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The study of narrative acts with and for digital media

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Abstract

In this article, we introduce the concept of narrative act which denotes a meta-action—an action on an action—that contributes to the narrative sequence. Narrative acts have been often described in narrative theories, in particular within structuralism, but never systematically studied. Examples of narrative acts include *Ask*, *Order*, or *Forbid*. Moreover, in the interactive digital narrative (IDN) field, such narrative acts may take a central role when they are used as building blocks in combinatorial generative systems. Therefore, this article proposes a unique effort to establish an extensive catalog of such narrative acts, with the view that this catalog is a work in progress by definition since it targets the IDN domain, which consists of a very limited corpus of works. It is, however, a necessary step toward a more theoretical approach of narrative acts in IDN. The catalog contains more than 200 narrative acts, for which a number of features have been collected. Among those is the source of the act, either a narrative or speech act theory or a theoretical work or an implemented system. A general three-level taxonomy is also proposed, associated with an interactive visualization tool available online, allowing researchers and creative authors to consult and expand the catalog.

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1 On the Role of Narrative Acts in Digital Narrative

1.1 The concept of narrative act

Structuralist studies of narrative, in their effort to formalize narrative and in particular the fabula/story,¹ have come to various theories and models that include the definition of generic actions. These generic actions are the building blocks of stories. Often, they are meta-actions: actions on actions. For example, *The Purloined Letter* from E. A. Poe starts with a description of two characters sitting in a book closet, while a third one, the prefect of police, enters the room. The story thus far only offers a description and does not contain any narrative act. We then learn that the prefect 'had called

to consult us, or rather to ask the opinion of my friend, about some official business which had occasioned a great deal of trouble'. This last sentence corresponds to the narrative act *Ask for advice*, as indicated by the verb 'consult', and implicitly introduces an unsolved mystery ('some official business'), despite some previous attempts to solve it ('great deal of trouble'). In this case, the reader does not immediately what the advice is about; this will be learned later in the story. In other cases, the narrative act is conveyed in a more concise way: A simple dialog line, such as 'Call them now!', is a meta-action, because it is an order to perform another action. Returning to the early model of Propp (Propp, 1928), among the thirty-one functions included in the narrative sequence, many

underlie a meta-action. For example, the function of Interdiction corresponds to the narrative act *Forbid*. Later, when Todorov studied narrative transformations, he detailed various ways by which an elementary action can be transformed into another more complex action via grammatical operations. For example, if the narrative evokes a certain action, such as stealing a horse, then a set of actions may occur in the narrative as transformations of the first action: renouncement (the character renounces stealing the horse), punishment (someone punishes the character for having stolen a horse), and so on (Todorov, 1969). At a more abstract level, the canonical narrative schemata proposed by Greimas and Courtés (Greimas, 1976, 1983; Courtés, 1991) organizes the whole narrative around one central action surrounded by four related components:

- the manipulation: How the actor is given the action;
- the competence: How the actor acquires the prerequisite to perform the action;
- the performance: The realization of the action; and
- the sanction: The evaluation (positive or negative) of the central action.

Narrative actions that fit with one of these components are meta-actions because they are manipulation/competence/performance/sanction actions about the central or primary action.

Although structuralist theorists did not necessarily attempt to agree on a common set of concepts or a shared terminology, the idea of ‘actions on actions’ appears as a transversal concept in narrative studies. To stress this commonality, we denote the generic component of such meta-actions as a narrative act. *Forbid*, *Help*, and *Condemn* are examples of narrative acts.

More precisely, we propose the following definition: A narrative act is a type of meta-action in which the embedded action is one of the core actions in the story (should this embedded action be performed or not).

Therefore, actions built from narrative acts constitute the main narrative sequence (or plot) in the story. For example, in the Little Red Riding Hood tale, core actions (also termed *tasks*) include

carrying the pot of butter (for Little Red) and eating Little Red (for the Wolf). What happens in the main narrative sequence—that is, the list of actions it is made of—stems from narrative acts: The mother asks her daughter to carry a pot of butter to Grandma (narrative act: *Request*), Little Red starts to carry the butter (narrative act: *Start to* or *Perform*), the Wolf has in mind to eat Little Red up (narrative act: *Intend to*), Little Red tells Wolf that she is going to see her grandma and carry her a pot of butter from her mamma (narrative act: *Inform performance*), and so on. Not all verbs in the text match with narrative acts; for example, the fact that Little Red diverts from her quest to gather nuts is not a narrative act because this action does not directly relate to the main narrative sequence. Rather, it aims to explain that Little Red will arrive much later than the Wolf (and it also connotes the naïve/frivolous facet of the character).

Narrative act echoes with speech act, which is introduced in the eponymous theory from J. L. Austin (Austin, 1962). A speech act is a type of linguistic communication between two entities. Because characters in stories communicate with each other, this communication can be analyzed in terms of speech acts. However, the focus of narrative acts is not the communication between agents but the unfolding of events and actions that constitute the narrative sequence (Adam, 1994) or plot. A narrative act is an act concerning a key component of the narrative sequence that may match a speech act, or it may not if the act does not involve communication. Therefore, the act itself is not what determines if it is a narrative act or a speech act, but how it is used in a given story. For example, if a butler agrees to close the door, this corresponds to the speech act of agreeing, but this does not refer to a narrative act, because closing the door is not part of the main narrative sequence (at least in a typical scene involving such an action). If the same characters agree to hide some money (which we suppose is an important part of the plot) later in the story, then the same speech act of agreeing is a narrative act that we will call *Accept Request*. As a corollary, narrative acts should not be categorized and analyzed like speech acts—that is, as types of

communication—but by how they relate to the main narrative sequence.

1.2 Narrative acts in digital narratives

Narrative acts play a specific role in the domain of digital narrative, in particular in interactive digital narrative (IDN)—also termed interactive digital storytelling. The field of IDN encompasses several initiatives that use the digital media not only for storing and disseminating classical narrative works but for creating new forms of narrative in which the reader has a specific, active role to play, exploiting the interactive nature of the digital medium (Koenitz *et al.*, 2015). For example, in what is referred to as *interactive drama*, the user takes the role of a main character in a story and acts for the character to shape the story in a certain manner (Laurel, 1986; Bates, 1992; Weyhrauch, 1997; Mateas, 2003; Szilas, 2003). To offer such an active role to the reader, different approaches have been undertaken. Works such as *Façade* (Mateas and Stern, 2004) let users write their own text without systematically interpreting the underlying meaning and let them produce utterances as pre-canned texts to be triggered under certain conditions. But other approaches represent the story as a succession of narrative acts that are instantiated in real-time to generate dynamic and interactive narratives. For example, the game *Trust and Betrayal* from Chris Crawford, as well as his following projects in interactive storytelling, are based on what he calls ‘verbs’, most of which are similar to narrative acts (Crawford, 2003, 2018a). Noticeably, the title of the above-mentioned game contains such a narrative act (*Betray*), as it corresponds to actions performed in the game, while the other verb in the title (*Trust*) designates the absence of betrayal and hence is not a narrative act. The interactive drama *Nothing For Dinner* (Habonneau *et al.*, 2012; ‘Nothing For Dinner’, 2014) is also based on a set of narrative acts, such as *Inform*, *Encourage*, *Dissuade*, *Ask for help*, and so on. What is interesting in these examples is that the concept of narrative act, initially developed for a narrative analysis purpose, is employed as a design concept and, as such, may even become part of the work’s interface.

In the IDN domain, should the narrative experience exist between a user and a computer (context of human–computer interaction) or between users (context of computer-mediated human–human communication), narrative acts appear as a fundamental theoretical concept and as building blocks, both for structuring the internal computational model and for managing the interaction. Also, the IDN field encompasses several media: text, images, and three-dimensional worlds. The concept of narrative acts will accordingly not only be confined to literature but will include drama in particular video games.

1.3 In search of a theoretical foundation of narrative acts in digital narrative

The use of narrative acts at the core of the narrative design raises a fundamental issue: What relevant narrative acts are to be selected to provide a meaningful interactive narrative experience?

The first approach consists of hard-coding this set, according to known narrative theories, that is defining a set directly within the program, this set being the same for all narratives. For example, the IDtension system (Szilas, 2007) uses structuralist theories to define a universal set of narrative acts, potentially covering a large range of stories. However, this approach raises theoretical issues. First, theories mentioning narrative acts are scarce and not unified compared, for example, to research in speech acts. Second and more fundamentally, if these acts are borrowed from narrative theories that were initially created in the context of linear media, then these systems may overlook some narrative acts that are specific to the interactive nature of IDN, and that would prove particularly relevant for interactive narratives. We suggest the hypothesis that IDN is an extension of classical narrative and therefore calls for an extended theory of narrative. Regarding narrative acts, classical narrative theory has produced a set of narrative acts that needs to be tuned and expanded, leading to an extended theory of narrative acts that encompass both classical/linear and interactive narratives. In terms of speech acts, it appears counterintuitive to claim that stories written for centuries do not cover the spectrum of existing speech acts and that a handful

of emerging IDNs would suddenly reveal novel speech acts; however, in terms of narrative acts, the participation of the user fundamentally changes the relationship with the narrative sequence. Therefore, narrative acts are expected to emerge or narrative acts that were secondary in linear narrative are expected to become prominent in the interactive case. In the long run, the extended theory of narrative acts that we search for will provide a better theoretical understanding of IDN in the same way that narratology studies helped understand classical narrative.

However, our motivation is not only theoretical. With a better understanding of the panel of existing narrative acts, both IDN system designers and creative authors will find the necessary guidance for writing at the level of narrative acts. Writing with a set of predefined narrative acts was found to be uncomfortable for the author (Szilas, 2014), and therefore, a second approach consists of letting the authors choose the set of narrative acts, as in the Storytron authoring tool, for example (Crawford, 2009). In this case, it is particularly difficult for an author to start from scratch when authoring these narrative acts, and some guidance is necessary, as authoring is known as a major bottleneck in IDN (Spierling and Szilas, 2009). Guidance is needed to design such IDN systems, especially because neither authors nor system designers are experts in narrative studies or linguistics.

From a methodological point of view, establishing a theory of narrative acts for IDN appears to be particularly challenging: How can a theory from a very limited corpus be built? Although narrative theories have been built from a corpus of stories (e.g. the Russian folktales for V. Propp or the Decameron for T. Todorov), such a corpus is more difficult to find in IDN, especially if we want to study systems that explicitly make use of narrative/speech acts. Therefore, in lieu of building a new theory of narrative acts straightaway, we suggest a less ambitious and more preliminary goal: The identification of narrative acts in linear and interactive narratives. That is, based on existing theories and digital narratives, our goal is to establish a catalog of narrative acts that will be searchable by both researchers (for gaining an understanding of the

nature of narrative acts in the context of interaction) and authors (for entering content in IDN systems and authoring tools). Based on existing narrative theories, the size of this catalog is expected to be reasonable albeit much smaller than other initiatives where all verbs or actions in a given language were collected, as in Gordon and Hobbs, (2017).

Building a catalog of narrative acts involves three main tasks:

- Referencing a tentatively comprehensive number of narrative acts and describing them in a uniform manner.
- Organizing these acts into one or more taxonomies to facilitate their consultation.
- Making these acts accessible, in particular via interactive visualization tools.

2 Method

2.1 Inclusion criteria

When establishing a catalog, the first question is asking which elements should be included in the catalog. Which ones should not be included? This is what we refer to as the *inclusion criteria*. Several methodological issues were encountered when defining them.

First, in the above introduction, the role of the catalog as a preliminary step to a general theory of narrative acts makes the design of inclusion criteria difficult. If narrative acts found in existing narrative theories are to be naturally included in the catalog, it is less clear how to extend this set to other types of acts, with the idea that the larger IDN context should provide a larger set of acts. Therefore, opening the catalog to speech acts has been decided, with the minimal condition that they can relate to an action, leaving the task of constraining the inclusion criteria further to future research.

Second, narrative acts have been defined as meta-actions or actions on actions. In several cases, however, acts were defined as actions on facts. For example, the speech act *Assert*, denoting a person asserting a fact to another person, is not a meta-action. However, the above-mentioned fact could be related to another action in several ways if we consider facts such as intending an action

(assert an intention to perform), having started an action (assert an ongoing performance), or having finished an action (assert a finished performance). One option may be to extend such acts to all facts that may contain an action, producing derived acts such as *Assert intention*, *Assert started*, *Assert finished*, and so on. However, this would exceed our initial goal—that is, making a catalog from existing sources. We decided to include these actions on states in the catalog of narrative acts while mentioning this particularity. Similarly, some narrative acts are described as states rather than actions in certain theories. For example, Greimas and Courtés mention the *Wanting to do* ('vouloir faire') category, which is a state. However, this is almost equivalent to the action that leads to that state, namely the *Decide* action. In these cases, the equivalent action-based narrative act has been directly entered into the catalog.

Third, some acts are often quite similar, and the decision of whether to consider an act as new or as identical to another act is not always obvious. In some cases, when the act differs in its parameters, we decided to separate them. For example, there are two 'ask for help' acts: one that concerns asking help regarding a goal to reach another one, which is more precise, that concerns a specific task that the asker cannot or does not want to perform. We have decided to keep those acts separate. In other cases, two acts differ in a subtler manner, and we decided to merge them. For example, the acts *Beg*, *Plead*, and *Entreat* mentioned in the speech act theory (Austin, 1962) were combined into the same narrative act (*Beg*).

Following these inclusion rules, the resulting catalog is not necessarily homogeneous; some parts may be more refined than others, depending on how they were treated in the literature. This is one aspect that characterizes the outcome of this work: A catalog of narrative acts is distinct from a theory of narrative acts.

2.2 Sources

According to the above discussion, two kinds of theoretical sources were considered: narrative theories and speech act theories. In addition, for each theoretical domain, we also explored related

computational models—that is, systems that make use of narrative acts or speech acts. This makes four types of sources.

2.2.1 Narrative theories

For our purpose, most of the relevant narrative theories are part of structuralist narratology. One of the explanations is that the structuralist approach relied on some sort of formalization, a trend that was not followed in subsequent narratological studies. In addition, more recent narrative theories have tended to disregard the properties of the fabula (story) itself, approaching narrative in a larger context that includes the cognitive reception/construction of narratives and their social consumption.

Greimas's and Courtés's approach (Greimas, 1983; Courtés, 1991) provides a highly abstract description of narrative transformations in terms of transformation from one modal state to the opposite/contradictory modal state. For example, for the 'want' mode, four states are defined: want to do, want to not do, not want to do, and finally, not want to not do. This gives four narrative acts as transitions toward these states: *Decide*, *Refuse*, *Renounce*, and *Accept*.

Todorov's less abstract approach matches well with our search for narrative acts (Todorov, 1970). His essay on narrative transformations understands transformations both linguistically (e.g. how a simple verb is derived into a more elaborated form) and narratively (how the story moves forward via transformations). Part of these transformations concerns actions, which yield to meta-actions. For example, when considering the transformations related to the grammatical aspects of the action, one can distinguish two narrative acts: *Start to* (a character starts to perform an action) and *Finish* (a character finishes an action).

We have also looked at Todorov's earlier work on the Decameron's grammar, which also contains narrative acts (Todorov, 1969). In particular, these acts are derived by the notion of modes, which comes from linguistics, such as the obligative or conditional mode. This notion of mode was later extended by the theory of possible worlds. This means that a narrative contains several possible worlds (Eco, 1985; Ryan, 1991) in addition to the

fictional worlds itself: wish worlds, knowledge worlds, conditional worlds, and so on. Each of these worlds can be associated with specific narrative acts. For example, a ‘pretend’ world yields to the narrative act of pretending some action was performed. Other examples from the analysis of the Decameron include *Decide by obligation*, *Disguise* (make believe that one action is another action), *Ask for help*, or *Ask for advice*.

Bremond’s narrative logic (Bremond, 1973) on narrative processes is an extremely complete description of micro transformations in narrative. These processes relate to the various states that an *agent* or a *patient* goes through vis-à-vis a central action (termed *task*). Bremond has classified processes according to general narrative roles, such as the Agent (*Perform*, *Perform mean*, *Progress*, etc.), the Influencer (*Advise*, *Encourage*, *Dissuade*, etc.), or the Improver (*Help*, *Obstruct*, *Protect*, etc.).

Note that Bremond’s work was built on Propp’s model by disassembling the Proppian sequence into numerous processes. Therefore, to avoid redundancy, Propp is not included in the list of sources.

2.2.2 Speech act theories

Contrary to narrative theories that have studied narrative acts scarcely and indirectly, speech act theory is a leading approach in linguistics that includes both theoretical and practical research (Austin, 1962; Searle, 1976). Several general classifications of speech acts have been proposed, as having in-depth treatments of specific types of speech acts, such as *Promise*, *Apology*, or *Compliments* (Sbisà and Turner, 2013). For the current research, we will consider the speech acts described by Austin and Searle. Formal implementations of these theories via agent communication languages (KQML, ACL) will be detailed below.

Austin initiated research in speech acts by studying to which extent language is used to perform actions rather than by just describing/expressing ideas. This leads him to proposing a tentative taxonomy of speech acts of five classes: Verdictives (e.g. *Assess*), Exercitives (e.g. *Order*), Commissives (e.g. *Promise*), Behabitives (e.g. *Thank*), and Expositives (e.g. *Agree*).

Searle studied speech acts in a more psychology-oriented way by providing conditions of executions to speech acts. For example, concerning the speech act of promising, a subject may make a promise to a hearer to perform an action if it is a future action, if the hearer is positive regarding the action and the speaker knows it, if it is not obvious that the speaker will perform the action, and so on. Such a detailed analysis of speech act conditions has inspired many computational implementations of speech act theory. Searle later proposed a taxonomy of illocutionary acts based on a series of twelve distinctive features. Five categories of speech acts are proposed: Representatives (e.g. *Assert*), Directives (e.g. *Order*), Commissives (e.g. *Promise*), Expressives (e.g. *Thank*), and Declaratives (e.g. *Appoint*).

In both taxonomies, some speech acts are clearly candidates as narrative acts, such as directives, while others will be discarded, as they constitute what we called primary actions (e.g. declarations).

2.2.3 IDN systems

A number of IDN systems use a story model that contains narrative acts, although they are not termed this way. Because the narrative acts are implemented this time, they are described in a more formal way, making it easier to analyze for the catalog. Importantly, even if IDN systems are often designed from existing theories, their implementation often introduces new narrative acts, hence their analysis at the same level of narrative and communication theories.

One of the earliest systems for IDN, Erasmatron (Crawford, 2003), relied on verbs that were characters’ reactions to story events. These verbs are described with parameters (actors, props, etc.) that may include other verbs. Subsequent systems from Chris Crawford (Storytron (Crawford, 2009), The Legacy of Siboot (Crawford, 2018a)) use the same mechanism. A main feature of these systems is that the creative author is responsible for writing the verbs via an authoring tool (Crawford, 2018b). Therefore, there is not a list of canonical verbs documented in the user manual. However, we have attempted to extract (Crawford, 1996, 2009, 2018a) the verbs that correspond to narrative acts from various implementations and documentations.

Narrative acts only found in that source include *Deal*, *AgreeToDeal*, *AcceptAdvice*, and *Threaten*.

Another early system, DEFECTO, inspired by Aristotle's Poetics, is based on predicates that take characters, goals, norms, and actions as parameters (Sgouros, 1999). For example, the predicate *Try* is a character's attempt to execute an action.

IDtension is another system for interactive drama that is largely based on narrative acts (Szilas, 2007). Its narrative logic handles around fifty rules that dynamically generate meta-actions, primary actions being called tasks. For example, the interactive drama *Nothing For Dinner* ('Nothing For Dinner', 2014), IDtension generates actions such as *Dissuade(Lily, Frank, Shout_louder (Paul))*—*Lily dissuades Frank to shout louder to Paul*—where *Dissuade* is a narrative act and *Shout_louder* is a primary action.

Façade is an interactive drama that uses the concept of discourse acts to interpret the user's input (Mateas and Stern, 2004). However, a very small portion of these acts use actions as parameters and therefore qualify as narrative acts. Similarly, Prom Week (McCoy *et al.*, 2011) is based on an extensive number of rules for generating characters' actions, but most of them do not take actions as parameters. An action such as *MakePlans* was an exception since it concerns another action. It was considered a narrative act.

2.2.4 Autonomous agents

Finally, speech act theory has been subject to several computer implementations, in particular in the field of autonomous agents. An overview of action coding in this domain would exceed the scope of the article, so we retained two emblematic efforts to standardized agent communication that include speech acts. Note that although these two approaches provide a fully formal description of a certain number of speech acts, it is important to stress that such a level of formalization is not targeted for the current catalog because formalized speech acts are only readable/usable by people with high computing literacy.

The first agent-based standardization effort is the development of KQML, the Knowledge Query and Manipulation Language (Finin *et al.*, 1993; Finin

et al., 1994). Messages exchanged between agents consist of a performative (e.g. *Advertise*), associated with arguments. Some of these arguments are performative themselves, indicating a meta-action. Narrative acts derived specifically from KQML include *Ask external help* (recommend-one in KQML: a character asks who can help him or her perform a task) or *Propose external help* (broker-one in KQML: a character proposes that another character may help perform a task).

A larger initiative is Agent Communication Language (ACL) from the Foundation for Intelligent Physical Agents (FIPA). ACL's specification of communicative acts is an implementation of Searle's speech act theory for autonomous agents. It is the outcome of an important standardization effort between researchers in the domain. The specification contains a list of twenty-two communicative acts, most of which fit within the scope of this article. Narrative acts derived specifically from ACL include *Confirm*, *Disseminate*, *Inform unknown performance*, *Propose performance*, and *Refuse performance*.

2.3 Coding scheme

Each collected narrative act needs to be presented in a uniform way. Beyond a flat list of acts, we propose coding each narrative act in a semi-formal manner, which will facilitate the comparison between acts and the future use in a computational context. A predicative format was chosen, which is usual in the computational domain:

NameOfTheAct(variable 1, variable 2, ..., variable *n*)

For example, the act of asking for help would be noted *AskForHelp(X,Y,a)*, meaning *X* asks *Y* to help him or her perform action *a*. Letters for variables are chosen conventionally: *X*, *Y*, *Z*, and *T* for characters; *a* and *a_n* for actions; *g* for goals; *s* for states; *obj* for objects; and finally *cond* for the logical conditions of a state.

In addition to the name of the act, its predicate form, and the corresponding meaning in full text, we identified a set of attributes to provide further details about the act:

- General type: The nature of the narrative act, either an action on an action or an action on a

state. In the latter case, the narrative act does not directly contain an action as a variable, but that it is generic enough that the variable may be a fact that contains an action (see above).

- Sources: Theories and/or systems where the narrative act has been identified are mentioned here via a short code (see Table 2), in addition to the original formulation of the act in the source. For example, a narrative act may have '(SAT,promise,give my word,swear) (CRA,promise)' as a source, meaning that it is described in two sources, SAT (for speech act theory) and CRA (for Crawford) and that it covers three acts in the first source (promise, give my word, and swear) and one act in the second source (promise).
- Number of involved characters: The number of necessarily present characters when the action is executed. Note that the predicate may contain more characters than this number in cases of characters that are only referred to by the act.
- Number of terms in the predicate: This provides an indication of the complexity of the narrative act.
- Domain/Class/Family: These attributes correspond to a hierarchical classification of narrative acts that will be detailed in the next section.

2.4 Classification

Although narrative acts could be accessed using a search engine, it is particularly relevant to organize them hierarchically. Not only does it help authors navigate the space of possibilities and stimulate new ideas of narrative acts to be used in their story, but it helps characterizing the acts as narrative acts. A classification is not neutral; it expresses a viewpoint of the classified data, and therefore, it cannot be totally disconnected from the goal of creating a theory, a goal that we have knowingly discarded, or at least postponed, from the scope of this article. In such a context, the proposed classification can therefore only be tentative. As Austin said regarding some parts of his initial classification, as identified by Searle, 'I am not putting any of this forward as in the very least definitive.' In this case, the task is all the more difficult, as each act included in the catalog is extracted from its own classification system.

When putting these acts in the same bag, one cannot merge the underlying theories without creating a nonsensical classification system. In addition, a distinctive constraint that drives this research is its orientation toward practice: At a practical level, the classification should also enable creative authors to find their way in the variety of narrative acts.

A first guiding principle to build the taxonomy of narrative acts was, naturally, to focus on the narrative nature of the acts. A distinctive feature at that level is how the narrative act relates to the action it contains as variable and as a meta-action. A first classification emerged, inspired by the three fundamental states attached to a narrative event, as identified by Bremond: before the event, during the event, and after the event. This creates three main domains: narrative acts that occur before the action they contain, narrative acts that occur during the action they contain, and narrative acts that occur after the action they contain. A fourth domain would then be necessary for those actions for which it is not possible to determine such a temporal distinction, in particular the generic actions such as *Inform* (see the above discussion).

However, we estimated that a more refined classification may be more useful and informative. The three above domains were further refined, according to narrative criteria. The 'before' domain was split into three domains:

- Decision: This gathers character-internal acts that change their volition state. It corresponds to transformations from *not want* to *want* and the reverse. For example, *Decide Between*, which is when a character has two action opportunities and chooses one.
- Influence: This gathers communicative acts in which a character attempts to affect the decision process of another character (hence possibly changing the volition state). For example, *Forbid*, which is when a character forbids another from performing a task.
- Preparation: This gathers acts that change or attempt to change the chances of achieving a goal, particularly acts that correspond to the transformations from *cannot* to *can* and the reverse (changes in ability). An example of preparation is

Ask for advice, which is when a character asks another character if it is a good idea to choose a given course of action.

The ‘during’ domain was left unchanged and called Performance. This domain contains all narrative acts that participate in the realization or nonrealization of an action. This domain is different because it is not defined as a communication act (although the performed action may consist of some form of communication) and it therefore does not fit into a speech act. The ‘after’ domain was refined to contain only acts that are an evaluation of the past action and was titled Sanction, according to classical narratology (Adam, 1994). Finally, the fourth domain was left unchanged and called Knowledge management. This domain contains acts that change, attempt to change, or maintain the beliefs of a character, excluding actions belonging to the other domains. This last domain is less satisfying because it seems vague and less related to narrative progression.

What is the role played by narrative acts from the Knowledge management domain? Even when knowledge transmission between characters does not equate to an influence, a preparation, or a sanction, it cannot be reduced to a simple decoration in the narrative machine. If we are permitted to use a mechanical analogy, although the first five domains may constitute mechanical parts in the core mechanic of the narrative machine, knowledge-related narrative acts may be the motor oil: They make all parts work together, and in the end, the narrative does not work without them.

The six domains were further divided into *classes*, constituting the second level of the hierarchical organization of narrative acts. They are represented in Table 1. A third level of classification into families was attempted, but because this hierarchical division was not homogeneous, we will not discuss it further in this article.

The proposed classification is tentative but has the merit of organizing acts according to their role in the narrative whenever possible.

2.5 Steps for narrative act inclusion

In this section, the successive steps for entering narrative acts into the catalog are described. The goal is to document the process for extracting and coding

narrative acts, not only for the sake of scientific replicability, but to allow the catalog to be extended in the future by people who were not involved in its initial construction. More precisely, the steps for adding acts from one given source are provided below.

Step 1: A source, either a system or a theory, is identified because it may contain some narrative acts.

Step 2: The first set of potential narrative acts is identified within the source. It is straightforward when the narrative acts are already well formalized (e.g. in the field of autonomous agents). But in many cases, no clear list is provided. For narrative theories, it requires a close reading of the text to extract narrative acts that may not be explicitly named and described. In Bremond’s work for example (Bremond, 1973), many cases are covered via combinatorial mechanisms. For instance, he details the counter-refutation act as a refutation of a refutation, but nothing seems to prevent adding another refutation in this chain. Bremond also covers—without deriving all corresponding cases—the paradoxical case, which is when an agent performs or intends to perform a task but does not want to be successful. This paradoxical case, if fully developed, doubles all narrative acts. Deciding whether to develop a set of narrative acts is therefore matter of interpretation.

Step 3: Narrative acts with no action as a variable are temporarily discarded.

Step 4: Among the preliminary list of discarded acts created in Step 3, some acts are finally kept: those containing as variable a fact that itself contains an action. For example, ‘Inform’ does not contain an action as variable, but one can inform another about a finished action.

Step 5: Within the remaining acts, duplicate acts should be detected; that is, the acts which are already in the current catalog, possibly under a different name. Choosing to keep

Table 1 Two-level classification of narrative acts

Domain	Class	Description
Decision	Commitment	A character commits to performing an action.
	Free decision	A character changes his/her degree of volition regarding an action, without being visibly constrained by another character.
	Influenced decision	A character changes his/her degree of volition regarding an action following an influence.
Influence	Anticipative influence	An argued influence that makes use of the natural consequences of the action depending on whether it is performed.
	Deceit	An argued influence that makes use of a distortion of reality.
	Explicit influence	An influence that does not involve a specific argumentation.
	Influence by extrinsic motive	An argued influence that highlights rewards or punishments, depending on whether the action is performed.
Knowledge management	Authority-based influence	An influence based on a social or moral authority.
	Hiding	An action that makes other character(s) have the wrong belief about the situation.
	Prediction	A character predicts what will happen.
	Reception	A character receives information.
	Solicitation	A character solicits information.
	Thinking	The internal thoughts of a character.
Performance	Transmission	The transmission of information.
	Individual performance	A performance only involving one character: the owner of the action.
	Social performance	A performance involving two or more characters.
Preparation	Ability change	The acquisition or loss of an ability to perform a task.
	Anticipation	The thinking action in which the character imagines what may happen in the future, in relation to a given action.
	Collaboration	The preparation of an action with another character.
Sanction	Opportunity information	Information transmission (including self-transmission) regarding an opportunity of action.
	Mediated sanction	A sanction performed by a character other than the actor of the action.
	Self-sanction	A sanction performed by the character committing the action.

Table 2 The distribution of narrative acts across theories and systems: Greimas & Courtés approach (GRC), Bremond's narrative logic (BRE), Todorov's grammar of the Decameron (TOD1), Todorov's narrative transformations (TOD2), speech act theory (SAT), DEFACTO (DEF), Chris Crawford's systems (CRA), IDtension (IDT), Façade (FAC), Prom Week (PMW), KQML, and ACL

Source	GRC	BRE	TOD1	TOD2	SAT	CRA	DEF	IDT	FAC	PMW	KQML	ACL
# acts	38	76	20	20	39	18	7	22	2	8	8	19

only one of them is often a difficult decision to make. In some cases, two acts described by different but close verbs may be considered synonyms, in case they are duplicates. In other cases, they resemble but vary in their force, as explained in the speech act theory (Searle, 1976); in these cases, they are not duplicates.

Step 6: Non-duplicates are coded with the various attributes described above. The most demanding task is to identify the proper position within the taxonomy. Naming the act is also difficult because the catalog is built incrementally and without a global model in mind. Iterative revisions are sometimes necessary.

Step 7: Data are entered in the database. For duplicates, only the source attribute is modified, while for non-duplicates, a new act is added. For that purpose, we use the visualization tool described below.

3 The Catalog

The catalog was built from twelve main sources containing 223 acts at the time of writing. This is a large number—larger than expected—and this number will increase, as will be discussed in the conclusion. All acts are represented in Fig. 1, which also illustrates the hierarchical organization of the acts.

Because it is not possible to detail each act, only global statistics will be provided. Among all sources, the richest one was Bremond's theory, with a contribution of seventy-seven acts. The whole repartition by source is detailed in Table 2. Note that in total, including the duplicates, 298 acts were identified. The repartition by domain, as illustrated in Fig. 1 and Table 3, shows a rather balanced distribution.

The density of information provided in Fig. 1 triggers the need for a better visualization of the catalog. This will be detailed in the next section.

4 Visualization

The visualization approach should follow the double orientation of the catalog toward both authors and researchers. For the former, visualization should ease the access to an act the author had in mind and encourage free exploration to foster creative discovery of narrative acts for a specific project. For the latter, the visualization should allow researchers to compare acts between them, stimulating cross-theory comparison and fertilization. These goals are not necessarily compatible and may require several visualizations. The solution proposed in this article is more author-oriented.

The main aspect of the catalog that should be represented for the purpose of facilitating the navigation is the hierarchical classification of the narrative acts. Several visualization techniques exist for that purpose, including trees, treemaps, sunbursts. We chose the sunburst technique because it is

compact and appears more readable than a treemap (Stasko and Zhang, 2000).

The color code was carefully selected to provide both a compelling user experience and to make the visualization more usable. A color palette used for visualization purpose was selected (<https://raw.githubusercontent.com/d3/d3-scale/master/img/category20.png>), and each color was set in three variants of decreasing luminosity to represent the three hierarchical levels, namely domain, class, and act (Fig. 2). When an element is rolled over, the corresponding element and its parents are left unchanged while all the remaining elements are lightened by 30%.

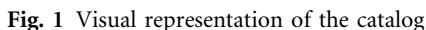
The visualization is interactive in several ways. First, it is zoomable: When clicking on an element, it is repositioned at the center of the sunburst, and the subcategories (if they exist) are placed around it (Fig. 2). Second, when mousing over an element, its name and associated features are displayed to the right of the sunburst. Putting all the names directly in the graphics would have eased immediate access to the acts, but we found that it raised readability issues. Third, the sunburst was complemented with a table with all narrative acts, which were accessible via a simple search bar (Fig. 3).

An administrative interface enables authorized users to edit and add narrative acts to the system.

From a technical point of view, the visualization tool was built using a database implemented in MySQL and various web-based technologies: HTML; CSS; PHP; Slim as a PHP framework coupled with Twig and Eloquent (for database communication); JSON, and D3.js for the generation of visualizations in SVG. The tool is accessible at this address: http://tecfa-labs.unige.ch/narrativeacts_vis/

5 Use of the catalog

To assess the relevance of the catalog and its visualization for creative authors, a simple qualitative experiment was set up. The goal was to evaluate if (1) the tool is usable, (2) the tool enables authors to find narrative acts when writing, and (3) the sunburst visualization and the table are complementary.



Globally, the interactive visualization of the catalog was deemed usable, although some issues were

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Table 3 Distribution of narrative acts across domains and classes

Influence	Decision	Preparation	Performance	Sanction	Knowledge management
Explicit influence	10 Transmission	30 Opportunity information	18 Individual performance	17 Mediated sanction	19 Reception
Anticipative influence	8 Free decision	15 Collaboration	18 Social performance	12 Self-sanction	8 Prediction
Influence by extrinsic motive	6 Influenced decision	12 Anticipation	9		Solicitation
Authority-based influence	5 Thinking	8 Ability change	4		Hiding
Deceit	3 Commitment	6			

more documentation and examples will be integrated in the catalog in the future. Finally, authors appreciated the interface design and the administrative access (for adding or editing acts).

From a researcher's/narratologist's point of view, the catalog proved useful as well. As a systematic semi-formalization of various narrative theories, it enables new data to be extracted beyond the textual description of the underlying theories. For example, as illustrated in Table 2, various theories' contributions to narrative acts can be quantitatively compared. It is also possible to measure the degree of overlap between theories and to possibly visualize it in the future. This suggests an interesting finding: The overlap between narrative theories is limited, and often, a given class is populated by one theory only, which illustrates the fact that each theory tends to focus on one aspect rather than another. For example, the Preparation/Ability class contains four narrative acts that were introduced by Courtés and Greimas. No other narratologist considered the act of acquiring the ability to perform a task. On the contrary, some narrative acts are shared by many theories, such as the act of giving an order. The large total number of distinct narrative acts—223 at the time of writing—greatly exceeds the richest theory or system. This suggests that, from a theoretical point of view, a global model that would incorporate most of these acts is still lacking.

6 Conclusion

In this article, we have introduced the concept of narrative act as a type of meta-action that surrounds

the central action in a narrative. This concept is present in several narrative theories but has not been systematically studied across different theories. In addition, with the purpose of extending narrative acts to IDN, we propose a large catalog of narrative acts that contains elements from both traditional and interactive narratives, theories and systems, and narrative and speech act theories. As a result, 223 narrative acts have been extracted, coded, and made available online through an interactive multi-modal system. This tool was preliminarily evaluated and regarded as usable and enjoyable, although conceptual difficulties remain concerning certain acts and categories of acts.

The catalog of narrative acts is meant to be a living object. Accessible online in consultation and edition modes, it can be further enriched with new sources, following the methodology described in this article. On the practical side, missing narrative acts will certainly be found when authors write a new concrete IDS work. Each new narrative work based on narrative acts will likely become a new source; it was decided not to imagine new narrative acts when building the initial catalog. There is also plenty of room to refine and improve the system regarding the naming of classes and acts, their descriptions, and the provision of examples.

An interesting future extension concerns the possibility of automatically generating examples. Because narrative acts are described as predicates with variables, it is technically possible to use this structure to generate small pieces of text that depend on various instantiations of the variables, using a simple template-based text generation approach (Reiter, 1995; Caropreso *et al.*, 2012). Such a

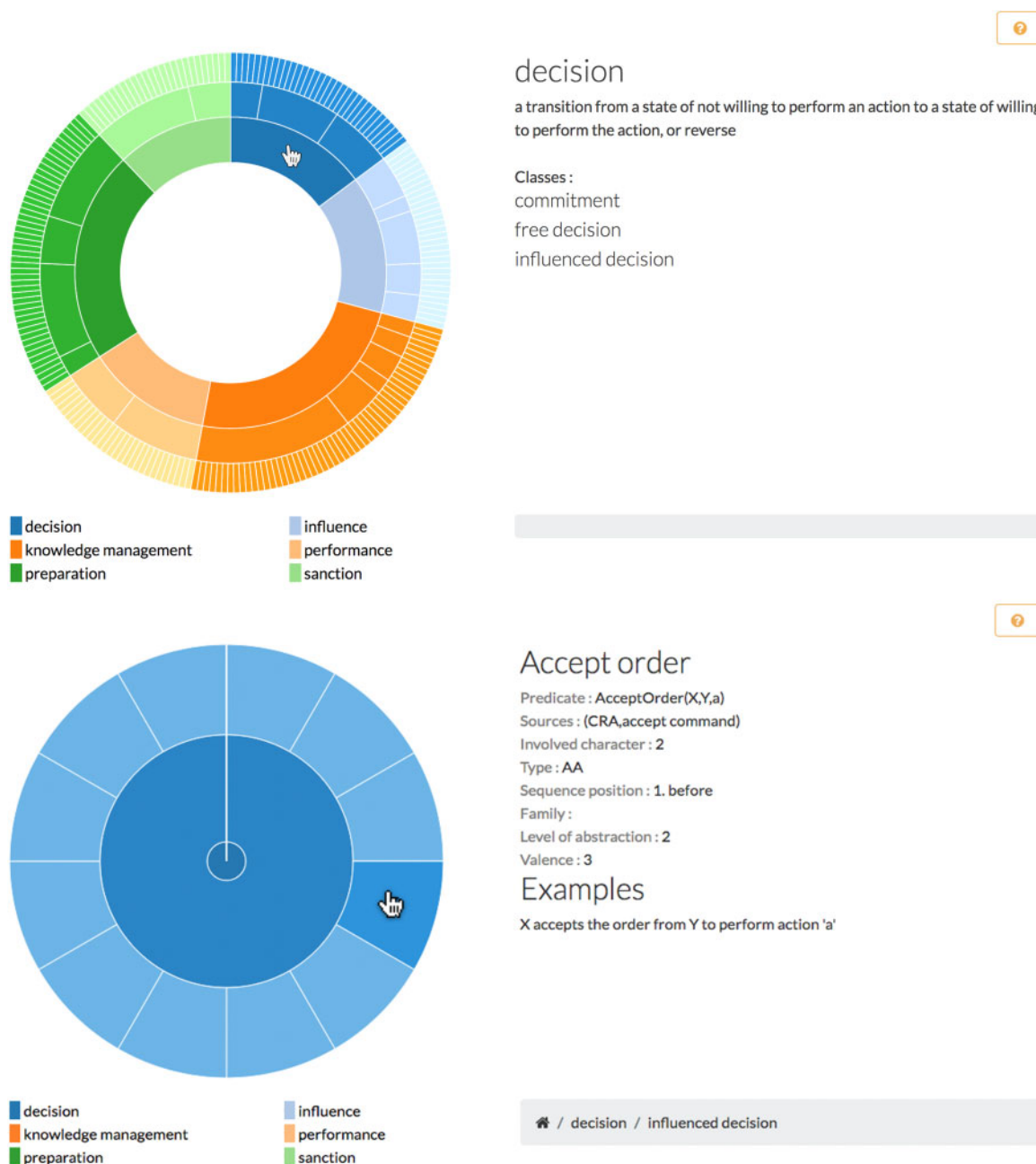



Fig. 2 Screenshots of the visualization tool. The upper screenshot illustrates the global zoomed-out view, where one domain is rolled over (decision). The lower screenshot is visible when the user has clicked on one class, here 'influenced decision'. The twelve narrative acts in this class are represented at the circumference of the sunburst, and one of them is rolled over (*Accept order*). The path to this act is visible at the bottom right of the screen



Show 25 entries
Search:

name ↑↓	predicate_form ↑↓	sources ↑↓	involved characters ↑↓	type ↑↓	sequence position ↑↓	level abstraction ↑↓	valence ↑↓
Abstain ⓘ	Abstain(X,a,a1,a2)	(BRE,S'abstenant de choisir)	1	AA	1. before	2	4
Accept ⓘ	Accept(X,a)	(GRC, ne pas vouloir ne pas faire)	1	AA	1. before	2	2
Accept advice ⓘ	AcceptAdvice(X,Y,a)	(CRA,accept advice)	2	AA	2. before	2	3
Accept interdiction unwillingly ⓘ	AcceptOrderWillingly(X,Y,a)	(GRC,devoir ne pas faire et vouloir faire)	2	AA	1. before	2	3
Accept invitation willingly ⓘ	AcceptInvitationWillingly(X,Y,a)	(GRC,devoir ne pas faire et vouloir ne pas faire)	2	AA	1. before	2	3
Accept order ⓘ	AcceptOrder(X,Y,a)	(CRA,accept command)	2	AA	1. before	2	3
Accept order unwillingly ⓘ	AcceptOrderUnwillingly(X,Y,a)	(GRC,devoir faire et vouloir ne pas faire)	2	AA	1. before	2	3

Fig. 3 Screenshot of the visualization tool displaying the table with all narrative acts accessible via a search engine

possibility would transform the catalog into a dynamic and interactive object based on the principle of simulations.

Also, new forms of data visualization could be added to the tool. In this article, the possibility of visualizing the overlaps between theories was mentioned. Similarly, dedicated visualizations could be developed for comparing IDS systems regarding which acts are commonly used and which are not or for comparing IDS systems and autonomous agent formalisms.

Finally, regarding one of our initial goals—expanding linear theory for covering nonlinear works—eighty narrative acts out of 223 were added from sources other than linear narrative theories. Our future research will test some of these narrative acts specifically and observe, experimentally, how they are perceived by users.

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Note

- ¹ see Chatman (1980) and Genette (1972) regarding the distinction between story/fabula and discourse/syuzhet.