# A Style of Theater Production
# Inspired by Interactive Content Data Mining

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**Abstract**

In this paper, we show how traditional theatre staging can be considered as based on a formal approach of similarity. It uses a dramatic ontology and instantiation variations. Drawing our inspiration from the opposite approach through interactive data mining, we hereby account for theater research using computers as partners to actors to escape *a priori* specification of characters.

## Different approaches for staging a play

With a new play to put on stage, every producer wishes to propose his own interpretation. Even if a lot of indications from the author are present in the preface or in the stage directions, interpretation is not inherently part of the text. A text cannot exist on stage without the interpretation of a producer.

### Dramatic ontologies and instantiation's variations

Actually this interpretation is an effort to create 'patterns'. The producer begins his work by establishing a short ontology of the dramaturgy. He describes the characters using archetypes (some comedy uses this process to the extreme with the trio wife, husband and casual lover) and he instantiates them by giving them a name, specifying the way they have to start up and how they have to be dressed…The scenario of the play presents variations of instantiations[1]: the spectator realizes that a character is in fact different from the archetype he was supposed to fit. Those variations can sometimes cause a modification of the initial ontology. For example in the play "El burlador de Sevilla" from the Spanish dramatist Tirso de Molina (1630), it is the metaphysical and dramatic dilemma that unveils the Don Juan myth. The question tackled in this play is to know if the character can save his soul if he acknowledges his faults just before his death. Can the ontology of the character drastically be changed at the end of the play?

### Ontology based similarity: A formal approach

In this traditional analysis of theater, the concept of similarity among different ontologies is a central one. The director "tunes" every scene as an example among the many cases present in the drama literature. Explaining a character to the actor who is going to play amounts to giving this character an ontology and to link it to others, coming from other plays directed by other directors. The aim is to make the actor understand by giving him "similar" examples.

If we generalize this process, it is actually a formal approach representing an example as an instance, that is part of a general structure containing every other case. We look for similarity by carefully "tuning up" the instantiation. This method has the advantage of giving us an explanation: then, one can create a key-concept *in intensio*. Ontologies allow us to look for elements similar to an example within the same concept (the search can immediately be done at a more general level, if no "hit" is obtained at the first level) this concept is suitable for a lot of activities, for example the organization of CDs sold in a department store [ROUSSEAUX & BONARDI04b]. Actually the practice of buying CDs surreptitiously conditions our musical activities, and the practice of classifying *a priori*, making changes one at a time, is structured by buying activities and the notion of genre.

[1] Mathematicians use instantiation operations to assign numerical values to variables. More concretely, computer scientists are instantiating abstract categories, assuming that a singular object belongs to an abstract category. All the abstract classes are linked to each other as parts of an ontology (ontologies are assumed to describe parts of mundane knowledge, they are widely used in artificial intelligence) or sometimes as parts of an object-oriented design (an object-oriented design is composed of inheritance graphs to produce computer programs simply by instantiation of key parameters).

## Approaching similarity through interactive data mining

In computer science, the question of similarity is dealt with differently, through interactive data mining. In this case examples are represented as specializations of all the cases. With this technique we look for other similar cases but without having an ontology from the start. Users accept to build it from their hands with the interactive help of the computer, in an *ad-hoc* way. Things are done *in extension*: building a similarity amounts to listing materials of similar aspects rectifying it repeatedly, using user-computer interaction. Modifications are made both through the user interface provoked by the machine propositions and by the machine itself trying to interpret the user's actions.

*Music-ripping* activity illustrates this method [ROUSSEAUX & BONARDI04]. It is the creative handling of numeric-audio-data by copy/paste/suppress actions through the user interfaces of the computer. When somebody's activity is a signed listening [DONIN04], a listening/composition/production, his/her object becomes the smallest element of listening/composition/production, a sample, which is always modified, re-organised, re-mixed and re-named [PACHET03] by the user.

Here is an important difference between Artificial Intelligence and mathematics. Actually mathematics assume that **intention** and **extension** are equivalent. The notion of equivalence class exists in both disciplines: in AI, individual elements can be linked to each other by checking if they beyond to the same class; in maths we handle sets (as integers…) with a minimal number of classes. Endomorph cores have the same role in vectorial algebra: we can verify if two individual vectors belong to the same core and in the case of a diagonalizable endomorph we can cover a vectorial space with a finite number of cores. On the contrary in the Artificial Intelligence field, there is no equivalence between **intention** and **extension** surely because the equivalence between a specimen (as an instance of a category) and a single element (as coming from reality) is noting more than a bad heuristic (denying the notion of context).

## A dramatic example: the *Traversée de la nuit*

How can the computing approach of *interactive data mining* be used for theater production? It supposes the introduction of the computer in a man-machine dialogue mode. Can a production avoid following a pre-established ontology and escape from a priori specifications of the characters using multi-modal interactions? There are the questions we wanted to ask with the production of the inter-media play *La traversée de la nuit*[1] written by Geneviève De Guaulle-Antonioz [DE GAULLE98], evoking her imprisonment in Ravensbrück jail camp at the end of the Second World War.

## Multi-modal interactions in *La traversée de la nuit*

The production of *La traversée de la nuit* relies on a 'self-made' man-machine system: an actress, Valérie Le Louédec, says the whole text, and a dancer, Magali Bruneau, performs a great number of moves inspired from Nô theatre. A multimedia computer also plays a part as an artificial actor. The computer acts by projecting lights on a wide screen behind the stage (the actress and the dancer are always able to see a part of the screen without looking behind them) so as to make the two actresses react. The dancer can adapt her moves to the screen movements and to the quality of the picture. The two actresses represent the same character (its conscious and unconscious mind), following the *shite* and *waki* tradition of the Nô theatre. Attracted by the dancer in her moves, the actress adapts her interpretation, which is also influenced by the screen. To loop the interactions, the computer reacts to the emotional states of the actress' voice.

*Figure 1. Example of picture behind the stage in* La traversée de la nuit *(Valérie Le Louédec on the left, Magali Bruneau on the right, picture: Julien Piedpremier)*

## Computing description of the man-machine system

The software implementation of the system is based on a neural network. It analyses the voice in input and generate pictures in output of the multi-agent system.

The real-time multimedia system used is made of a neural network set to recognise emotional states from the voice of the actress. For the output, the multi-agent system generates pictures then projected on the screen. The whole

[1] The play took place on 21, 22 et 23 November 2003 in Centre des Arts d'Enghien-les-Bains (95).
Production: Christine Zeppenfeld;
Actress: Valérie Le Louédec and Magali Bruneau;
Multimédia conception: Alain Bonardi and Nathalie Dazin;
Music: Stéphane Grémaud;
Lights: Thierry Fratissier.

software has been coded with the real time graphic development Max/MSP/Jitter platform.
The neural network has been trained in a supervised mode during several months. The actress was using a restrictive list of emotional states for the whole text. The voice input is analysed sentence after sentence, each of them generating a twelve co-ordinates vector: four of them concerning the pronunciation of vowels, four of them concerning the noise, i.e. the pronunciation of consonants. The four lasts describe the prosody (the amplitude curve of the voice in the sentence). For each vector at the entrance, the neural network gives a specific emotional state.

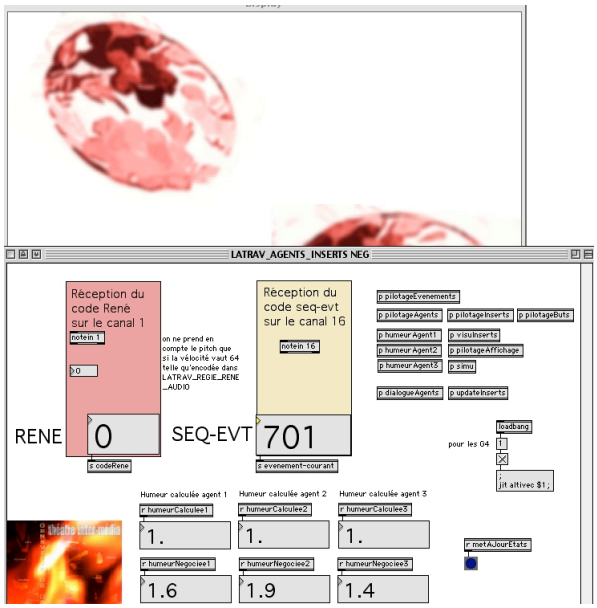


*Figure 2 .Some examples of Max/MSP/Jitter patches. On the background two autonomous agents bring picture fragments in* La traversée de la nuit *in the front part of the control screen (Alain Bonardi)*

The multi agent system allows for real-time picture generation projected on the screen. Agents react as dynamic 'poster stickers' who construct ever-changing pictures together.

- Every agent's own sensitive psychological model (positive or negative) reacts to the text, and to the emotional states of the neural network. Depending on what the network shows and depending on their sensitivity, the agents' moods conditions their will to accomplish their tasks.
- The agents are co-ordinated to optimize the usefulness of the picture (which changes for every sequence of the text).
- Agents act together for the same goal in a mechanism of mood compensation: the ones who is in an excellent mood has to transfer some energy to the ones who are in a very bad mood.
- Agents communicate with each other one to one at fixed times about their respective mood.
- The agents' environment is made of emotional states recognised by the neural network, it is also composed by the events indicating which part of the play is being said and the values associated with that part of the play. Finally an agent-observer evaluates the quality of the picture produced.

## Conclusion

We showed how interactive data mining can inspire new ways to stage plays associating computers and actors. Escaping from traditional production based on ontologies leads to weaken instantiation and to strengthen numerical data active handling. This handling is often irreversible for data, so mixing a compilation or a musical sequence in an *ad hoc* software is very similar to establishing a dramatic link 'live' when actors and computers provoke each other. In both cases the machine is involved in a heuristic mechanism.
Within those types of theatre production, the notion of style is completely renewed, because it can never be expressed in the **intention concept** but in the **extension concept**, two forms that are not equivalent as far as human interpretation is involved in a categorization process.

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