STORY GENERATION AFTER TALE-SPIN

Natalie Dehn

Yale University
Department of Computer Science
Artificial Intelligence Project
P.O. Box 2158
10 Hillhouae Avenue
New Haven, CT. 06520

ABSTRACT

TALE-SPIN, the laat major AI attempt at atory generation, approached the problem of making up atoriea primarily from the perspective of an impartial world simulator. AUTHOR ia a program (under development) which generates atoriea as a creative reaaoner in purauit of her own narrative goals. It is thus intended to aimulate an author's mind aa ahe makes up a story, rather than the world as things happen in it. The four major forces driving the atory generation process, according to the AUTHOR model, are

(1) author intentionality,
(2) conceptual reformulation,
(3) reminding, and
(4) the opportunity enhancement metagoal.

1. World Simulation Based Story Generation

TALE-SPIN [Meehan, 1976] is a program which made up Aesop-fable-like conceptual atoriea, which it then expressed in natural language. Each atory TALE-SPIN made up waa based on a model of the storyworld, including the characters in it and their goala, peraonalities, and interperaonal relatione. Storiea were apun by working out consequences of the model. Thus, central to TALE-SPIN waa the idea of world simulation.

The three levels TALE-SPIN was most concerned with simulating were:

1. character intentionality - e.g., if Joe Bear was hungry, he would try to get something to eat

2. social conatrainta - e.g., if Joe Bear believed Irving Bird to be hia friend, he could aak an outright favor; if Joe Bear believed their relation to be a bit cooler, he would feel obliged to offer something in return (auch aa a worm)

3. phyaical cauaality - e.g., if Irving Bird ate a worm, the worm would cease to exist; after "fooling around",

Aa oppoaed to Sheldon Klein's ayetem which only produced atory texts and which ia incapable, in principle, of understanding the atoriea it "makes up" [Klein et al., 1976].

characters felt "wiped out"

World simulation, however, fails to reflect the proctaa that an author goes through in making up a atory - storyworlds are developed by authors aa needed, frequently as post hoc justification for eventa that the author has already decided ahe wants as part of the story. As illustration, let us consider the question of why, in the Star Wars aequel, "The Empire Strikes Back", Princess Leia and Solo go to visit Landeau.

If one asks a reader (or viewer) this question, the anawer will be along the lines of, "They needed a place to hide from imperial stormtroopers until they got the hyperdrive fixed, and Landeau was an old buddy of Solo's, and ..."•

Were this story being made up by a world simulation approach, Landeau would have to have been invented as part of the initial specification of the story world, back before any of the atory action had been decided. The deciaions that Solo liked Landeau a lot and trusted him some but that Landeau was dishonest, would also have to have been made before starting the action. Landeau would then have remained dormant until it developed that Leia and Solo ran into hyperdrive problems while fleeing imperial stormtroopers. At this point, storyworld causal necceaaity would have to require Solo to do some further planning and thence think of asking Landeau for help.

Setting up an initial story world such that things work out in an interesting way is, at the very least, tricky business.

2. Author Intent Based Story Generation

A more plausible mechaniam for making up this story, however, is one driven by author intent, in which Landeau would not be invented until needed. His invention would be motivated by the need to get Solo out of action for a while so that Luke Skywalker could get the girl, get the credit for some heroic behavior, and eventually rescue Solo and repay his debt.

The difference between a world simulation and an author-intentional model of the story generation proceaa hingea on the difference between character and author goala. While a character's purpose (like a real person's) is to have things go well for himself and for those he carea about, the author's purpoae ia to make up a good atory. The author can think about the atory world, but ia not

16

part of it; she cannot be personally threatened by dangers in the story world, nor can she take advantage of opportunities that arise there. Though the author will frequently "intervene" to ensure that things work out well for a character or to ensure that he loses, she is never in the relation of goal cooperation or goal competition (as described in [Wilensky, 1978]) with the character, because she is functioning on a different level than the character whose fate she determines. To the author, the character is mere modelling clay like the rest of the story world which serves as his environment.

The claim, then, is that making up a story is a deeply goal-based activity, the final story standing as the achievement of a complex web of author goals. The author's goals serve as a sort of scaffolding in constructing the story; they are no longer directly visible in the final story, but are reflected in the storyworld situations and resolutions they gave rise to.

3. Conceptual Reformulation

Author goals do not remain static as story generation progresses. In fact, a large part of the work of making up a story is the successive reformulation of author goals. Story ideas, fragments, etc. also go through numerous conceptual drafts, each reformulation supplying new perspectives which aid further retrieval of related material and constraints from the author's memory.

Conceptual reformulation is an activity that happens on many different levels in the story generation process - e.g., getting the author from an idea to a kernel episode, from a kernal episode to a sequence of episodes, from an characterization of someone to an episode illustrating that characterization, from a change in relation between two characters to a dialogue triggering or reflecting that change.

Suppose, for instance, the author has developed the following kernal episode:

Shy person (protagonist) in need of employment gets job as salesman but is incapable of facing $DOOR-TO-DOOR. Failure seems imminent when protagonist comes up with (and tries) sFORM-LETTER as substitute script towards same goal. Succeeds with flying colors

After several passes of successive reformulation, the story sketch might now be:

EP1: anecdote demonstrating shyness of protagonist

EP2: episode demonstrating closeness of protagonist to mother [further development of protagonist's shyness; drama enhancer for EP4]

EP3: episode revealing continuing unemployment of protagonist [and his interview avoidance?]

EP4: protagonist's mother falls seriously (and expensively) ill; urgency of employment increases

EP5: starts responding by mail to newspaper want ads [foreshadowing of final solution]

EP6: series of job application failures, leading to decreasing discrimination in selection of ads to respond to

EP7: success(?) - opportunity as commissioned door-to-door salesman

EP8: details of conditions (through letter): should show up at office for one day of orientation, starting on road the next, commission system with minimum monthly quota

EP9: first day at work: obnoxious friendliness of salesmen

EP10: $DOOR-TO-DOOR script presented, in story round among saleamen, in exceedingly unfavorable light

EP11: at home after firat day at work; in shock over encounter; in further shock at thought of coming month

EP12: more bad news about mother's health, increasing drama

EP13: agonizing by protagonist about about mess he's in, and recapitulation of it, leads to idea of $FORM-LETTER

EP14: writing and sending out letters, applying old mass mailing system [from EP5]

EP15: first mixed results coming in; pessimistic interpretation

EP16: orders pouring in; rave success

EP17: epilogue: appreciation and money pouring in from company

There is insufficient space to list all the reformulations made, but the following handful can serve as illustration. The author goal to

1. make the story plausible got reformulated into the author goal to

   a. justify the protagonist getting into such an unlikely situation for a shy person

   b. justify the protagonist coming up with the solution he did

2. make the story dramatic got reformulated into the author goal to

   a. emphasize the aversiveness of the salesman situation

   b. reduce the obviousness of the letter campaign solution

   illustrate key facts got reformulated into the author goal to make up episodes illustrating and presenting

   a. the protagonist's shyness

   b. the protagonist's mother's illness

Bach of these reformulations, of course, will undergo numerous further ones as the story develops further.

4. Author Memory and Story Generation

Aa TALE-8PIM was basically simulating the world, rather than an author'a mind, "memory issues" were restricted to matters of computer data structures and repreaentation of knowledge* AUTHOR, however, reliea very heavily on a memory that is human-like in ita organisation and contents. This memory needs to contain not only facta about the atoryworld thua far conatructed, but also prior knowledge of memorable epiaodea, characters, etc. in the author's life. How all thia ia organised and acceaaed ia very critical to the story generation process. Of specie1 importance are memory search strategiea [Kolodner, 1980] and reminding mechanisms (Schank, in press). A "by-product" of conceptual reformulation (actually, thia may be why it ia so effective in the first place) ia greater opportunity for relevant remindings.

Reminding plays two important roles in the story generation process:

1. aa a source of relevant external material - incidenta, characters, etc. from the author's life - to be worked into the story, and

2. as a way of keeping track *of* internal material, narrative goals, etc. allowing the author to become distracted (another important memory phenomenon) yet return to earlier ideas as they become relevant again.

5. Creative Reasoning

Story generation ia predominantly a process of creative reasoning. Aa auch, there are two eaaential characteristics of the process that any model of story generation ahould capture: the degree to which the proceaa ia deliberate and directed, and the degree to which the process is serendipitous.

Although story generation is driven by the author's narrative goals, story generation ia not planful in the traditional, top-down, means-end analysis sense. Rather, there are two metagosls:

1. that of achieving the current narrative goal, and

2. that of finding better narrative goals to pursue.

Methan waa very concerned with restricting TALE-SPIN's knowledge to the kinds of knowledge people have; thus, for inetance, he uaed a symbolic, rather than a more efficient numerical, repreaentation for storyworld geography. Nonetheleaa, it was sufficient, for his purposes, to index "facts" in a very simplistic manner.

The suthor (or sny creative thinker) has to be able to pursue the former, while recognising that it is the latter that is sctually the more important.

There are aeveral eaaential characteristics of creative reasoning:

1. sensitivity to unforeseen opportunities, when one hss the good fortune for them to srise

2. willingness to be distracted from what one was doing, if something better cones up

3. s process of successive reformulation, dramatically increaaing the probability that uaeful opportunities will ariae

4. having at all times a aenae of direction which aervea both

    a. to keep the author usefully occupied in progressing towarda her goals

    b. to provide new environments in which fortuitous opportunities sre likely to srise.

This last characteriatic, the opportunity enhancement metagoal, accounts for the dual directed-yet-serendipidous nature of creative thinking: why conceptual reformulation is so powerful a mechaniam, and how a phenomenon auch as being reminded can be constructively chsnneled in the crestive thought process comprising story generstion.

REFERENCES

Klein, Sheldon, et al. (1976). Automatic Novel Writing: A Status Report. Technical Report #186. Computer Sciences Department. University of Wisconsin-Madison.

Kolodner, Janet L. (1980). Retrieval and Organizational Strategiea in Conceptual Memory; A Computer Model. Ph. D. Thesis. Research Report #187. Department of Computer Science. Yale University, New Haven, CT.

Meehan, James R. (1976). The Metsnovel: Writing Stories By Computer. Ph. D. Thesis. Resesrch Report #74. Department of Computer Science. Yale Univeraity, New Haven, CT.

Schank, Roger C. (in preaa). Dynamic Memory: A Theory of Lesrning in Computers and People.

Wilenaky, Robert (1978). Underatanding goal-baaed stories. Ph. D. Theaia. Reaearch Report #140. Department of Computer Science. Yale Univeraity, New Haven, CT.