Third International Conference on Information Systems for Crisis Response And Management in Mediterranean Countries. October 26-28, 2016 University Carlos III of Madrid. Madrid, Spain

MADRID 2016
ISCRAM-med

# POSTER PAPERS

**Paloma Díaz**
**Narjès Bellamine Ben Saoud**
**Julie Dugdale**
**Chihab Hanachi (Eds.)**

DEI Interactive Systems Group

ISCRAM

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# ISCRAM-Med 2016

## Third International Conference on Information Systems for Crisis Response and Management in Mediterranean Countries

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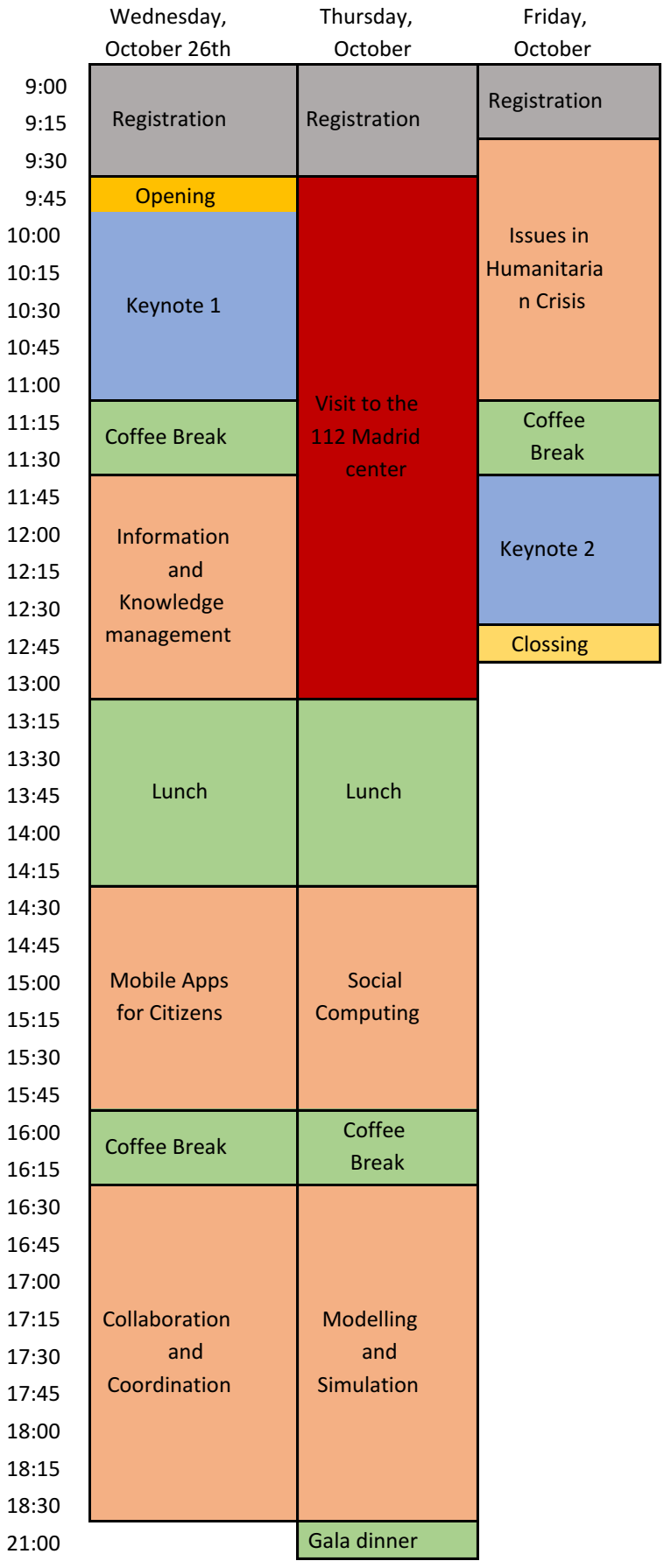
# CONFERENCE PROGRAM

## Conference Program



# Wednesday, October 26th 2016

9:00-9:45 Registration

9:45-10:00 Opening session

10:00-11:15 Keynote

The role of the International Organization for Migration in the Mediterranean crisis

*Nunes Nuno, CCCM & IOM*

11:15-11:45 Coffee break

11:45-13:15 Session 1: Information and Knowledge management

Coordination Mining in Crisis: a tool and a case study (F)

*Chihab Hanachi, Manel Tahari and Meriem Riahi*

A Rule-based Computer-Aided System for Managing Home Accidents in Childhood (S)

*Baya Naouel Barigou*

GIS-based Multi-Criteria Analysis and if then rules for ranking industrial zones (P)

*Taibi Aissa and Atmani Baghdad*

Emergency Crisis Management Models: an ontological review (P)

*Ali Al Imem, Ahmed Maalel and Henda Hajjami Ben Ghezala*

Modeling emergency care process taking into account its flexibility (S)

*Asma Mejri, Sonia Ayachi and Ricardo Martinho*

13:15-14:30 Lunch

14:30-16:00 Session 2: Mobile Apps for Citizens

Improving first aid skills: how local conceptions of risk influence user engagement with the First Aid App in Israel and Malta (S)

*Susan Anson, Maurice Said, Hayley Watson and Kush Wadhwa*

Emergency Management and Smart Cities: civic engagement through gamification (F)

*Marco Romano, Paloma Diaz and Ignacio Aedo*

Scenario-based evaluation of 112 application “Pomoc” (S)

*Anna Stachowicz, Marcin Przybyszewski, Jan Zych, Patrycja Młynarek and Rafał Renk*

Inclusive access to emergency services: An action research project focused on hearing impaired citizens (P)

*Vaso Constantinou, Andri Ioannou and Paloma Diaz*

16:00-16:30 Coffee break

16:30-18:30 Session 3: Collaboration and Coordination

Building city resilience through collaborative networks: A literature review (F)

*Raquel Gimenez, Leire Labaka and Josune Hernantes*

Towards integral security concepts for government buildings through virtual facility reconstruction (F)

*George Leventakis, George Kokkinis and Thanasis Sfetsos*

Work Practice in Situation Rooms – An Ethnographic Study of Emergency Response Work in Governmental Organizations (F)

*Jonas Landgren and Fredrik Bergstrand*

Towards Crisis Simulation Mediation Information System Engineering (S)

*Aurélie Montarnal, Anne-Marie Barthe-Delanoë, Sébastien Truptil, Frédérick Bénaben and Audrey Fertier*

## Thursday, October 27th 2016

9:00-9:45 Registration

10:00-13:00 Visit to the 112 Madrid center

13:15-14:30 Lunch

14:30-16:00 Session 4: Social Computing

Analyzing and Visualizing Emergency Information in a Multi Display Environment (F)

*Paloma Diaz, Teresa Onorati and Sergio Del Olmo Pueblas*

From the social semantic web to recommendation (P)

*Firas Ben Kharrat, Aymen Elkhleifi and Rim Faiz*

Which centrality metric for which terrorist network topology? (F)

*Imen Hamed, Malika Charrad and Narjès Bellamine Ben Saoud*

X-ETL Engine: from relational model to a multidimensional model (P)

*Nawfal El Moukhi, Ikram El Azami and Aziz Mouloudi*

16:00-16:30 Coffee break

16:30-18:30 Session 5: Modelling and Simulation

SPRITE – participatory simulation for raising awareness about marine submersion risk on the Oleron island (F)

*Carole Adam, Franck Taillandier, Etienne Delay, Odile Plattard and Mira Toumi*

BDI modelling and simulation of human behaviours in bushfires (F)

*Carole Adam, Geoffrey Danet, John Thangarajah and Julie Dugdale*

Obtaining optimal Bio-PEPA model using association rules: Approach applied to tuberculosis case study (F)

*Dalila Hamami and Baghdad Atmani*

Optimization of Orchestration of Geocrowdsourcing Activities (S)

*Kahina Bessai and François Charoy*

# Friday, October 28th 2016

9:00-9:30 Registration

9:30-11:15 Session 6: Issues in Humanitarian Crisis

Visual Synthesis of Evolutionary Emergency Scenarios (F)

*Monica Sebillo, Maurizio Tucci and Giuliana Vitiello*

Knowledge Management for Humanitarian Assistance and Disaster Relief (KMHADR) (S)

*Francesca Fallucchi, Massimiliano Tarquini and Ernesto William De Luca*

Sentiment Analysis of Media in German on the Refugee Crisis in Europe (S)

*Gerhard Backfried and Gayane Shalunts*

Towards an agent-based humanitarian relief inventory management system (F)

*Maroua Kessentini, Narjès Bellamine Ben Saoud and Sami Sboui*

11:15-11:45 Coffee break

11:45-12:45 Keynote

Working together: an experimental approach to understand collaborative and prosocial behavior

*Angel Sánchez, UC3M*

12:45-13:00 Closing session

# POSTER PAPERS

# Inclusive access to emergency services: An action research project focused on hearing impaired citizens

Vaso Constantinou[1], Andri Ioannou[1], Paloma Diaz[2]

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**Abstract.** In case of emergency, hearing impaired people are not always able to access emergency services and, hence, they do not have equal access to social support and infrastructure. In this work we undertake the development and evaluation of a system aiming to meet the communication needs of hearing impaired citizens in cases of emergency. The system consists of (i) a mobile application that records and sends the details of an emergency event, and (ii) a central management system that handles these calls from the operation center at the emergency services. The system was completed in four cycles of design, development and evaluation with the involvement of 74 hearing impaired users and three officers from the Cyprus Police (Emergency Response Unit).

**Keywords:** emergency services; technology for hearing impaired people; inclusive citizen participation; inclusive design; action research

## 1 Introduction

In the European Union 9% of the total population, that is 44 million people, are deaf or hard of hearing [1]. In Cyprus, where this study was conducted, the number of deaf or hard of hearing people is currently approximated at 1000, according to official data from the Ministry of Labor Welfare and Social Insurance. The rights of people with disabilities are registered internationally by the UN Convention on the Rights of Persons with Disabilities and locally, by the constitution and laws of the Republic of Cyprus [2]. Unequal treatment is determined as the impossible or unreasonably difficult access to services and the failure to implement changes, such as the use of specific tools that would facilitate access to services for persons with disabilities. However, although the legislation guarantees the rights of people with disabilities, in practice the implementation of accessibility for all is limited, with an emphasis on physical access. In this work, we emphasize that the concept of access is not limited to physical access, but should also include access to services to all citizens including those with disabilities.

A few studies have focused on the obstacles faced by hearing impaired people when contacting emergency services. These studies have shown that they have significantly less recorded access to primary care and emergency services [6], which is largely due to infrastructure deficiencies [4]. According to the European Commission, the majority

of disabled people have no access to the EU emergency number 112, mainly due to weak infrastructure, equipment and procedures. Seven countries have implemented infrastructures for 112 in order to be accessible by people with hearing disabilities [1]. The solutions implemented to date vary. In some countries, specialized text phones are used and communication is made by exchanging messages, or in some cases, text is translated into voice through a relay service. Another solution implemented in France involves communication by sending a fax using preprinted sheets [1]. Some other solutions allow the exchange of SMS with the emergency services, but have the disadvantage of a possible delay in messaging as supported by Chiu et al. [3] and Meng et al. [5]. Considering that hearing impaired citizens are not always very proficient at using the written language and therefore their ability to use SMS as a communication tool in emergency situations is limited [1], some EU countries have used communication services with predefined SMS messages containing the event location using GPS [1]. As another option, specialized video relay services support the communication between a hearing impaired person and normal hearing person through an intermediate operator who translates from and to the sign language.

This study undertakes the development and evaluation of a system aiming to meet the communication needs of hearing impaired citizens in cases of emergency. The system consists of (i) a mobile application which records and sends the details of an emergency event, and (ii) a central management system that handles these calls from the end of the emergency services (https://youtu.be/28fGVy41dFY). The implementation was completed in four cycles, for the development of applications and the overall evaluation.

## 2 Methodology

The present study was completed in cycles of design, development and evaluation with the involvement of 74 hearing impaired users and three officers from the Cyprus Police (Emergency Response Unit). Data was collected in each cycle and findings lead to improvements of the system, which was subject to investigation in the next cycle, until all requirements were met in a total in four cycles.

### 2.1 Participants

The study involved a total of 74 participants, partially 35 men (47.3%), 61 deaf (82.4%) and 13 (17.6%) hard of hearing. Other participants were three officers from the Cyprus Police - Emergency Response Unit (CP-ERU).

### 2.2 Procedures

Cycle 1. This cycle involved face-to-face meetings with the deaf participants (N=74) where data was collected via questionnaires and focus groups. Also, data was collected via interviews with the three officers of CP-ERU. The data collected led us to the

identification of requirements, the preparation of the specification and design of a functional prototype of the system.

Cycle 2. This cycle involved a subgroup of 15 deaf participants with range of ages from 21 to 64. The prototype system was examined by each of them completing four scenarios, aiming to present any weaknesses or problems encountered. The scenarios included: (S1) There is an accident on the motorway (police call); (S2) There is a fainted boy (ambulance call); (S3) There is a fire in a rural area (fire call); (S4) You came home and you realize that it has been burgled and your mobile does not have GPS (police call without GPS). Evaluation data fed into the second version of the system that included all the changes proposed, both by users and CP-ERU officers.

Cycle 3. In this cycle a new subgroup of 20 deaf users (ages 24- 61) participated in the evaluation of the application using the same scenarios and data collection procedures as in cycle 2. Another meeting was also held with the CP-ERU officers. The final version of the system is presented in the next session.

Cycle 4. A final round of evaluation was conducted in cycle 4 with 36 deaf participants (ages 22 - 68) for whom the system was new. Five usability-type measures were gathered: (1) time for completing four scenarios (same scenarios used in cycles 2 and 3; (2) user errors; (3) errors repeated more than once; (4) number of unsuccessful attempts to reach the emergency services, (5) number of unsuccessful attempts to reach the emergency services. Moreover, the participants completed a usability questionnaire and qualitative data was collected via focus groups at the end of the experience. Last, three CP-ERU officers were observed using the system (responding to the 4 scenarios) from the end of the CP emergency services.

## 3 System

The system is composed of two parts. First, the system includes a mobile application for deaf users that collects the event data, creates an XML file containing the information and sends it to a specific address on the server. Second, the system includes a data management application at the end of the CP-ERU, recording events into a database (MySQL).

The mobile application was developed using android studio considering the large market share for Android OS. The main screen of the application contains three predefined function buttons for emergency calls: (1) police, (2) ambulance, (3) the fire department, using GPS for tracking the location of the incident. By pressing one of them the application creates an XML that contains all the elements of the event and sends to a specific address. A fourth button was added for emergency calls without GPS, in case the device does not have GPS or the user is located in a space where communication with satellites is not possible (Fig. 1). In this case, the application requires the "Message" field to be completed by the user to record his position.

The data management application makes use of JavaScript for retrieving and displaying data and PHP for XML management and data recording in the database. The application allows for incident data viewing and sending messages to the users. The application checks for new records (every 10 sec.) and displays the cumulative number of events, listed in three categories: all events, outstanding and resolved.

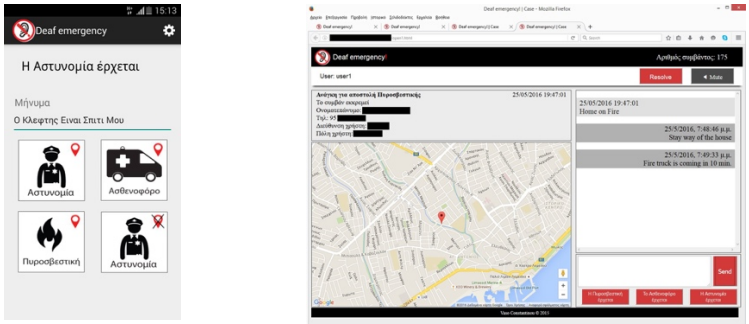


**Fig. 1.** Application screenshots: mobile application (left), data management application (right)

## 4 Analysis and Results

Results from the final round of evaluation demonstrated how the system can provide easy and direct access to emergency services, without the need of any intermediate, enabling the inclusion of these citizens in a critical process such as the response to an emergency. A detailed presentation of the results is beyond the scope of this demo paper and is presented elsewhere (please check research at http://cyprusinteractionlab.com/).

**Acknowledgments.** Authors acknowledge travel funding from the European Union's Horizon 2020 Framework through NOTRE project (H2020-TWINN-2015, GA Number: 692058).

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# GIS-based Multi-Criteria Analysis and if… then… rules for ranking industrial zones

AissaTaibi, BaghdadAtmani

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**Abstract.** The approach proposed in this article allows, from a study of geographic, environmental and socio-economic criteria, to cooperate If Then rules, Analytic Hierarchic Process (AHP) and geographic information system (GIS) for spatial choosing of the right site for installing industrial projects. The result obtained by IAHP (Intelligent Analytic Hierarchic Process) for ranking industrial zones in Algeria is refined by a viewing GIS-IZ (Geographic Information System for Industrial Zones). The IAHP unit ranks industrial zones using AHP after reduction of judgment criteria by If… then… rules and GIS-IZ module to the visualization of these zones on the map. The system was designed for the evaluation of a new methodology of multi-criteria analysis guided by data mining. Only the Spatial Decision Making Support System (SDMSS) is presented here.

**Keywords:** GIS, MCDA, MCDA-GIS integration, Industrial zones, AHP, if…Then rules.

## 1 Introduction

The project under investigation is to rank the industrial zones of western Algerian programmed by the state to satisfy the expectations of investors**,** for the economic balance of regions and population stabilization with respect to the environment. Policy makers should act early based on deep analysis of the environmental, socioeconomic and other criteria (factors, constraints) to carefully carry out their selection to end without risks. Anarchical zoning to solve such problems can cause epidemiological change and deterioration in the health of citizens. The linear model of Simon (intelligence, design, and choice) and its extensions are insufficient to respond to the complexity of these problems [1]. Decision making in this project is complex because of the inherent trade-offs between sociopolitical, environmental, ecological, and economic criteria. Each zone is a spatial action since action to take is spatial if it is defined by its geographical location, shape and spatial relations [2]. Most judgment criteria have a geographical character. The specifics of this kind of problems is in favor of integration between GIS and MCDA. The researchers focused on this approach since 1999 trying to answer questions like: What MCDA methods to integrate with what GIS? In what field the approach is used? What integration mode is adopted... hundreds of articles have been published to answer this questions, the earlier works are that of Diamond and Wright (1988), Janssen and Reitveld (1990),Carver (1991), Langevin et al (1991 [3]. The conceptual idea on which is based MCDA-GIS integration work is to use the functions of GIS to prepare inputs necessary for the MCDA methods and GIS presentation potentialities to visualize the results of the analysis on the map [4]. Geographic information systems (GIS) are used to model, store, manage, view, analyze, and represent objects or collections of spatial objects [5]. Analytic Hierarchy process (AHP) is used because it is successfully applied in the fields of industrial location[6], it is a user-friendly method and have mathematical properties and it is understandable by the decision maker. AHP allows ranking [7]. A knowledge base especially for the problem is constituted with a set of decision rules [8]. The objective is to reduce the number of objective technical criteria. In this paper, Pairwise comparison matrices are built on the basis of a performance table made for the same case study but using an outranking method [9]. IAHP unit is developed for ranking, the best zones are obtained while visualization is performed by GIS-IZ unit on map before and after ranking. Before the aggregation by AHP, if ... then… rules are used to reduce the number of criteria. Reduction of criteria improves results and reduces the complexity. When adopting GIS-MCDA approach in this case, a mixed integration mode is proposed. We encountered many problems such as the choice of the appropriate MCDA method, the subjectivity and hesitance of decision makers. To solve the second problem we will engage data mining. The rest of this article is presented as follows. Section 2 is devoted to present briefly

GIS-MCDA integration and if…then… rules , Section 3 is devoted to the Proposed Spatial Decision Making Approach, a case study is illustrated in section 4 and we end with a conclusion and perspectives.

## 2 Integration between GIS,MCDA and If…Then… rules

All data are processed and aggregated in one hand by MCDA using appropriate decision rules and by GIS for spatial analysis and mapping in the other hand.[4] Has proposed three integration mode (a: Indirect Integration, b: Built Integration, c: Complete integration). In this paper a mixed integration is proposed: Mapping geographic criteria is made independently (indirect integration) while visualizing function is integrated directly with the MCDA Module. (Fig. 1).

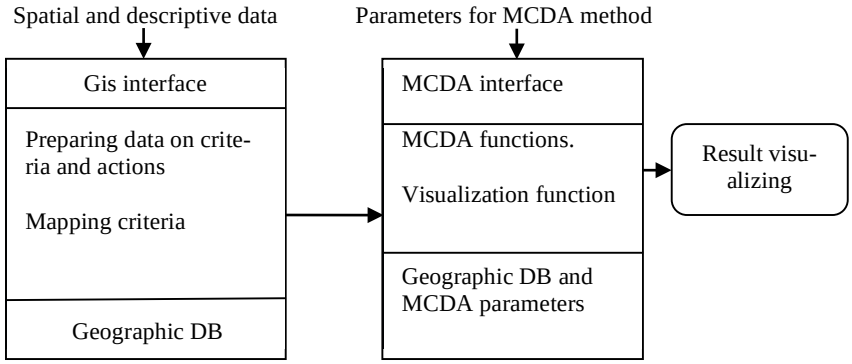



**Fig. 1.** GIS-MCDA proposed mode integration.

The rules base serve as a filter that perform a pretreatment of information and consequently reduce the number of criteria to be processed by MCDA [10] (Fig. 2)

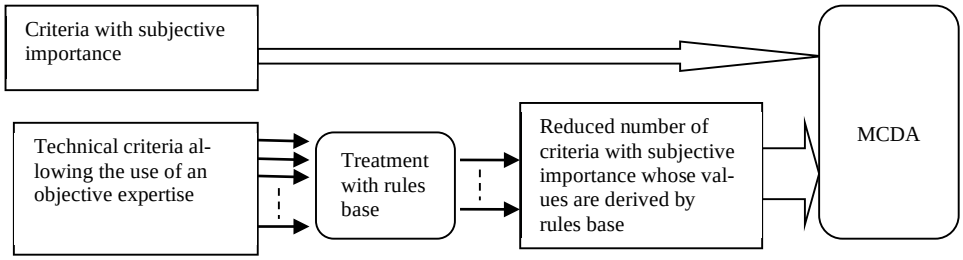
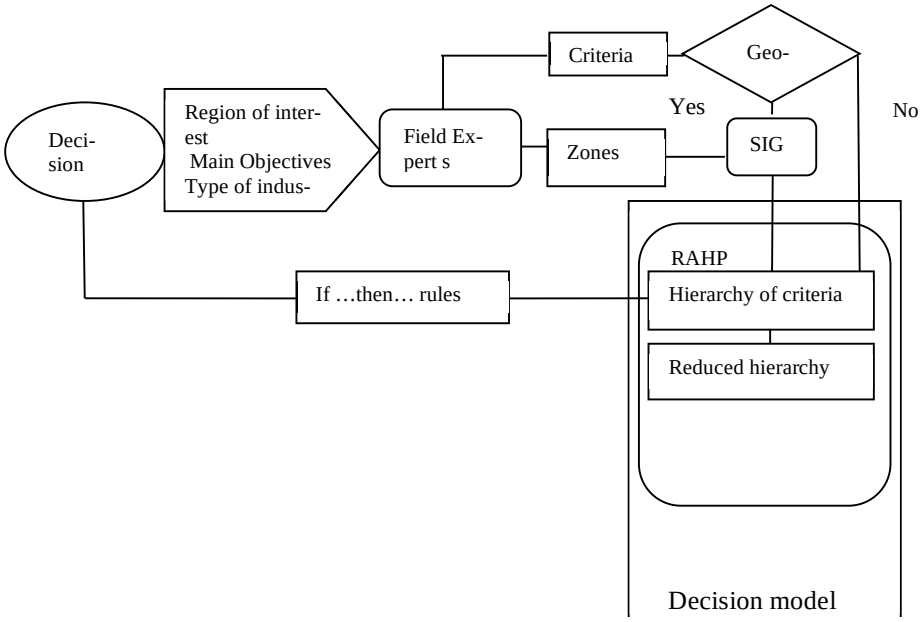



**Fig. 2.** Combining multi-criteria analysis and rules base inspired from [10]

## 3 Proposed Spatial Decision Making Approach

The proposed approach consists of two phases: Screening and Evaluation, as depicted in (Fig. 3)



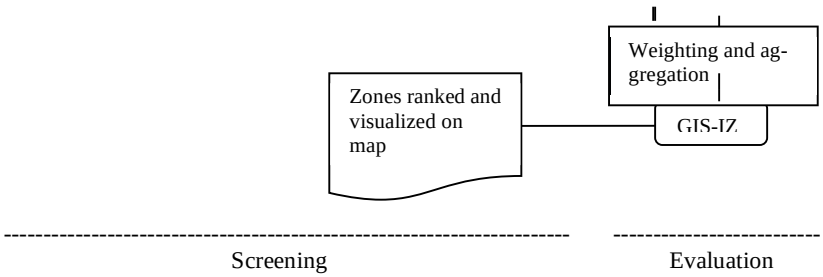



**Fig.3.** Framework of proposed approach

# 4 Case Study

## 4.1 Set of actions

Of the 39 industrial zones created through the entire national territory by ANIREF (Agence Nationale d'Intermédiation et de REgulation Fonciére) [11] our study has focused on the industrial zones of western Algerian. Each zone is an action (A1: Maghnia, A2: Sidi Bel Abbes, A3: Ras Elma, A4: Sidi Ahmed, A5: Horchaia.)

## 4.2 The criteria

The initial criteria used in this study were classified into four categories: natural risks, socio-economic, environmental impact and climate characteristics. According to these categories, 11 criteria are defined. Fig.4 shows the hierarchy of judgment criteria.

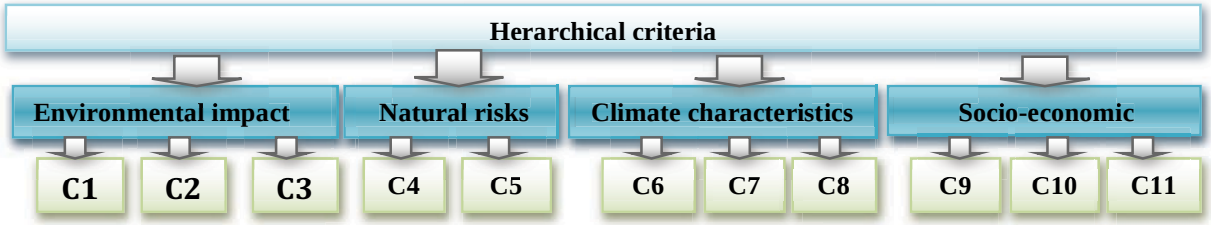



**Fig. 4**: Hierarchy of judgment criteria.

(C1): Risk groundwater pollution. (C2): fauna and flora problem. (C3): Noise citizens.(C4): Seismicity. (C5): Flood. (C6): Temperature. (C7): Rainfall.(C8): bioclimatic Floor.(C9): Cost management (C10): equipment and development potentiality (C11): Transport Infrastructure

Certain criteria are geographic as shown in (Fig. 5). The decision maker refers to the thematic maps of these criteria and to geographical positions of actions on these criteria maps to give the pair wise comparison matrices with help of a performance table [9]

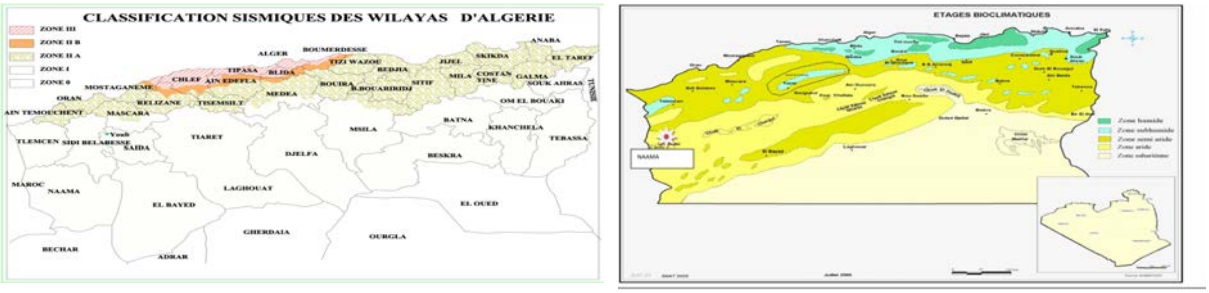



**Fig. 5.** Seismic classification and Bioclimatic Floors of Algeria [11]

## 4.3 Rules base

Rule base must be developed with the help of expert since the deductions must be based on the field expert. (Fig.6) show the set of criteria after pretreatment by rules .Example of rules used in this case is given below:

If ((15 < C6< 20) and (50<C7<200) and (C8 =semi arid)) then (climate = favorable)

If (C4 = strong and C5 = strong) then (natural risk = strong)

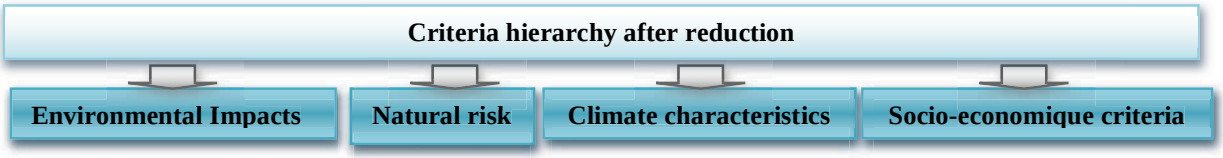



**Fig. 6.** Criteria hierarchy after reduction by if…then…rules

## 4.4 Results

After pair wise comparison and aggregation by both AHP and IAHP ranks are given in table 1 and table 2 below:

Table1: Zone ranks using IAHP

| Action | Weight | Rank |
|---|---|---|
| SBA | 24.55% | 1 |
| Hourchia | 18.62% | 4 |
| Koléa | 20.00% | 3 |
| Ras Elma | 23.47% | 2 |
| Maghnia | 7% | 5 |

Table2: Zone Ranks using AHP

| Action | Weight | Rank |
|---|---|---|
| SBA | 20.27% | 2 |
| Hourchia | 16.98% | 4 |
| Koléa | 17.04% | 3 |
| Ras Elma | 23.8% | 1 |
| Maghnia | 7% | 5 |

## 5. Conclusion and perspectives

By comparing the two results we note that changes are not significant between IAHP and AHP. In terms of complexity we save to build eleven (5X5) matrices with aggregation of each one.

This study allowed us to determine the usefulness of the approach for many sectors where the decision is important and dangerous, and intersects with the geography and even history. It is a contribution to make out the approach from the academic side to the field. The rank of an industrial area so obtained is an index that can: Criticize the choice of this zone, Alert the planners and builders of the area and assign the area to adequate investment projects. Our perspectives are to extend the study on all industrial zones at the national level. To remedy the disadvantage of MCDA methods in modeling the preferences of decision makers with subjectivities and hesitance we will engage data mining.

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# Emergency Crisis Management Models: an ontological review

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**Abstract.** Laziness and grievous un-seriousness methods taken by governments for handling complex crisis had only brought more fuel to the fire and unfortunately left it untreated. As technologies has reached significant progress to provide in time, urgent, management solutions to take over crisis of their own. Unluckily, an evidence growth on continuous emergent events still proves the opposite. Understanding this inability and setting up ways on how to resolve it requires meditation moment on current research studies. This move is an attempt to cut off with the gap mentioned above and another move to rethink modeling and developing modern crisis management approach. This paper presents the state of the art of Emergency Crisis Management and our envisaged approach.

**Keywords:** Crisis Management. Ontology. State of the art. Collaboration. Context.

## 1 Introduction

The chasing curse of crisis tragedy in all its myriad forms globally strikes planet earth, causing an immediate damage with no warning signs, driving the scene through a negative change in stability. Typically, a crisis is kept vague and unexplained for anyone to finally surprise and create chaos anywhere, anytime in a moment of inadvertency and surprisingly overload the management capacity. Knowledge engineering based technology's resounding success were chosen to treat crisis. Still, interpreting terrorist waves recently witnessed in Tunisia (Sousse 2015), France (Paris, 2015), USA (San Bernardino, 2015), resulting infrastructure destruction; to many deaths; injuries among innocent civilians, military and internal security staffs proves that traditional management ways are not playing their role and technologies are out of it. Luckily, ontologies' advantages are a corner stone to push crisis management phases works effectively. Our intentions are to provide a review of ontologies used so far for crisis management approaches and to state the missing points. The paper is organized as follows: Sect. 2 presents the state of the art of Emergency Crisis Management; Sect. 3 discuss our envisaged process; Sect. 4 ends up the paper with a conclusion.

## 2 State of the art

Intents behind reading the literature are redirected to build a coherent knowledge base on all phases of crisis management. For that we address the following questions:

- Where knowledge on crisis resides? (Social networks, databases, experts…);
- Has knowledge already represented or grouped in assembled models? How so?
- How and for what kind of use cases been used for? (e.g. firefighting rescue mission).

For the quest of proper, complete, and semantically understandable knowledge on crisis one major element have been adopted to do so are ontologies. In fact, ontologies stick to its capability to represent data and information towards higher conceptual level and derive more valuable knowledge. Indeed, ontologies were the main focus of several approaches for modeling knowledge on crisis and on their management. In this paper relevant ontologies were selected in terms of (1) crisis coverage; (2) use cases; (3) usage and roles; (4) goal; (5) crisis types. A more in-depth review of ontologies for crisis management can be found in [20]. The selected ontologies, concepts, taxonomies, vocabularies are used to support crisis management domain applications. The ontologies were more or less used for: (a) collecting and storing relevant information from heterogeneous sources; (b) feeding source for algorithms to make continuous analysis or interpretation; (c) information filtration process; (d) queries; (e) store hidden dependencies with engines help; (f) rules; (g) giving access to of users, agents or applications; (h) visualization of threats and terrorist networks; (i) event extractions (newspaper, articles, magazines etc.) [9, 4, 1, 5]. Up to now, the proposed ontologies were not detailed enough to cover most management phases and crisis types making it too generic [5, 13] or too specific for particular domain [4] and that both would be difficult for adaptation or to be reused. Further works added real-time concepts to ontologies to tackle complex and dynamic emergency situation and support real-time decision making [6, 16, 17, 18]. The complexity of crisis yet requires a unification of the right supplies and expertize on using them wisely. By that, context and collaboration was considered as a key cores to provide real-time decision making and construct situation awareness within disaster management resulting a collaborative environment to group units and let them work in intelligent manner to share convenient tasks, resources, supplies and receive optimal directions [12,7,11,2]. In these works, context concepts constantly vary in terms of numbers which make context an open research still very much an open research area. Context ontologies also considers mobility of users to send meaningful information or to allocate resources and items based on their profiles, devices capabilities, time of interaction, skills, location and the activities they perform. Matching standard ontologies as FOAF, vCard, owl-time, FIPA…raise situation awareness in crisis hardware and software [15]. In crisis, collaboration also plays critical role for the seamless integration of heterogeneous knowledge and treatments of critical situation through the coordination of processes, tasks, and activities between actors to achieve common objectives [10, 19]. The collaboration between crisis or context ontology by alignment functions to get access to standard ontologies such as w3c geospatial vocabulary, and semantic sensor network ontology empowers real time monitoring of incidents [3, 8, 15]. In summary we set up context, collaboration and mobility as key features to evaluate research studies (see Table 1). In

here knowledge on crisis are built upon layers, we aim to reuse and extend this effort in developing our approach.

**Table 1.** Comparative review on vocabularies, concepts, taxonomies used in crisis management of four dimensions provided above: context, mobility, collaboration done for adaptation purposes: ++: very rich; +: rich; +/-: less rich; -: poor.

| Reference | Context Support | Collaboration Support | | Mobility Support |
|---|---|---|---|---|
| | | Static | Dynamic | |
| [9][1] | - | - | - | - |
| [4][5][13] | +/- | - | - | - |
| [6][16][17][18] | + | - | - | - |
| [2][8][7][11][12] | + | + | - | - |
| [15] | ++ | - | +/- | + |
| [10] | + | - | + | - |
| [3] | +/- | - | +/- | - |
| [19] | - | - | ++ | - |

## 2 Envisaged Process

Managing crisis requires all potentials and a deeper knowledge to produce vital emergencies scenarios. Our envisaged process for the future will comprise various actors, ontologies, services and collaboration patterns to trend collaborative and context-aware mobile decision support approach for real-time emergency management.

## 3 Conclusion

A short review on the ontologies devoted to crisis is provided. Ontologies, collaboration, context, mobility are key features to develop our approach in the near future. Our intentions continue (i) to cover most crisis types and all management phases; (ii) To invest in artificial intelligence, knowledge, dynamic approaches to solve the dilemma; (iii) to validate our proposal based on real use cases.

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# From the social semantic web to recommendation

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**Abstract.** This paper present a new recommendation algorithm based on contextual analysis and new measurements. Social Network is one of the most popular Web 2.0 applications and related services, like Facebook, have evolved into a practical means for sharing opinions. Consequently, Social Network web sites have since become rich data sources for opinion mining. This paper proposes to introduce external resource from comments posted by users to predict recommendation and relieve the cold start problem. The novelty of the proposed approach is that posts are not simply characterized by an opinion score, as is the case with machine learning-based classifiers, but instead receive an opinion grade for each distinct notion in the post. Our approach has been implemented with Java and Lenskit framework; the study resulted in Movie dataset, we have shown positive results. We compared our algorithm to Slope One algorithm. We have obtained an improvement of 8% in precision and recall as well an improvement of 16% in RMSE and nDCG.

**Keywords:** Recommendation system, collaborative filtering, user profile, social network, user cold start.

## 1 Introduction

Recommender systems help users to identify their interests and sets of choices by predicting the usefulness degree of an item or group of items to these users. They are defined as a special type of information filtering that gives information about which items might be interesting to users. Recommender systems generate personalized recommendation for users based on a set of previously rating items. However, social networks and platforms promote the participation of users in many ways, stimulating the expression of opinions about the contents inserted by other users, by ‘Like’, ‘Share’ annotations, star-rating systems... This huge amount of data is a precious information source about perceptions, trends, and feelings, and a lot of research is being carried on to identify ways for extracting meaningful information from these data. Indeed, social networks could be an important source of recommendation.

We have improved the Slope One algorithm [4] by external knowledge and through some experiments results. The approach has been implemented in Java and tested on the Netflix MovieLens dataset.

## 2 Related works

In a social network context, the identification of the opinion of users is receiving an increasing attention. It is a striking indicator of the appraisal of topics, people, situations, re-sources and trends. Hence, the development of opinion Mining [1], of ontologies of emotions and of W3C markup language proposals like Emotion Markup Language [2]. However, there are few application that still use the most avanced results in web technology to deal with opinion. Moreover, most of the approaches use emotional ontologies where emotions are individual isolated units (e.g. WordAffect). Such considerations motivated our focus on the ontology of emotions in [3], an OWL ontology where emotions are structured and organized in levels, trying to integrate the results of the most recent psychological models.

## 3 Our approach

### 3.1 General architecture

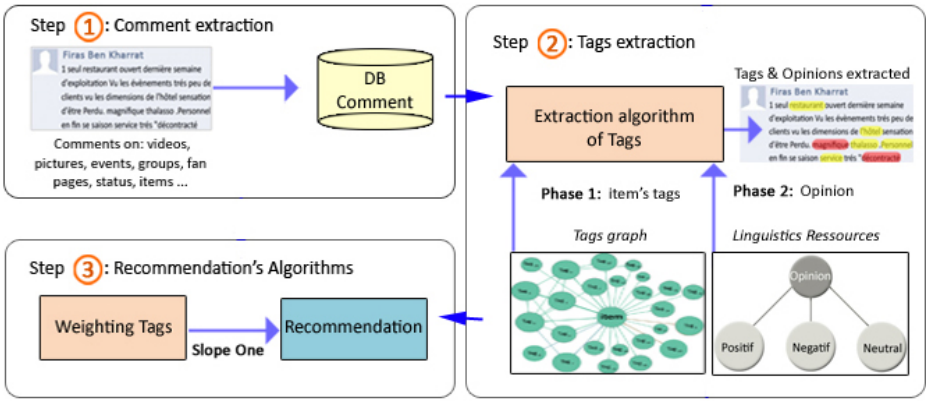


**Fig. 1.** Architecture of collaborative recommender systems based on contextual analysis.

Figure 1 displays the overall architecture of the approach we propose in this paper. It is based on contextual analysis of user's comment. Our architecture connects the users via collaborative social network in order to use the opinion of their comments. This system combine the social network analysis comments with the opinion of item's tags in one social recommendation algorithm. The proposed system consists of three parts; The first one deals with comment posted by the user. This comment is stored in the data base of comment, described in section 3.2. We use these data to create a user profile. The other one is based on opinion analysis methods that deploy linguistics-based techniques. This consists of exploring the linguistics of different tags, for each user's comment, is described in section 3.3. Next, we calculate a new item and user weight from the extracted opinion. Finally, the recommendation layer, where new input is sent to our algorithm, described in section 3.4.

### 3.2 Data

The main confronted problem was the issue of gathering data from social network. We created a script in java to extract all available comment based on 'Facebook Graph API', the package is installed in online web site to collect profiles. The dataset used in training and test was a collection of 1k Facebook profiles, which included comments related to the topic of movies.

### 3.3 Contextual Analysis

**Tags graph:** This graph is defined as a collection of tags, organized in a hierarchical structure (depending on the domain), in order to describe objects of the items. Our system use tags graph to represent items descriptions. Figure 2 shows an example of tags graph for the item 'Aviator' from the domain of films.

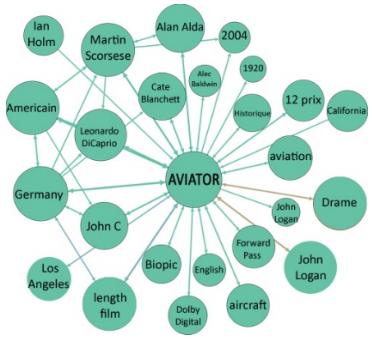


**Fig. 2.** Example of tags graph of the film 'Aviator'.


**Fig. 3.** Example of positive Tags.

**Linguistic resources:** is a lexical resource for opinion mining represented in tags form. We used WordNet the lexical database for the English language. It groups english words into sets of synonyms called synsets. We selected opinion words and we assigned to each synset of WordNet three opinion scores: positive, negative, neutral. An example of positive tags is described in details in figure 3.

**Extraction algorithm of tags:** used to annotate all tags in comments. We have two types of tags; Tags that described items and tags that described opinion. When, we found the two types of tags in the same sentence, then, we affect the option found to all tags described items in this sentence. Sometimes we found more than two opinions in the same sentence. In this case, we have defined a priority for the selection of opinion: Negative, then Neutral finally positive.

### 3.4 Recommendation algorithm

As already explained, the basic idea behind the proposed approach is to take advantage of contextual analysis for providing more elaborate opinion scores regarding the tags contained in a comment. The aim is to have a system that accepts as input a comment regarding a specific subject and provides opinion scores for every item's tags of this

subject. The step of recommendation is divided in two phases: (a) creation of opinion's score, and (b) the integration of opinion dimension into recommendation algorithms. These two phases are further described next.
The formalization of weight for the user *i* and item *j* is as follows:

$$w1_{i,j} = \frac{\sum_{k=1}^{n}(\alpha_k \times g_k)}{n} \quad (5)$$

With: $\alpha_k$is the weight of the tag's opinion *k*. *n* is the number of tag. And $g_k$ is the grad of the tag *k;* $g_k \in ]0,1[$ depend on tag's importance.
The formalization of weight for system users and item j is:

$$w2_j = \frac{\sum_{k=1}^{n}(\beta_k \times g_k)}{n} \quad (6)$$

With: $\beta_k$ is the weight of the tag's opinion *k*, returned from all opinions of current users.
The proposed recommendation algorithm is based on the opinions information about users, the tags information about items and the social comments information.
The new algorithm is defined by an improved Slope One algorithm, Eq (7).

$$P^{SS1}(u)_j = \frac{\sum_{i \in R_j}(dev_{i,j}+u_i)}{card(R_j)} + \log\left(1 + \frac{w1_{u,j} \times w2_j}{1+w1_{u,j}+w2_j}\right) \quad (7)$$

With:
$$dev(i,j) = \sum_{u \in S_{i,j}(X)} \frac{(u_i - u_j) \times (1+w1_{u_i,j})}{card(S_{i,j}(X))} \quad (8)$$

## 4 Conclusion and future work

In this paper we have proposed a new approach for the recommendation systems based on users' profiles. The proposed approach is spread over three stages to recommend the items, in a first stage, by the preprocessing that consists in collecting users' profiles from MovieLens dataset. As for the future perspectives of this study, we suggest to elaborate user profile using a domain ontology. We aim to extend our algorithm to search several connected communities and we will try also to extract information from other resources such as discussion forums, blogs and search history to enrich knowledge about users.

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# X-ETL Engine: from relational model to a multidimensional model

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**Abstract.** Designing a data warehouse as a support of the decision-making process remains a complex task and a major challenge for companies and organizations. This complexity is principally due to data sources that are heterogeneous and to the absence of a conventional method for modeling the data warehouse.
Our work aims to integrate one of the most used data sources namely relational databases, and to develop a new method for designing a data warehouse in XML format (language chosen) using the MDA (Model Driven Architecture) techniques.

**Keywords**: Data warehouse; relational model; multidimensional model; design methods; designing data warehouses; Model Driven Architecture; MDA.

## 1 Introduction

In the era of globalization, companies and organizations were faced with fierce competition. They found themselves into an international market that rapidly adapts and allowing them to have access to all kinds of possibilities. Therefore, these organizations needed to be more competitive by being too demanding in terms of information.

Indeed, the success and survival of every organization has become dependent on its ability to intercept, store, manage, and maintain a large amounts of information and use them easily and quickly to get new knowledge required for decision making or may constitute a competitive advantage in the market. All these steps can only be realized by building a data warehouse system.

Lots of efforts have been devoted to data warehouse design, and several methods automating the data warehouse modeling were developed but none of them has become a consensus. Despite we still lack a standard model, it is widely assumed that the data warehouse design must follow the multidimensional paradigm and it must be derived from the data sources, since a data warehouse is the result of homogenizing and integrating relevant data of the organization in a single and detailed view [1]. Other research considers that user requirement analysis is crucial in data warehouse design [2] and therefore some experts developed a new method that supports both approaches [3].

In this paper we introduce a new method that aims to automate this crucial step.

## 2 Rules for data warehouse design from relational data

This section presents some rules that are the results of all previous methods. These rules will form the foundation of our solution to standardize the data warehouses design. But before that, it should be specified that a survey and a thorough needs analysis must be done before proceeding to anything, and that our first model will use relational databases as data sources to generate a multidimensional model. Once the model is generated, it will be validated by the survey results. The table below lists these rules:

**Table 1.** Rules for identifying facts, dimensions, measures and attributes

| **« Facts » and « measures »** | **« Dimensions » and « attributes »** |
|---|---|
| • The fact tables are the concepts of main interest for the decision making process. They correspond to events that always occur in the organization or company.<br>• The measures of the fact table should be numeric and additives (at worst semi-additives).<br>• The data of a fact table are fixed and cannot be changed.<br>• A fact table represents always a particular activity and should be interrogated from a particular context (one or a few dimensions).<br>• No line of the fact table must contain an empty value.<br>• A fact table contains only the foreign keys which represent the primary keys of the dimensions, and these keys must be numeric for that the fact table becomes more efficient.<br>• Each combination of dimension values defines an instance of the fact table and which is characterized by one and only one value for each measure. | • The dimensions determine how fact instances can be aggregated significantly for decision making process.<br>• A fact table always contains the time dimension.<br>• The dimensions should have numeric primary keys.<br>• The primary key of each dimension table should be unique (preferably auto-increment), and fields should have an atomic value (not compound).<br>• The dimension hierarchies should preferably have a simple form of 1-n type, and avoid relationships of n-n type.<br>• A non-dimensional attribute contains additional information on an attribute of the hierarchy, and it is linked by to-one relationship [4].<br>• The non-dimensional attributes cannot be used for aggregation [4]. |

There is no doubt that these rules will facilitate the identification of facts, measures, dimensions and attributes from relational data. And therefore, we have the essential components for the construction of our own method while using the MDA techniques. Once our method will be developed, we will try to apply it for building a data warehouse for the National Library of Morocco from their relational data.

## 3 New method for transforming a relational model to multidimensional model

The main steps to complete this transformation are as follows:

1. Specify the source meta-model: first, we have to specify the source meta-model, in our case it is the meta-model of relational schema;
2. Specify the target meta-model: we must also specify the meta-model representing the decisional concept;
3. Write the model transformation: the last step is to formulate the rules of the targeted transformation. The XSLT language will be used for this purpose.

The figure below illustrates these different steps.

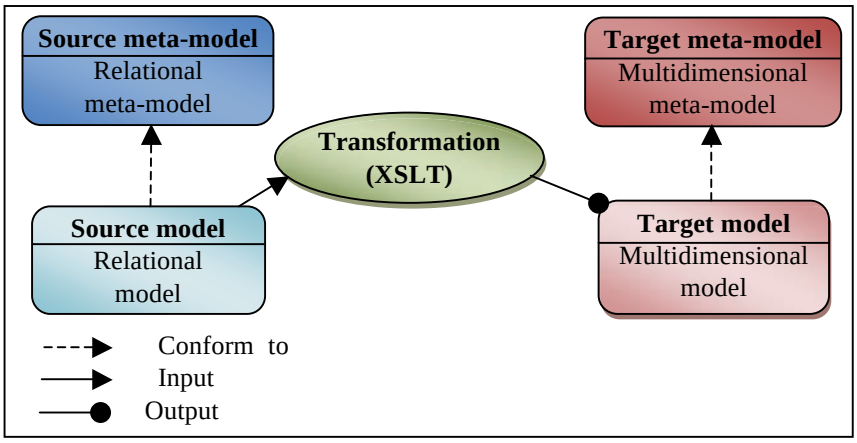


**Fig. 1.** The different steps to transform a relational model into a multidimensional model

So, we started to define our two meta-models (source and target) by using Ecore which is considered as an EMF model (Eclipse Modeling Framework).

The relational meta-model consists of three essential elements: a database that contains tables which in turn contain columns. So we tried to resume these components in the figure below:

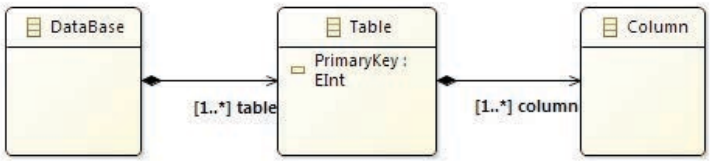


**Fig. 2.** The relational meta-model

Concerning the multidimensional meta-model, it consists of a multidimensional schema that contains facts and dimensions. Each fact contains measures and each dimension contains attributes. The figure below resumes these components and describes our multidimensional meta-model (target):

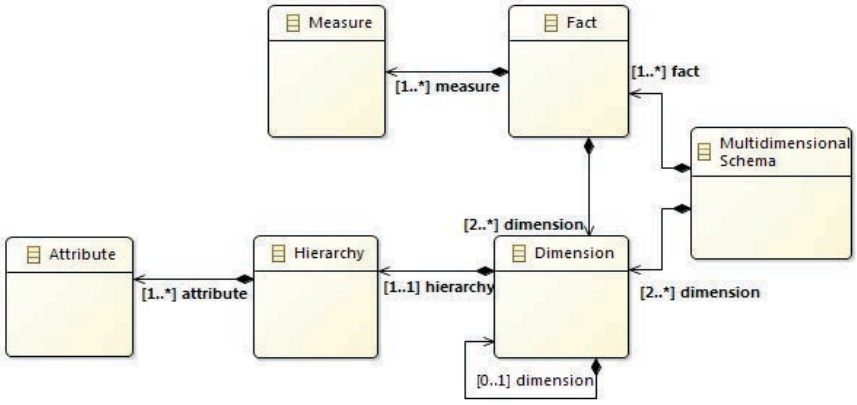


**Fig. 3.** The multidimensional meta-model

And for that our models be compatible with these meta-models, we created two other files with xsd language in which we described how should be the model structure to comply with its meta-model. Thus, we got an xsd file to validate the relational model and another one to validate the multidimensional model. These two files are described below.

## 4 Conclusion

In this paper we defined a list of rules for identifying the components of a data warehouse from relational data. These rules constitute the core of our model transformation engine and which will allow to transform relational model to a multidimensional model.

After defining in the last section the two meta-models (relational and multidimensional) and the corresponding XSD files, our next step consists to use these rules to build our transformation engine. This engine will be written with XSLT language and should enable to transform a relational model into a multidimensional model which respects the multidimensional meta-model structure.

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