event from the most serious one.
 - It does not allow to link the type of accident or severity of the injury with fields or characteristics of the involved units, the drivers or the pedestrians.

[Introduction]

The point of view of the accident reconstruction::

Due to these limitations, the study of the traffic accident typology and its development have been traditionally treated from the perspective of the accident reconstruction, and not from the statistical perspective.

However, this type of study have many limitations:

- These studies are only carried out with a low percentage of accidents having concrete characteristics.
- The information has to be coded by computer in order to have access to it.
- The necessary costs and means to carry out these studies are very high.

TAKING THIS PROBLEM INTO ACCOUNT THE **METRAS** METHOD HAS BEEN DEVELOPED, aiming to be able to study the accident type from a statistical perspective.



[Definition] The METRAS (Measuring and Recording Traffic Accident Sequence) method::

- It is a new procedure to collect information on the typology of the accident. It integrates a structured, detailed and standardized sequential description of the accident. This is an alternative to the traditional classification.
- It considers that an accident is a complex process having a dynamic nature and that one single category does not allow its description.
- It implies a generic structured protocol in order to collect the information related to the sequence of the events that take place in the space and in the time during the course of an accident, from a statistical perspective. Each event is considered to be an important and identifiable incident in a system of pre-established categories, that make an accident.

[What is it?] The METRAS (Measuring and Recording Traffic Accident Sequence) method::

- This method reaches a higher detailed level of information / a better knowledge of the accident reality / it does not have the same costs as the in-depth studies.
- This allows drawing a bridge between the statistical studies and the accident reconstruction studies, raising an intermediate level of analysis.
- From this point of view, the traffic accident is considered to be the final result of a process in which several events are caused because of previous actions, offences or errors from the persons involved in the accident, environmental conditions, the road, or the interaction between several elements present just before the start of the accident.
- An event is a relevant or identifiable incident or happening in a system of pre-established categories that form an accident. It covers running off the road, collisions, running over, rollovers and fire of the vehicle.
- The sequence of these events is what will be called traffic accident.



[Backgrounds] The METRAS (Measuring and Recording Traffic Accident Sequence) method::

- National Centre for Statistics (NCSA) and Analysis National Highway Traffic Safety Administration U.S. Department of Transportation (NHTCA). Sistema Automotor Nacional de Muestreo (NASS) --- GES (in-depth studies, starting from a sample).
- INRETS (Institut National de Recherche sur les transports et leur sécurité) ---- Sequential model of the accident. (In-depth studies). Brenac and Fleury (1999) define the typical scenario.
- Amans et al. (2003) carry out a detailed study on the accidents from a macro perspective and an in-depth study. The macro analysis produces the current classification (the same), the in-depth study is necessary.
- CARE report on the accident typology
- Accident models from the labour perspective. MAIM. Davies y Manning. From interviews. It does not fit to the traffic model

METRAS method

METRAS method





[A practical example]::

- 0). Two vehicles are circulating in a motorway in different carriageways.
- 1). The A vehicle (yellow one) leaves the road from the left
- 2). The A vehicle hits the centre guardrail
- 3). The A vehicle makes a frontal collision with the B vehicle that is circulating in the opposite carriageway

[8]

[A practical example] Classic classification of the accident type::

- 1). The A vehicle (yellow one) leaves the road from the left
- 2). The A vehicle hits the centre guardrail
- 3). The A vehicle makes a frontal collision with the B vehicle that is circulating in the opposite carriageway

40. TIPO DE ACCIDENTI 1. Colisión de vehículos	E 2. Colisión vehículo-obstáculo	3. Atropello:	4.1. ☐ Vuelco en la calzada IZQ. D 5-6. Salida de la calzada 5.☐ 6	CHA.
en marcha 1.1. FRONTAL 1.2. FRONTOLATERAL 1.3. LATERAL 1.4. ALCANCE 1.5. MÚLTIPLE O EN CARAVANA	en calzada 2.1. UEHÍCULO ESTACIONADO O AVERIADO 2.2. VALLA DE DEFENSA 2.3. BARRERA DE PASO A NIVEL 2.4. OTRO OBJETO O MATERIAL	 3.1. □ PEATÓN SOSTENIENDO BICICLETA 3.2. □ PEATÓN REPARANDO EL VEHÍCULO 3.3. □ PEATÓN AISLADO O EN GRUPO 3.4. □ CONDUCTOR DE ANIMALES 3.5. □ ANIMAL CONDUCIDO O REBAÑO 3.6. □ ANIMALES SUELTOS 	NOISION 1. CHOQUE CON ÁRBOL O POSTE 2. CHOQUE CON MURO O EDIFICIO 3. CHOQUE CON CUNETA O BORDILLO 4. OTRO TIPO DE CHOQUE 5. CON DESPEÑAMIENTO 6. CON VUELCO 7. EN LLANO 8. OTRA 7.1. Otro	





[A practical Example] Limitations of the classic definition::

ONE SINGLE CATEGORY TO DEFINE THE ACCIDENT TYPE

According to the classic classification of the accident type in Spain, the previous example could be classified in several ways:

- 5.3 Running off by the left hitting the ditch
- 5.4 Running off by the left with another type of impact
- 2.2 Collision against bumper fence
- 3.1 Frontal collision

SEVERAL CRITERIONS TO SELECT THE ACCIDENT TYPE

Criterion of the first event of the accident

- Criterion of severity of the injuries
- Combinatorial criterion of elements
- Infrastructure criterion
- Other criterions

Moreover, the accident type information is not associated with any of the involved unit (vehicle/pedestrian).

To these complications, we have to add the problem <u>of filling in the</u> <u>questionnaire from their own instruments</u> that have different classifications.

[10]

[A practical example] Stages of the METRAS method::

The METRAS method proposes several stages:

- 1. A stage prior to the accident sequencing that contains data about the place, each one of the involved units (vehicles, pedestrians), actions prior to the accident carried out by the involved drivers or pedestrians, offences of each driver or pedestrian, errors, mechanical failures of each vehicle, psychophysical conditions of the drivers or pedestrians (alcohol, drugs, illness), fields that are present in the current traffic accident statistical questionnaires.
- 2. A conflict stage, that is the innovative part, in which the accident takes place and that is composed by the succession of different events that shape the accident, the order of appearance of these events, the order of participation and appearance of the vehicles that have been involved in each event, pointing out also the most serious event.

[11]





[A practical example] The way to fill in the information with the METRAS method::

- The way to fill in the accident sequencing in the conflict stage is the following one:
 - Firstly, in the "involved units" section, in the first and in the second cell, the unit(s) involved in the first event has to be pointed out.
 - Then, from a large list of categories of accident types (not complex), the type of accident that took place has to be selected. If this event has caused the most serious consequences on the persons involved in the accident, we will point it out as the most serious event.
 - Further on, the next row has to be filled in by giving the information about the second event that took place and so on until the last event, being accurate with the order of the events.
- By following the example, the accident information will be encoded like the accident sequencing that appears in the following chart:





[Results of this codification] What is the METRAS method allowing::

- Firstly, if we try to describe the accident from the information that has been entered in the chart, we could get the following description: the yellow car, with an excess of speed, leaves the road from the left, hits the centre guardrail, overruns the other carriageway and makes a frontal collision with the minibus that was circulating correctly.
- As we may observe, this information could be used to explain what happen during the accident without having to write it, having the information encoded and allowing a more objective and faster point of view. It also allows to draw a graphic image of the accident.



[Results of this codification]

What is the METRAS method allowing ::

- On the other hand, the accident structure allows to carry out several analyses:
 - The information about the first event allows to identify what first happened and then study the influence of the infrastructure conditions, the situational factors, the factors of the driver / pedestrian and of the vehicle to prevent the accidents. It could be a key element for the study of the active safety.
 - In the example, the relationship between the first event of the accident (running off the carriageway) and the prior elements to the accident (excess of speed) could be studied.
 - The information about the most serious event allows to know the event that has caused the most serious consequences for the involved persons. This could be a key element for the study of the elements of passive safety.
 - In this example, having the information that the frontal collision has been the event that has caused the greatest severity of the accident, causing two serious injured persons and one casualty, we can know what are the events that cause the greatest consequences. So, as for the severity of the injuries, a frontal collision is more important than to run off the carriageway.



[Results of this codification]

What is the METRAS method allowing ::

Finally, the whole accident could be studied, and then investigate if the accidents that start in a particular way, even if it is a type of accident that has practically no serious consequences, may become more complex accidents with large consequences. In this case it could be possible to study what is the evolution of the accidents that start with a car running off the carriageway and if they use to have serious consequences. This information could help to identify several accident scenes and prevent the occurrence of this type of accidents with so serious consequences. Accident sequencing may allow to draw patterns of accident rate for particular roads, vehicles and even drivers or pedestrians.



[The METRAS method in a very complex accident]





METRAS method

[17]

- A: Red lorry B: White minivan
- **C: Ambulance**
- **D:** First white lorry
- E: Last white lorry

ACCIDENT SEQUENCING				
UNITS	EVENTS	MOST SERIOUS EVENT		
A B	7	X		
BC	7			
B	20			
A D	7			
Α	20			
Α	35			
A B	7			
E C	7			
E D	7			

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[The experience with the METRAS method] In Catalonia::

- It has its <u>first practical experience in the SIDAT project</u> <u>framework</u>, carried out by the SCT in collaboration with INTRAS.
- Before introducing this section to the questionnaire, a pilot test was carried out.
- Participants: Members of the police forces of the four districts of Catalonia.
- **Objective:** Value the understanding of the process, evaluate the instructions, homogeneity of the answers, value the errors, check whether the categories are appropriate or not, value the need of training, improvement suggestions.
- Task: Fill in a sequencing table from an accident report. Identify the involved units, the event, the order of occurrence of the facts and the most serious event.
- Sample: From a descriptive analysis of the serious and fatal accident rate in Catalonia, a sample of representative reports of this accident rate in motorway and urban area, by district and by involved units is selected.



[The experience with the METRAS method] In Catalonia::

PROCEDURE

- Each report is filled in by up to four different agents.
- Each participating agent fills in accident sequences from different level of complexity (number of events / units involved).
- Finally, a sample of 73 traffic accident reports, 55 agents that filled in the data and a total number of 305 accident sequences is achieved.

RESULTS OF THE PILOT TEST

- UNDERSTANDING: Practically whole the agents do understand the procedure.
- Around 80% correctly answer to the first event and the most serious one.
- The reports sometimes do not have enough information, and may be interpreted differently.
- There is a coincidence of 90%.
- Doubts: a person that has been run over is not considered as a unit, they do not take running off the road into consideration.
- This pilot test showed very positive results as for the understanding of the method, easiness of completion, objectivity, both for motorway and urban area accidents.



[The experience with the METRAS method] In Spain::

- Its second practical experience is presented in the framework of the project carried out by the DGT in collaboration with INTRAS, in order to carry out a new urban questionnaire for traffic accident with casualties in Spain.
 - A Working commission made up of local police agents with traffic accident competences has positively valued the method and has considered to put it on trial with good perspectives.
 - Several local polices in Spain will, individually, put on trial the system in their municipalities (Madrid, A Coruña...). In Madrid they already have their first experiences with the training of the agents.
 - A pilot test is carried out to evaluate the new urban contents in which this system is presented as section of the statistical questionnaire for serious and fatal accidents. This pilot test has two stages.



[The experience with the METRAS method] In Spain::

- The first stage of the pilot test consists of: the agents in charge of the data collection fill in the serious or fatal questionnaires to evaluate from the reports and information they have in their system about accidents with specific characteristics that take place in their municipality lately. In this stage, the participation of X agents and a completion of X serious or fatal questionnaires is estimated.
- **The second stage** consists of the completion of the statistical questionnaires for the accidents that happen during the pilot test week together with documents of evaluation of the difficulties and contents. It is foreseen to get a total of X serious or fatal questionnaires.
- This pilot test is being carried out between the 4th and the 17th of June 2007, so the results are not yet available.



[The experience with the METRAS method] Contributions to conferences::

The METRAS method is presented as communication in the "IV Conference of Survey Methodology", organized by the Public University of Navarre in Pamplona on the 20-22 of September 2006.

Metraseis, a leading company for the creation of quantitative, qualitative, international, online studies, promotes in the framework of this conference the awarding of the second edition of the prize to the most innovative contribution in the field of the survey methodology.

This award is granted by a commission composed of two persons assigned by Metraseis, the president of SIPIE and two members of the Scientific Committee of the Conference.

The <u>Metraseis Award</u> for the most innovative contribution in the field of the survey methodology was given to the "<u>METRAS method of</u> <u>event sequencing in the field of traffic accident statistical</u> <u>questionnaire."</u>.

[Conclusions]::

CLASSIC PERSPECTIVE:

- Many doubts to identify the accident type
- Different criterions (criterion of severity/first event...)
- Difficulty in complex accidents

METRAS METHOD

- Allows improving the current information quality and reliability in the classification of the accident typology.
- Knowing each event and the order of occurrence.
- Fixing several accident typical scenarios.
- Identifying the first event.
- Identifying the most serious event.
- Identifying the units involved in each event.
- Allows a sequential description that may represent the basis for the report automatization.
- New perspective for the accident study from the macro point of view.
- Less costs and resources than the in-depth studies.
- It does not undergo the own modifications of the legal procedures.
- Allows the conversion to the classic accident typology.



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Presentation of The METRAS Method of Sequencing Events END <u>THANK YOU FOR YOUR</u> <u>ATTENTION</u>

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