

## Chapter II

### Literature Survey

Then while I was blocking out words – you just mouth out sounds and some things come – I found the words ‘Martha my dear’.. I remember George Harrison once said to me, ‘I could never write songs like that. You just make ‘em up, they don’t mean anything to you.’.. These songs grow. Whereas it would appear to anybody else to be a song to a girl called Martha, it’s actually a dog, and our relationship was platonic, believe me. (Paul McCartney cited in Miles 1997, p.498)

The objective of this chapter is to offer to the reader different views of the writing process. The chapter is divided in four sections:

- ◆ The first recapitulates different positions about the creative process.
- ◆ The second discusses some writers’ thoughts about writing.
- ◆ The third examines different theories of the writing process.
- ◆ The fourth describes and analyses computer models of story generation.
- ◆ The fifth defines some key terms.

The present research focuses on the hypothesis that a cycle of engagement and reflection constitutes an important part of the creative process in human beings. The first section in this chapter reviews some of the statements where different writers, composers, researchers and philosophers have expressed similar ideas.

The second section describes writers’ opinions about writing. In particular, this section concentrates on the importance in composition of writer’s previous experiences. These ideas influenced the design of the Engaged State in the prototype developed as part of this research.

The third section describes five different accounts of the writing process. The first account sees problem solving as an important part of writing. The second describes writing in terms of story-grammars. The third suggests that writing (as speech) is an automatic activity, which is not driven by goals or pre-defined structures. Finally, the last two accounts consider all these views as part of the same process.

The fourth section describes four computer models of story generation and one of general cognition. These programs are based on different theories of writing and constitute relevant examples of what have been done in the field.

The fifth section offers a definition of terms such as *story* and *creativity*.

#### 2.1 Some Antecedents.

With the aim of making the exposition as clear as possible, the ideas in this section are presented in a kind of evolutionary process towards the Engaged and Reflective States account and they do not necessarily follow a chronological order.

The view of creativity as a process where ideas form without control or rational intervention of the author has been mentioned for centuries. To explain this phenomena different theories have arisen: divine power (Maritain 1953), Collective Unconscious (Jung 1923), fears for death and will for immortality (Rank 1932), conflicts between artist's dependence on his mother and at the same time destructive impulses toward her genitals (Lee 1940), are some examples. The following comment illustrates this view: "... poems are not of man or human workmanship, but are divine and from the gods, and that the poets are nothing but interpreters of the gods, each one possessed by the divinity to whom he is in bondage" (Aristotle 1928, cit. in Rothenberg & Hausman 1976, p.33).

On the other hand, the view of creativity as an author-directed procedure, i.e. "a special kind of problem-solving process" (Getzels and Csikszentmihalyi 1972, cit. in Rothenberg & Hausman 1976, p.163) has also occupied the minds of many people. A statement that supports this position can be found in Poe's description of the process he followed when he wrote his famous poem "The Raven". Poe claims that "no one point in its composition is referrible [referrable] either to accident or intuition—that the work proceeded, step by step, to its completion with the precision and rigid consequence of a mathematical problem" (Poe 1846, cit. in Rothenberg & Hausman 1976, p.59)

These seemingly contradictory views of creativity as either something out of conscious control of the author or on the other hand as a rational guided problem-solving process, start to be seen as something related in some studies and reflections on artists' methods of working. In such studies, both positions are put together as parts of the creative process although, nevertheless, they still are seen as different manners of being creative.

This situation is illustrated by some of Copland's descriptions of composers: "the Franz Schubert type... is more spontaneously inspired. Music simply wells out of him..." while "The constructive type... constructs a musical work, day after day, in painstaking fashion." (Copland 1955, p.22). Another example is given by Spender who talks about two kinds of poets: "The difference between two types of genius is that one type (the Mozartian) is able to plunge the greatest depths of his own experience by the tremendous effort of a moment, the other (the Beethovenian) must dig deeper and deeper into his consciousness, layer by layer." (Pender 1946, p.116). Benedetto Croce states that "Knowledge has two forms: it is either *intuitive* knowledge or *logical* knowledge; knowledge obtained through the *imagination* or knowledge obtained through the *intellect*.." (Croce 1909, cit. in Rothenberg & Hausman 1976, p.328). Other researchers have also shared this dual division or classification. Hartley and Branthwaite (1989) talk about two kind of writers: the 'Thinkers' who "spent more time thinking about what they were doing" and the 'Doers' who "seemed to think less about what they were doing". Chandler (1992) describes how "Planners tend to think of writing primarily as a means of recording or

communicating ideas which they already have clear in their minds; Discoverers tend to experience writing primarily as a way of ‘discovering’ what they want to say.”

Finally, this dichotomy turns into a partnership when both positions are seen as different elements of the same activity. Beardsley illustrates this situation when he asserts that:

Though there are no universal *stages* of the creative process, there are two clearly marked *phases*, which constantly alternate throughout. They involve an interplay between conscious and preconscious activities. There is the *inventive* phase, traditionally called *inspiration*, in which new ideas formed in the preconscious and appear in consciousness. And there is the *selective* phase, which is nothing more than criticism, in which the conscious chooses or rejects the new idea after perceiving its relationships to what has already tentatively been adopted. (Beardsley 1965, cit. in Rothenberg & Hausman 1976, pp.308-309)

Following the same line, Wellek and Warren describe how in primitive societies, in order to get an inspired state, the shaman (prophet or poet) may voluntarily put himself into a trance or may involuntarily be ‘possessed’ by some ancestral spirit-control. Thus, they define two kinds of writers: the ‘possessed’, i.e. the shaman, the prophet, and the “‘maker’, the writer who is primarily a trained, skilful, responsible craftsman... But of course these types must be understood as not mutually exclusive but polar... we have to think of the writers as both ‘maker’ and ‘possessed’.” (Wellek and Warren 1970, pp. 84-85). Sharples (1994) has summarised these views in what he has called Engagement and Reflection: “[Engagement] is being ‘caught up’ in a task, so that you are thinking with it, not about it...” (Sharples 1994, p.387). “Reflection allows one to think about the creative act and to view the result as an entity, available to be moulded and revised...” (Sharples 1994, p.389).

## **2.2 Writers Views about Writing.**

During the Second International Symposium Creativity and Cognition 1996 at Loughborough University, the Dutch artist Fré Ilgen expressed in one of the expositions his concern about the necessity of researchers listening more frequently to what artists have to say. This section attempts to echo Ilgen's request and "listen" to what writers have to say about writing. Thus, some interviews and self-reports of well-known writers that have influenced the present research are briefly mentioned.

The use of such self-reports as a tool to study creativity has received much criticism (see e.g. Weisberg 1993). The main disadvantage of this methodology resides in its lack of control over the accuracy and/or objectivity of artists' accounts. For example, Vicente Leñero (1983) has written that when journalists or researchers have asked him to talk about the "intimacy" of his most famous novel *Los albañiles*, in order to defend himself from adverse comments or to capitalise on positive appraisals, he invented social worrying, narrative searches, etc. which never were really present during the writing process. Vargas Llosa (1971) also has pointed out how unsound testimony can be. Thus, pressures like expectations about how the creative process works, artist's intentions, political positions, etc might shape self-accounts. However, on the other hand, this methodology offers important advantages; the

most significant of them is the opportunity to collect information, sometimes very private information, from an important number of well known creative artists with completely different backgrounds which would be impossible to obtain using different methods.

### **2.2.1 Writers' Experiences.**

Writers' experiences are the material from where they build their stories (novels, poems, etc.). In the words of David Lodge, "Novels burn facts as engines burn fuel, and the facts can come only from the novelist's own experience or acquired knowledge." (1996, p.27) Vargas Llosa (1966) expresses the same idea when he declares that the starting point for a writer is his/her experience, and that s/he does not have any other starting point than his/her own experience of the world.

But experiences do not just give writers actions to put together in a story; they also provide the substance necessary to build structures in the writer's mind which allow her/him to see and link events, ideas, feelings, etc. in novel and surprising ways. This point is better explained through an example.

Mario Vargas Llosa (1966) describes how experiences in Victor Hugo's life influenced him to write *Les Miserables*. When Victor Hugo was young, a line of prisoners he saw on the street shocked him. He decided to write a short story about prisoners and prisons. When he was looking for information to write his book he visited the prison and discovered that there were some individuals serving life sentences because they had stolen a piece of bread. This situation made him feel angry and he came to realise the social injustice of those days. He tried to find a solution for that injustice: he talked in Parliament, wrote some articles, and at the same time he tried to write a story about the convicts' life. However something was wrong with the story, it did not satisfy him, and he left it.

While he was trying to improve prisoners' life and change the penal code, he heard about a wonderful, charitable and compassionate bishop who was living in a small town in France. Victor Hugo got excited about the story of this man and decided to write a novel whose main character was a similar bishop. In this manner, he signed a contract with a publisher and he began to write. However, when he finished the first version he got the same feeling he had had when he wrote the book about the prisoners: something was lacking and he left the project again.

He kept on writing verses and novels for some years, until one day he got the idea of combining the prisoners and bishop themes and wrote a new novel. Nevertheless, this project failed again; he had the feeling that the text was not authentic enough and he abandoned it when the French revolution started in 1848. Victor Hugo played an important role as mediator during the war; he visited all the barricades trying to get a truce while the insurgents invaded his house. However, in all those moments -writes Vargas Llosa- without him being aware of it, he was accumulating that definitive third experience which would give to the convicted and bishop's stories that social, epic and historical dimension, that kind of fervour, of ferment found on the streets, which gives all its greatness to *Les Miserables*. Victor

Hugo wrote the last version of the novel many years later, when he was in exile on an island in the Pacific Ocean.

This example described by Vargas Llosa clearly shows how previous experiences in Victor Hugo's life were essential in order to write the novel. *Les Misérables* is not a book about the French Revolution but a book that, based on historical events, presents a new view of that world to the reader. Thus, from a cognitive psychology perspective, those experiences provided Victor Hugo with an important set of mental structures that allowed him to produce a piece such as *Les Misérables*.

This idea of modifying one's own experiences to write original stories is shared by different authors. For example, Faulkner affirms that "a writer needs three things, experience, observation, and imagination..." (cited in Plimpton 1958, p.120). Julieta Campos thinks that "the novel is an inextricable alliance between memory and imagination" (1973, cit. in Klahn & Corral 1991, p.225). And Carlos Fuentes writes "What does a writer provide to his nation but the same that he demands from himself: imagination and language?" (1993, p.20). For these writers imagination plays an important role in the creative process. But what do writers understand imagination to be? According to Gabriel García Márquez, "imagination is a special faculty that artists have in order to create a new reality starting from the reality in which they live" (1979, cit. in Klahn & Corral 1991, p.123). Carlos Fuentes sees imagination as the "transformation of experience into knowledge" (1993, p.11). Mario Vargas Llosa supports these ideas when he writes "novels are not written in order to describe life but to transform it adding something new to it" (1984, cit. in Klahn & Corral 1991, p.401). He describes novels as "a [Striptease] but in reverse order: the writer starts with a nakedness which is the experience of reality and he dresses it, he covers it... in order to hide such a reality from readers and also, in many cases to hide it to himself." (Vargas Llosa 1966, cit. in Klahn & Corral 1991, p.349)

The key phrases here are "transformation of experiences" to create "new realities". The Representational Redescription model (Karmiloff-Smith 1995) seems to explain (at least in part) this process.

... a specifically human way to gain knowledge is for the mind to exploit internally the information that it has already stored (both innate and acquired), by redescribing its representations or, more precisely, by iteratively re-representing in different representational formats what its internal representations represent. (p 15)

The end result of these various redescriptions is the existence in the mind of multiple representations of similar knowledge at different levels of detail and explicitness. (p. 22)

In this way, the structures obtained through redescription allow creating new events, relations, etc. That is, they "are the seeds of creativity" (Karmiloff-Smith 1993, p.28). It is hypothesised in this research that writers experiment this (or a similar) redescription process, and when their experiences have been re-represented in what Karmiloff-Smith refers as the explicit format, they are able to use them, not

always consciously, to link events in novel ways. Because this representational process provides new structures not present before in their minds, writers can write things they could not before. Thus, it is hypothesised that in order to create new realities, it is necessary to have multiple mental representations at different levels of abstraction of those experiences.

How can all these ideas been applied in this research? It is out of the scope of this work to investigate the redescription process (Karmiloff-Smith 1993, 1995). However, the concept of multiple representations of similar knowledge at different levels of abstraction, and their role during writing are important in the present work. Can MEXICA (the computer-prototype implemented in this research) transform experiences to create new realities? No, for two reasons. Firstly, it cannot have experiences. And secondly, the cognitive process necessary to perform such an activity to a human level is too complex. However, the present research attempts to provide a computer model where the same data encoded in multiple representations are the basis for the production of new material.

## **2.3 The Writing Process.**

This section describes four accounts of writing where different positions are represented:

- Section 2.3.1 describes Hayes' general framework of writing based on the problem-solving approach.
- Section 2.3.2 analyses the story grammars approach (i.e. predefined story-structures).
- Section 2.3.3 describes Torrance's et al. account where writing (as speech) is seen as an automatic process, i.e. the production of material is not guided by explicit goals or predefined structures.
- Section 2.3.4 describes Gelernter's general model of creativity, where the problem-solving position and the automatic position are seen as complementing each other.
- Section 2.3.5 describes Sharples' engagement-reflection account of writing, where these two positions are seen as strongly interacting with each other.

This section attempts to offer a general perspective of those accounts that have been important in this research. See Levy & Ransdell (1996) for recent research in the writing process.

### **2.3.1 Hayes' Framework of Writing.**

In 1980 Hayes and Flower published a model of the writing process, which had an important influence in the field. Recently, Hayes (1996) presented a new framework for the study of writing, which

attempts to clarify some aspects contained in the 1980 model, as well as to incorporate some of the new findings in the field.

Hayes states that his new framework does not describe major aspects of writing in detail. That is, although the framework includes well developed parts (e.g. clearly structured models of planning and text production), elements that are starting to take shape or which have just begun to be useful are also incorporated. In the same way, the relation between parts in the framework has not yet been clearly defined. Thus, the framework offers general aspects of the process rather than detailed descriptions.

The framework is divided in two main components: the task environment and the individual. Within the task environment component, Hayes includes social aspects (e.g. culture, type of audience) and physical aspects (e.g. the writing medium used) that affect the writing process. Hayes states that, since he is a psychologist and not a sociologist or cultural historian, he prefers to concentrate on the individual component. This component is constituted by four elements: Motivation/Affect, Working Memory, Long-term Memory and Cognitive Process.

1. The Motivation/Affect element is related to the nature of motivation in writing. Hayes establishes a strong link between motivation and writer's goals. He also includes within the Motivation/Affect element aspects like how beliefs about writing influence writer's motivation, affective responses to some texts, etc.

2. Working Memory has two major functions: to store information (particularly phonological and visual-spatial information) and to perform some cognitive activities (e.g. mental arithmetic, logical reasoning and semantic verification).

3. Long-term Memory stores writer's knowledge about vocabulary, grammar, audience, topic, and so on. An example of this kind of knowledge is the task schemas. Task schemas are packages of information that indicate how to carry out a specific task. They include information about the goals of a task, the processes to be used in order to accomplish the task, the sequencing of those processes, and criteria for evaluating the success of the task. Long-term memory also includes knowledge about the audience, topic, linguistics and genre.

4. Regarding the Cognitive Process, Hayes affirms that the primary cognitive functions in writing are text interpretation, reflection and text production:

- Text interpretation consists of creating internal representations from external sources. Examples of these functions are reading, listening, and scanning graphics.
- Reflection consists of creating new internal representations from other internal representations. Examples of these processes are problem solving (including planning), decision making and inferencing. Hayes states that problem solving —i.e. finding the steps necessary to reach a goal— “constitutes a substantial part of any but the most routine composing activities” (Hayes 1996, p.20). The same occurs when people have to evaluate alternatives, i.e. decision making (e.g. what position to take in a controversial topic, what points to highlight). Thus, “like problem solving, decision making is also an important component of all but the most routine writing tasks” (Hayes

1996, p.21). Inference, which is not necessarily goal oriented, consists in deducing new information from old (e.g. writers make inferences about the knowledge and interest of audiences).

- Text production consists of producing written, spoken or graphic outputs from internal representations. Hayes suggests a model of text production. Cues, built from the writing plan and from the text produced so far, are used to retrieve into working memory a package of semantic content. A surface structure to express this content is created and stored in an articulatory buffer. When all the content is expressed or when the buffer is full, the writer articulates —either vocally or sub-vocally— the sentence part. Then, an evaluation occurs; if the articulated sentence fulfils the evaluation requirements it is written down and the process starts again. Otherwise, it is rejected and a new sentence part is built and evaluated.

All elements in the individual component (Motivation/Affect, Cognitive Process, Working Memory and Long-term Memory) interact with each other. The same occurs between the individual component and the task environment

The new framework differs from the 1980 model in the following aspects:

- Special attention to the role of working memory
- Inclusion of the visual-spatial dimension.
- Integration of the Cognitive Process and Motivation/Affect
- Reorganisation of the Cognitive Process. New and more specific models of planning, text production and revision.

### **2.3.2 Story Grammars.**

Story grammar theories have been developed with the objective of creating a theory of story understanding. From a story grammar's perspective stories are considered as linguistic objects, which have a constituent structure that can be represented by a grammar. That is, story grammarians see stories as something linguistically analogous to sentences; therefore, since sentence grammars characterise the constituent structure of sentences, story grammars represent the constituent structure of stories. Since Lakoff (1972) developed the first story grammar based on Propp's (1968) studies on Russian folktales, different authors have developed their own grammars (e.g. see Rumelhart 1975, Mandler and Johnson 1977, Pemberton 1984). A grammar consists of a set of rewrite rules. Symbols that can be rewritten are called non-terminals; symbols that cannot be rewritten are called terminals. The following is an example of part of a story grammar developed by Thorndyke (1977, cit. in Black and Wilensky 1979):

Story -> Setting + Theme + Plot + Resolution

Setting -> Characters + Location + Time

Theme -> (Event)\* + Goal

Plot -> Episode\*

Episode -> Subgoal + Attempt + Outcome

Attempt -> Event\* or Episode

The first rule in the grammar specifies that a Setting, a Theme, a Plot and a Resolution form a story. The second rule establishes that the Setting can be rewritten in three components: Characters, Location and Time. Now, the Theme is formed by one or more optional Events that initiate a Goal State (observe the notation used in this rule: the parenthesis indicates that the Event is optional, and the start symbol indicates that the Event can occur one or several times). The following rule indicates that a Plot is formed by one or more Episodes. A Subgoal state, an Attempt and an Outcome constitute an Episode. An Attempt is formed by one or more Events, or by a whole Episode, and so on.

Story grammars have been the centre of a polemic. While some authors believe that story grammars are important for story understanding, others argue that they are not the right approach. For instance, Black & Wilensky (1979) see several problems with story grammars. They state that sometimes story grammars cannot distinguish between stories and nonstories; as a consequence, they classify nonstories as stories. As an example they show how, if some of the elements that grammars used to recognise stories (e.g. setting, goals, a protagonist) are included in a procedural description text, the grammar classifies the text as a story. These authors state that the opposite problem also occurs. That is, story grammars are unsuccessful in generating many types of valid stories; as a consequence such valid stories are rejected by the grammar. As an example, they mention how story grammars can only represent stories where a main character is attempting to achieve a single goal; thus, stories with multiple and conflicting goals cannot be managed by the grammars and are classified as nonstories. Black & Wilensky suggest that studying the knowledge that readers require to understand characters' attempt to achieve goals "would be a more successful research framework than the story-grammar approach" (p. 223). Wilensky (1983) has pointed out what he believes is at the core of the problem with story grammars: he states that —while sentences are textual objects— stories are mental objects and cannot be treated as linguistic elements. Therefore, the whole approach is ill conceived. Another critic, Garnham, states that "almost none of the knowledge that we use in understanding texts has been shown to be specific to stories, and even less of it to the structure of stories" (Garnham 1983, p.153).

The followers of story grammars have a different opinion. They claim that story grammars represent the structure of stories (Mandler 1983, p. 603) but from particular domains, e.g. oral tradition (Mandler & Johnson 1980, p. 306). That is the reason why some valid stories are classified as nonstories by grammars; i.e. a valid story that does not belong to the domain cannot be recognised. Story grammars represent a kind of knowledge that people have that allows understanding and generating stories (Bereiter 1983, p. 593, Mandler 1983, p. 603). Thus, independently of the formalism used to study stories, some characterisation of their constituent structure is necessary and —as Rumelhart points out (1980)— story grammars provide it (Mandler & Johnson 1980, p. 310). Thus, Mandler concludes that a

“story grammar characterises a particular type of text; it involves an analysis of the constituent structure and ordering rules for such texts and thus is similar to the analysis of other linguistic objects, such as sentences” (Mandler 1983, p. 603).

### **2.3.3 Writing as an Automatic Process.**

Torrance, Thomas & Robinson (1996) have pointed out how "Discovering what to say is part and parcel of the writing process" (p.189) and therefore the necessity of theories of writing which account, not just for the process of how ideas are transformed into text, but the way writers generate such ideas. According to them, at least two positions regarding theories of idea generation can be found: the strategic and the automatic. With reference to the strategic position, Torrance et al. point out how most of the research in text generation describes writing as a conscious and analytical problem solving process in pursuit of rhetorical goals. "Idea generation is characterised as an explicit and effortful process involving deliberate and strategic search for ideas"(p.189). An example of this position is Hayes & Flower (1980) model.

Standing by the second position, Torrance et al. suggest that instead of the analytical, strategic, cognitive activity view, writing (like speech) can be seen as a largely automatic and implicit process. Their position is based on research on human memory and theories of concept retrieval. The following are the core points of a summary made by Torrance et al. regarding such theories.

The retrieving of concepts from long-term memory works as follows. When a probe is presented in working memory, an automatic activation of related concepts in long-term memory is produced. Those concepts more strongly related to the probe are more likely to be retrieved than those less related. That is, the strength of the association between them determines whether or not an idea is retrieved. In this way, the content in the probe determines which concepts are brought into working memory.

Raaijmakers and Shiffrin (1981, cited in Torrance et al. 1996) claim that probes are formed by permanent and nonpermanent cues. The former remain unchanged during the retrieval process, while the latter are constantly modified. These changes take place in two possible situations. If a concept is retrieved, it replaces one of the nonpermanent cues selected at random and becomes part of the probe. Otherwise, if after several attempts a probe is unsuccessful in retrieving something from memory, the nonpermanent cues are "purged and replaced with the next few concepts to be retrieved." (Torrance et al. 1996, p.192).

Two points are highlighted from this summary:

- 1) The decisive importance of probe's content in concept-generation.
- 2) How a fully automatic procedure that determines such content “can result in the successful generation of a large number of concepts of a given theme.” (Torrance et al. 1996, p.193)

Torrance et al. notice how problem-solving models of writing describe similar stages for idea generation, and they summarise them as follows:

1. The writer identifies a memory probe and searches long-term memory in order to retrieve a proposition (e.g. an essay topic).
2. A process to evaluate the retrieved proposition takes place.
3. Optionally, if the proposition passes the evaluation, it is written.

If more ideas are required the process is repeated. Torrance and his colleagues suggest that, under this position, the most evident source of concepts for the writer to create the probe is the writing assignment; furthermore, additional cues are possible obtained from the analysis of the rhetorical demands of the writing task.

Thus, under the automatic position an automatic process determines the content of the probe. Under the problem-solving position, writing assignments and rhetorical demands determine the content of the probe, and an evaluation process takes place.

Within this framework, the results of a study where students were asked to write an essay about the pros and cons of decriminalising drugs are presented by Torrance et al. (1996). Its objective was to investigate the importance of strategic and automatic processes in the production of appropriate ideas for inclusion in an essay. They conclude that the results of their study “point to an idea generation process that has more in common with simple models of memory retrieval than the more strategic problem-solving account developed earlier.” (pp. 203-204) Nevertheless, they do not deny that problem-solving strategies can play an important role in writers' idea generation process.

“Much of the work on the psychology of writing ... has started from the premise that mature writing is essentially an explicit, analytic, and strategic cognitive activity... An alternative ... may be to start from the other end with the premise that writing, like speech, is largely automatic.” (p.205)

### **2.3.4 High and Low Focus.**

Although not explicitly developed as a writing theory, Gelernter's (1994) ideas of creativity are relevant to this work. He claims that the way in which a person thinks depends on a characteristic called “mental focus”. Focus is a continuous spectrum of cognitive activity ranging from high to low. At the high end of the spectrum, the thought is analytic and penetrating. “As we set off down-spectrum, thinking becomes less penetrating and more diffuse, consciousness gradually ‘spreads out’ and... emotions starts gradually to replace logical problem-solving as the glue of thought” (p. 5). Gelernter claims that creativity can be reduced to the discovery of new analogies during Low Focus, which occurs when one thought triggers another one which is related to it by shared emotions.

Sharples (1996) points out some problems with this theory. Gelernter sees emotions as the way to link thoughts; however, as Sharples mentions, other things such as a colour, a sound, etc. can also work as a link between thoughts. Gelernter's theory also excludes the possibility of analytical thought as a generator of creativity. Nevertheless, Sharples acknowledges the utility of seeing High and Low Focus as part of the same spectrum of thinking, as a way to understand writing. "When a person sits back and thinks, there is no barrier between the free association of ideas and the controlled transformation of mental spaces or the solving of problems." (Sharples 1996, p.134)

### **2.3.5 Engagement and Reflection.**

This chapter has exposed two general views of creativity and writing: either as an explicit problem-solving activity, or as an automatic, low-focus process. Sharples (1996) merges these two views into one theory: for him the writing process consists of a cycle between engaged writing and deliberate reflection, guided by constraints.

During engagement the writer is completely absorbed, creating written material on an external medium. Working memory is fully devoted to the task and as a result no other deliberative cognitive activity (with the exception of speaking the words out loud) can be performed. When the writer needs to reflect on the material produced it is necessary to stop the engaged state; in this way, intervals of engagement and reflection arise.

"Reflection consists of 'sitting back' and reviewing all or part of the written material, conjuring up memories, generating ideas by association, forming and transforming ideas, and planning what new material to create and how to organize it." (Sharples 1996, p. 144)

In this way, Sharples' theory of writing suggests that "it is the entire cycle of engagement and reflection that pushes composition forward, with engagement providing new material for consideration, and reflection offering a reinterpretation of the material and new plans to be enacted." (Sharples 1996, p. 144)

Sharples' views of the writing process form the basis of this research. A more complete description of his account is presented in Section 3.1.

## **2.4 Computer Story Generation.**

Most computers models developed to simulate and/or study the writing process are based on problem-solving techniques or story grammars. This section reviews some of these models, as well as a general model of human cognition, in order to present an overview of the field. The section is divided in five parts:

- Section 2.4.1 describes SOAR, a general model of human cognition based on problem-solving techniques.
- Section 2.4.2 describes TALE-SPIN, a computer model of writing based on problem-solving techniques. TALE-SPIN writes stories by setting goals for the characters and recording their attempts to achieve them. Thus, this system is concerned with character-level goals.
- Section 2.4.3 describes MINSTREL, a computer model of creativity and writing. This program is a case-based problem-solver. In contrast with TALE-SPIN, MINSTREL is concerned with author-level goals, and makes use of predefined story structures.
- Section 2.4.4 describes GESTER. This program is a model of story generation based on the story-grammar approach.
- Section 2.4.5 describes GRANDMOTHER. This system combines the story-grammar approach employed in GESTER with problem-solving techniques to produce stories.

Each of these computer models studies different aspects of story developing: some are concerned with story structures, and others with characters' goals or the author's goals. Some of these programs mix these two positions (predefined structures and problem-solving techniques). In this way, these programs are illustrative examples of computer models of writing. For a general review and/or analysis and current research of creativity and AI see Rowe and Partridge (1993), Boden (1992, 1994, 1996), Dartnall (1994).

### **2.4.1 SOAR.**

SOAR (Laird et al. 1987) is a problem-solving architecture and a model of human cognition. It is not explicitly designed for the study of creativity but to model general intelligent behaviour. It is driven by goals and subgoals which represent what the system wants to achieve. SOAR has been run on different AI problems which range from simple games to typical expert system tasks.

All its knowledge is encoded in long-term memory as a production system. The retrieval of information from long-term memory (including information about available plans and preferences about how the system should behave in its current situation) takes place in an elaboration-phase/decision-procedure cycle called the decision cycle. During the elaboration phase the current content in working memory is matched against all the rules in long-term memory. An important characteristic in SOAR is that all rules in which preconditions are satisfied are triggered in parallel, i.e., if the preconditions of one hundred rules are fulfilled, then one hundred rules are fired. Elaboration may take many steps because the information produced (by the productions) in one step may allow other elaboration to be made (new rules to be fired); so, elaboration ends when quiescence is reached. In this way, during this phase all relevant knowledge available about the current situation is brought into working memory. The decision

procedure, an architecturally fixed heuristic, selects an action to be followed from the available alternatives, and then the cycle starts again with more elaboration being made.

An impasse can occur when there are no alternatives available or the information to take a decision is not sufficient or inconsistent. Then, SOAR answers by creating a goal (a new problem) to break the impasse and the cycle starts again. SOAR has a learning mechanism called chunking; whenever a goal is achieved, the solution found is generalised and added to the set of productions in order to avoid future impasses in similar situations. Since SOAR's long-term knowledge is represented as a single memory organisation (a production system), the system requires bringing to working memory all knowledge it has related to a particular situation to keep on working. This method of retrieving relevant information during the production of material does not seem very efficient.

The main difference between SOAR and the present research is pointed out by the fact that SOAR is a problem-solving architecture driven by specific goals (or states) to achieve, i.e., a system which focuses all its resources on achieving a particular state in a problem space. In contrast, this research employs a computer model of creativity in writing that avoids the use of goals as a way to guide its production of material.

#### **2.4.2 TALE-SPIN.**

TALE-SPIN (Meehan 1981) is a program that writes stories about characters who have to solve problems like being hungry, tired, etc. in a simulated world. That is, TALE-SPIN stories are generated by setting goals for characters and then recording their attempts to reach the goal. The following is an example of a story created by TALE-SPIN:

ONCE UPON A TIME GEORGE ANT LIVED NEAR A PATCH OF GROUND. THERE WAS A NEST IN AN ASH TREE. WILMA BIRD LIVED IN THE NEST. THERE WAS SOME WATER IN A RIVER. WILMA KNEW THAT THE WATER WAS IN THE RIVER. GEORGE KNEW THAT THE WATER WAS IN THE RIVER. ONE DAY WILMA WAS VERY THIRSTY. WILMA WANTED TO GET NEAR SOME WATER. WILMA FLEW FROM HER NEST ACROSS A MEADOW THROUGH A VALLEY TO THE RIVER. WILMA DRANK THE WATER. WILMA WAS NOT THIRSTY ANY MORE.

GEORGE WAS VERY THIRSTY. GEORGE WANTED TO GET NEAR SOME WATER. GEORGE WALKED FROM HIS PATCH OF GROUND ACROSS THE MEADOW THROUGH THE VALLEY TO A RIVER BANK. GEORGE FELL INTO THE WATER. GEORGE WANTED TO GET NEAR THE VALLEY. GEORGE COULDN'T GET NEAR THE VALLEY. GEORGE WANTED TO GET NEAR THE MEADOW. GEORGE COULDN'T GET NEAR THE MEADOW. WILMA WANTED GEORGE TO GET NEAR THE MEADOW. WILMA WANTED TO GET NEAR GEORGE. WILMA GRABBED GEORGE WITH HER CLAW. WILMA TOOK GEORGE FROM THE RIVER THROUGH THE VALLEY TO THE MEADOW. GEORGE WAS DEVOTED TO WILMA GEORGE OWED EVERYTHING TO WILMA. WILMA LET GO OF GEORGE. GEORGE FELL TO THE MEADOW. THE END.

All events are represented in terms of Conceptual Dependency (CD) expressions. Some models which describes knowledge about the story-world (e.g. that bees lives in beehives, bears eat honey, etc.) are provided. Also, the system is given a set of problem-solving procedures (i.e. explicit information of how to deal with problems of transportation, acquisition of objects, acquisition of information, persuasion, etc.) and forty-one inference functions. Such functions are used to compute the consequences of an event (in TALE-SPIN each CD expression, i.e. each event, has associated a set of these inference functions which generate new CD expressions).

The program starts with an initial dialogue between the user and the system where s/he defines the set for the story, i.e., who are the characters participating, who is the main character, (and specially) what is the problem that this main character needs to solve, etc. Once this initial event has been defined the top level cycle starts: an event is "asserted", i.e. it is recorded (which means that if the event represents a goal it is included in a PLAN-LIST, otherwise it is added to memory) and all its consequences computed (i.e. all the inference functions associated to that event are executed). Then, each of the inferences generated is asserted and all the consequences of each of such inferences are also asserted, and so on. When no more consequences can be generated the PLAN-LIST is sent to the problem solver: calls to the right procedures to solve the problem are done which produce new events to be asserted and the cycle keeps on going; the story ends when the main character's problem is solved.

TALE-SPIN manages four types of inferences. Type-1 or "backwards inferences" indicate which previous states or acts are necessary for a particular situation to occur; e.g. type-1 inferences from "Betty bee gave the honey to Sam bear" are that Betty had the honey and that the honey was near Betty, i.e. a transfer of possession (ATRANS) must be preceded by the acquisition of the possession by the right character (CONT) and by the proper location of the possession (LOC). When there is a goal to achieve TALE-SPIN applies backwards inferences to establish a path between the desired goal and the actual state of the story-world.

Type-2 inferences are the consequences of an event. The generation of consequences forms the core part of the writing process in TALE-SPIN. Some of them are context free but many depend on the state of the story-world: e.g. what facts characters know or what attitudes they have towards each other. Type-3 inferences indicate which states are the preconditions for acts and Type-4 inferences indicate what other acts might follow a particular one.

Part of an example of the inference process given by Meehan is now reproduced. Having George Ant and Wilma Bird as characters, if George falls into a river an inference from that is that George is in the water. Two inferences from that are that George and Wilma are aware that George is in the water. When someone is in the water it is inferred that the person might die. This sets up the goal to avoid or undo the event. The inference of having a goal is to call the problem solver, etc.

Using inferences of type one or two, characters in TALE-SPIN can produce some plans using hypothetical simulations; e.g., Type-1 inferences can be used to plan how to achieve a specific goal, while inferences of Type-2 can be used to foresee the outcome of an event. Because hypothetical

simulations are based on the character's knowledge of the world which can differ from the real status of the story-world, plans based on such simulation do not always work for the characters.

Finally, to give the reader an idea of the way in which the problem solver mechanism works, a portion of another given example is re-created. This is a story about Betty bee and Sam bear where the main problem is that Sam bear is hungry. The program knows that bears eat honey, so the routine for acquisition of objects is called in order to get the honey. This routine calls the routine for acquisition of information in order to let Sam know where to look for it, in this case, at Betty's beehive. Now, the routine for acquisition of objects tries to apply one of the different plans it has associated to get the honey, e.g., ask if the honey is free, persuade Betty Bee to surrender it, steal it, etc. For this example the option of stealing the honey is selected since it is the only one whose preconditions are satisfied. This option has associated the plan of make Betty bee move away from the beehive in order to take the honey, so a new procedure is called to achieve this subgoal, and so on.

TALE-SPIN is a program that showed (probably for the first time) how problem-solving techniques can be applied to story telling. After twenty-seven years (the first versions of the program were run in 1976) its influence in the field is still present. For example, in her review of AI models of the arts Boden refers to MINSTREL (one of the latest story-writing systems developed, see next section) as "a more powerful version of TALE-SPIN." (1996, p.281). So, the problem-solving approach introduced by TALE-SPIN became the model to follow for a significant number of AI researchers working with story telling.

However (naturally), the program has important shortcomings. One of the most significant is its extreme rigidity. In TALE-SPIN all possible directions a story can follow have been previously defined. That is, it is not able to surprise the programmer (and any user who has used the system a couple of times) with an original story. Another important limitation of the system comes from its lack of differentiation between characters and author's goals. That is, because TALE-SPIN is driven just by the characters' goals whose aims are to solve particular problems, uninteresting stories like "John Bear is hungry, John Bear gets some berries, John Bear eats the berries, John Bear is not hungry anymore" can arise.

Meehan mentioned "Stories are certainly *more* than problem-solving narratives, but they may not be less." (p. 203) The present research attempts to explore those other aspects of stories not covered by problem solving.

### **2.4.3 MINSTREL.**

MINSTREL (Turner 1993) is a computer program that writes short stories about King Arthur and his Knights of the round table. It is a case-based problem-solver where past cases are stored in a episodic

memory. Stories are created using predefined themes; such themes are represented as schemas and have explicit specifications about the structure of the story. The following is an example of a story created by MINSTREL:

Once upon a time there was a lady of the court named Jennifer. Jennifer loved a knight named Grunfeld. Grunfeld loved Jennifer.

Jennifer wanted revenge on a lady of the court named Darlene because she had the berries which she picked in the woods and Jennifer wanted to have the berries. Jennifer wanted to scare Darlene. Jennifer wanted a dragon to move towards Darlene so that Darlene believed it would eat her. Jennifer wanted to appear to be a dragon so that a dragon would move towards Darlene. Jennifer drank a magic potion. Jennifer transformed into a dragon. A dragon moved towards Darlene. A dragon was near Darlene.

Grunfeld wanted to impress the king. Grunfeld wanted to move towards the woods so that he could fight a dragon. Grunfeld moved towards the woods. Grunfeld was near the woods. Grunfeld fought a dragon. The dragon died. The dragon was Jennifer. Jennifer wanted to live. Jennifer tried to drink a magic potion but failed. Grunfeld was filled with grief.

Jennifer was buried in the woods. Grunfeld became a hermit.

The writing process in MINSTREL consists of instantiating all the schemas that make up the theme. When MINSTREL cannot find events in episodic memory which instantiate such schemas, a set of heuristics called Transform Recall Adapt Methods (TRAMS) are applied. Basically, TRAMS make small transformations into the schema-specifications used as index to recall from episodic memory, creating a new slightly different index. Then, MINSTREL tries to find an event which instantiates the new specifications; if it fails, a recursive call to the TRAM's procedure is made, a new TRAM is selected producing a new slightly different specifications and another attempt to recall from memory is executed.

This process continues until an event is instantiated or no more TRAMS can be applied. If all selected TRAMS fail, MINSTREL goes back one layer in the recursive procedure, selects a new TRAM between the options available in that layer, and continues with the search (i.e. backtracking). When an event is instantiated, MINSTREL goes back layer by layer adapting the event found to the original specifications in each layer.

Turner defines TRAMS as the heart of the creative process in MINSTREL. To demonstrate their power he gives an example where from two episodes in memory three new episodes unrelated to the original ones are created. The goal is to create a scene where a Knight kills himself. The original episodes in memory are 1) a Knight fights and kills a troll and 2) a Princess makes herself intentionally ill by drinking a potion. One of the solutions MINSTREL comes across when solving the problem is that a Knight intentionally drinks a potion in order to kill himself. To achieve this result MINSTREL applies two TRAMS to the second episode in memory. The first "recognizes that being killed is similar to being injured ... [that is, it] 'guesses' that an action which is known to result in injury might also result in dead" (Turner 1993, p.116). So the TRAM substitutes a potion to make someone ill for a potion to kill someone. The second TRAM allows the character Knight to be substituted by the Princess. Thus, the episode where the Princess makes herself ill is recalled, Princess is substituted by Knight and a

potion to make someone ill by a potion to kill someone. This produces the scene where the Knight kills himself drinking the potion.

Finally, together with thematic goals (to select and instantiate a theme), MINSTREL also manages (all of them as author level goals) drama goals (how and when to include suspense, tragedy, etc.), consistency goals (to avoid inconsistencies in the story) and presentation goals. The story ends when all these goals are achieved.

Important differences exist between MEXICA and MINSTREL's philosophy. Probably the most important of them is Turner's view of creativity just "as an extension of problem solving" (Turner 1993, p.75); by contrast, the present research sees problem solving as one of several different elements which participate during the creative process.

Regarding MINSTREL's architecture, although TRAMs seems to be a powerful tool in some cases they appear to be written for the special purpose of achieving a specific episode. For example, in the case of the Knight who wants to commit suicide, it is difficult to picture how a TRAM which "guesses" or "recognizes that being killed is similar to being injured" (p.116) can work in a different context. To illustrate this situation, the reader can imagine a Knight who is sewing his socks and pricked himself by accident; in this case because the action of sewing produced an injury in the Knight, MINSTREL would treat sewing as a method to kill someone.

TRAMs are selected using the specifications of the problem as an index, i.e., episodic memory contains past problems and associated TRAMs; thus, the programmer decides which TRAMs go together with particular episodes. This association TRAM-episode might lead to programmer-influences in the way MINSTREL develops a tale. That is, when developing a story MINSTREL is not really selecting which TRAMs to use but trying all the TRAMs previously selected by the programmer for a specific episode. One of the most impressive characteristics of MINSTREL is its ability to create stories where revenge, deception, mistaken beliefs, etc. take place. However, these situations are not really created by the system. MINSTREL has ten heuristics that explicitly indicate the structure that such scenes have and the way to construct them. So, again predefined procedures with precise information on how to achieve particular events play a considerable role in MINSTREL's outcomes. Another important limitation comes from its lack of flexibility in the organisation of its tales: all stories MINSTREL produces are structurally predefined, i.e. MINSTREL is not able to create a story with a surprising twist or an unexpected end.

MINSTREL is a very complex program which has pointed out the utility of small modifications as a way to solve problems. Although TRAMs in MINSTREL seem at times to be too specific, they can be a powerful tool during problem solving. Also, MINSTREL indicates the importance of author-level goals in storytelling, particularly theme, consistency, drama and presentation's goals. On the other hand, TRAMs tailored to the specific genre of the story, and inflexibility in story's structure and some scenes' structures are the most important limitations of MINSTREL.

Finally, Turner's view of MINSTREL as a "prima facie evidence that artistic ability can be explained in terms of problem-solving, and that *no further or different cognitive process need be stipulated.*" (p. 244, italics are mine) seems to be naive, and the present research attempts to demonstrate the importance of studying those other cognitive process not covered by problem-solving techniques and MINSTREL.

#### 2.4.4 GESTER.

Pemberton (1984) developed a general model of story structure based on old French epics. She studied nine mediaeval poems concerning the adventures of a family of French Christian fighters and described their structures in terms of a grammar.

The starting symbol in Pemberton's grammar is *complex stories*. It consists of one or more *simple stories*. The simple story is expanded as follows:

SIMPLE STORY-> initial situation + ACTIVE-EVENT + final-situation

ACTIVE-EVENT-> COMPLICATION + ACTION-SEQUENCE

COMPLICATION-> motivating-motif\* + motivation

ACTION-SEQUENCE-> PLAN + QUALIFICATION + ACTION + resolution

ACTION-> action\* + STORY + ACTION | action\*

PLAN-> informing-act\* + plan-proper

QUALIFICATION-> qualifying-act\* + qualification-proper

The asterisk means that the element can be repeated.

(Cited in Sharples 1991)

Pemberton (1987, 1989) used this grammar to implement a program called GESTER (GEnenerating STories from Epic Rules). GESTER has access to information about story structures in the form of the story grammar (story structure rules), and about the epic sub-genre in the form of a discourse grammar (story world rules) and a database describing objects and attributes in the epic world (story world database). The story world rules describe how to select the actors and actions in a story, restrictions on possible combinations of such actors and actions, as well as several inference steps (e.g. how to deduce if a subject can be an ally or an enemy). The story world database includes facts about objects and relations. For example, facts as social status, marital status, family and social relations, nationality and gender, are stored in this database. Pemberton states that a full theory of story production must considerate knowledge of:

- a. story structure
- b. the audience

- c. the author
- d. the cultural context
- e. the rules of the sub-genre

GESTER includes knowledge about points a) and e), and it is assumed that knowledge about the cultural context d) is present in the rules of the sub-genre. The story structure rules are described in a general way in order they can be used in the production of different type of stories when they are combined with the appropriate story world rules and facts.

To produce a story GESTER expands the *complex story* rule and goes through the tree defined by the grammar, making choices according to the information in the story world rules and the story world database, until the terminal symbols are reached. In the present version of the program, a complex story consists of just two simple stories. There are four possible situations where two simple stories can be linked:

- When one story causes the other (referred as *cause*).
- When an event in the first story motivates the second (referred as *motive*).
- When the active elements of one story follows the elements of the other (referred as *then*).
- When two stories share one or more characters (referred as *same actor*).

Stories move from a starting point where something is lacking in the story world, to a point where the missing element is either solved or repeated. To produce coherent stories GESTER employs three general “features”:

1. Story features define how simple stories are joined together (possible values are: cause, motive, then and same actor), whether a story will be successfully resolved, if a story involves friendly or hostile interactions, and particular types of motivating act.
2. Role features assure that actors have the same role during the whole story.
3. Transformation features control the mapping between story line and discourse level. Pemberton defines four levels for the French epic texts: 1) textual level, 2) discourse level, 3) story line level and 4) narrative model level. The words and phrases that the reader experiences constitute the textual level; Pemberton refers to this level as the lexicalised version of the discourse. The discourse is in turn a modified version of the story line. That is, the story line contains the sequence of all events occurring in the story and the discourse consists of the same elements but arranged in a more convenient manner for telling. Finally, the narrative model —the highest level— is the abstract form of the story line level. Thus, transformation features control the interaction between level 2) and 3). “Lexicalisation rules” are included in the story world rules module.

The following is an example of a story created by GESTER:

Charles lacked a city.

As a result of hearing of Narbonne Charles wanted Narbonne.  
 Then Aymeri agreed to help Charles.  
 Then Charles and Aymeri rode to Narbonne.  
 Then, Charles attacked the walls of Narbonne, currently controlled by Baufumez, helped by Aymeri.  
 Thibaut and Clarion threw burning pitch down on Charles and Aymeri.  
 Charles and Aymeri retreated.  
 Then, Charles attacked the walls of Narbonne, currently controlled by Baufumez, helped by Aymeri.  
 Thibaut and Clarion threw stones down on Charles and Aymeri.  
 Charles and Aymeri broke into Narbonne.  
 As a result of seeing Blancheflor Charles wanted Blancheflor.  
 Charles succeeded in getting Narbonne.  
 Charles praised god. Charles forgot to reward Aymeri. Charles threw Thibaut into prison.  
 Then Charles planned to obtain Blancheflor for Charles.  
 Then Aymeri refused to help Charles because he was not rewarded.  
 Then Bertrand agreed to help Charles.  
 Charles abducted Blancheflor, currently controlled by Thibaut helped by Bertrand.  
 Because Thibaut was in prison he did not oppose Charles and Bertrand. Clarion opposed Charles and Bertrand in getting Blancheflor.  
 Charles succeeded in getting Blancheflor.  
 Charles praised god.  
 Charles rewarded Bertrand.

By contrast with other story grammars, Pemberton's grammar does not go to the degree of describing the story style or content. Instead, in GESTER, such a grammar only creates a general frame for the story; facts and rules about the characters and their world are then used to create the final outcome.

Its main shortcoming (also the case for other programs based on this approach) is its rigidity. GESTER is only able to produce stories that satisfy its grammar and is not able to modify its knowledge to generate different outcomes. For example, GESTER cannot create a story-plot which does not involve the lack of something. Another problem with GESTER is that it only produces general outlines; i.e., it requires some procedures to elaborate more details in the stories it produces. This possibility is open since its grammar does not go to the level of defining the actual words of the story; in this way, some processes could be added to fill some of the grammar's slots with more detailed text.

It is worth pointing out that an adequate structure is a necessary characteristic of any good story, and story grammars provide the means to ensure it. Thus, it is necessary to find a way that allows employing the advantages offered by story-grammars but in a more flexible way.

In this way, as Pemberton states, "We need a much richer model of story processing than that which could be offered by either the story grammar or the goal directed model alone." (Pemberton cited in Casebourne, 1996 p.149)

#### **2.4.5 GRANDMOTHER.**

GRANDMOTHER (Casebourne 1996) is a program that combines the story grammar approach with problem solving techniques. It utilises Pemberton's grammar (see Section 2.4.4) to establish a general structure for a story but fills some of the slots (the qualification and action sequences) with text

generated by a planning system. The following is an example of an output produced by GRANDMOTHER:

*Once upon a time there was a queen called Emma who lived in a city called Atlantis. She had lived there happily for many years, but then one day a villager called Rebekka came to her city and killed her husband. Filled with hatred for Rebekka, Emma thirsted for revenge. She resolved to hurt Rebekka. Emma wondered how she might go about achieving her goal. She thought for a long time and eventually came up with a plan. She decided to find Rebekka and murder her. However in order to kill Rebekka, Emma would need an army. Rebekka was a powerful villager, but she was vulnerable to an army. Luckily Emma already had an army, so she could embark immediately on her quest. Emma prepared to set off on her quest, but first Emma looked for Rebekka in Atlantis, however she didnt find her there. Emma sailed from Atlantis to the sea. Emma sailed from the sea to Noone. Emma looked for Rebekka in Noone, however she didnt find her there. Emma rode through the forest. This part of the forest was dark, Emma was a little scared. Emma looked for Rebekka in the forest, however she didnt find her there. Emma continued to ride through the forest. This part of the forest was green and pleasant. Emma looked for Rebekka in the forest, however she didnt find her there. Emma rode from the forest to Chilbolton. Emma looked for Rebekka in Chilbolton, and Emma found Rebekka in Chilbolton. Emma ordered her army to attack Rebekka. Rebekka received a mortal wound, and died immediately. So Emma finally got what she wanted. Which shows that ruthlessness and violence, prevail over weakness. The End.*

The text generated by the planning system module is in italics. The grammar is used as a kind of template, where the slots are filled with suitable values obtained either from the user or a database or the planning module. For example, the **initial situation** is generated filling the following predefined structure: “Once upon a time, there was a <type of protagonist> called <name of protagonist> who lived <protagonist’s home>.”

The planning module is provided with a plan to follow by the grammar. Such a plan consists of a list of actions to be performed sequentially. So, the planner takes the first action in the list and tries to perform it; then, takes the second one, the third and so on. When the list is empty the plan has been successful. When an action is not successfully performed, the plan list is modified. Although travel actions are not included as part of the plans, they can be added to the story at any point when the plan cannot be executed.

The main aim in GRANDMOTHER is to prove that two different approaches for story generation can be combined, resulting in a more powerful system. In this way, “Pemberton’s grammar ensures a story will always develop from a potentially interesting initial problem, through a problem solving stage, to a pre-specified resolution. The planning module allows certain elements to be developed more flexibly than is possible by simple selection from allowable segments of text” (Casebourne 1996, p.151)

However, Casebourne did not do anything to avoid inheriting the limitations of both methods, already described in previous examples in this section. So, although GRANDMOTHER combines story grammar and problem solving techniques, the stories it produces are very rigid.

## 2.5 Some Definitions.

Based on the analysis made in this chapter, an initial definition of story and creativity is offered:

- In this research a *story* is defined as a sequence of events or actions which are coherent and interesting.
- In this research *creativity* consists of producing novel and appropriate narratives (Sharples 1996). A narrative is considered appropriate when it satisfies the requirements of coherence and interest established for a story.

Chapter III describes Sharples' account of writing in detail and the general architecture of MEXICA. Based on these descriptions the concepts "coherent", "interesting" and "novel" are clarified. Section 3.2.6 offers a complete definition of the terms *story* and *creativity*.

## 2.6 Summary.

This chapter presents different perspectives of the writing process.

- The first section examines the opinion of different philosophers, writers, composers, etc. about creativity from an engagement-reflection point of view.
- The second section presents writers thoughts about writing. It is stressed the importance of writers' experience in composition.
- The third section describes five theories about writing: Hayes' framework of writing (problem-solving), story-grammar approach, Torrance's et al. automatic position, Gelernter's ideas about writing and Sharples' engagement-reflection account.
- The fourth section describes illustrative examples of computer models of story structures, the writing process and general cognition: SOAR (based on problem solving), TALE-SPIN (based on character-level goals), MINSTREL (based on author-level goals and predefined structures), GESTER (based on story-grammars), GRANDMOTHER (based on story-grammar and problem solving).