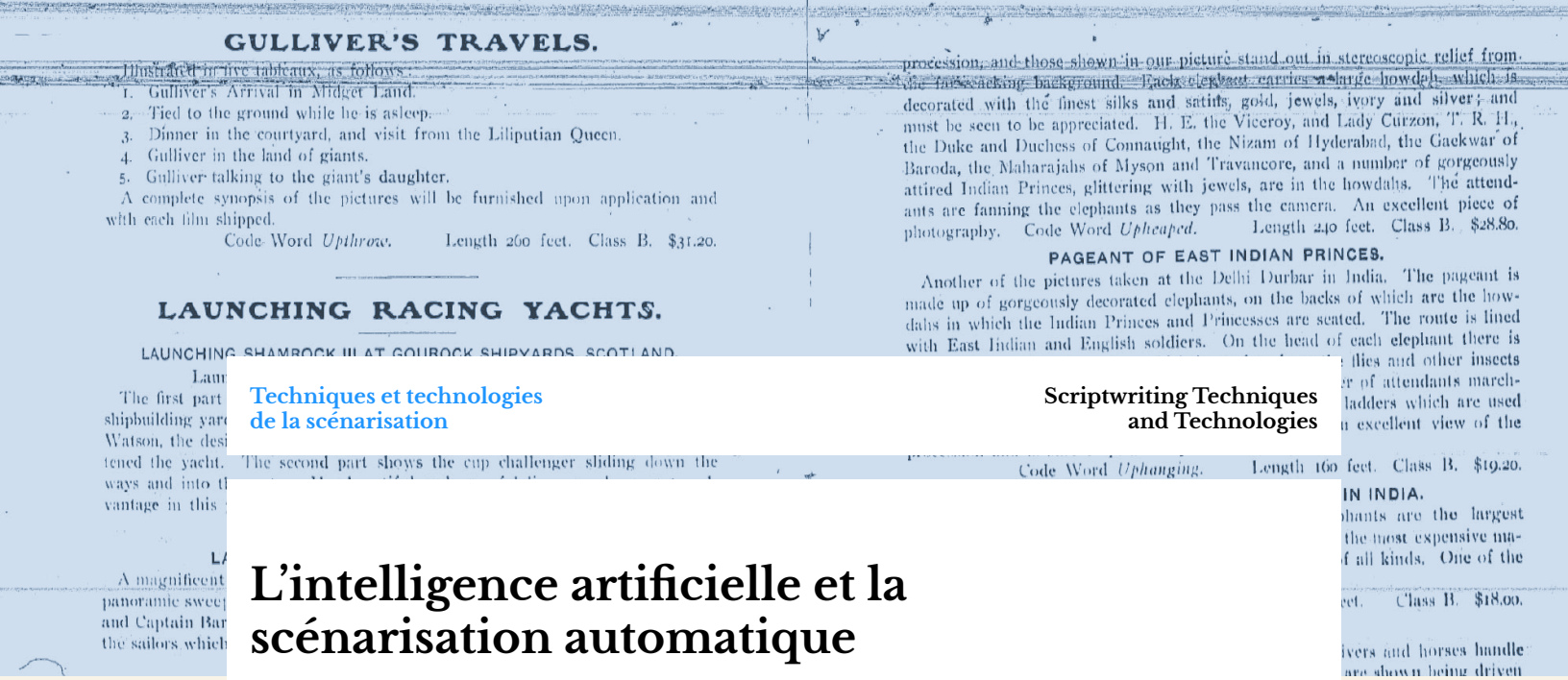
GULLIVER'S TRAVELS.

Illustrated in five tableaux, as follows:

1. Gulliver's Arrival in Midget Land.
2. Tied to the ground while he is asleep.
3. Dinner in the courtyard, and visit from the Liliputian Queen.
4. Gulliver in the land of giants.
5. Gulliver talking to the giant's daughter.

A complete synopsis of the pictures will be furnished upon application and with each film shipped.

Code Word *Upthrow.* Length 260 feet. Class B. $31.20.

LAUNCHING RACING YACHTS.

LAUNCHING SHAMROCK III AT GOUROCK SHIPYARDS, SCOTLAND.

The first part shows the cup challenger sliding down the ways and into the water.

procession, and those shown in our picture stand out in stereoscopic relief from the fire-cracking background. Each elephant carries a large howdah which is decorated with the finest silks and satins, gold, jewels, ivory and silver; and must be seen to be appreciated. H. E. the Viceroy, and Lady Curzon, T. R. H., the Duke and Duchess of Connaught, the Nizam of Hyderabad, the Gaekwar of Baroda, the Maharajahs of Mysore and Travancore, and a number of gorgeously attired Indian Princes, glittering with jewels, are in the howdahs. The attendants are fanning the elephants as they pass the camera. An excellent piece of photography. Code Word *Upheaped.* Length 240 feet. Class B. $28.80.

PAGEANT OF EAST INDIAN PRINCES.

Another of the pictures taken at the Delhi Durbar in India. The pageant is made up of gorgeously decorated elephants, on the backs of which are the howdahs in which the Indian Princes and Princesses are seated. The route is lined with East Indian and English soldiers. On the head of each elephant there is

Code Word *Uphanging.* Length 160 feet. Class B. $19.20.

IN INDIA.

Class B. $18.00.

Techniques et technologies de la scénarisation

Scriptwriting Techniques and Technologies

L'intelligence artificielle et la scénarisation automatique

Artificial Intelligence and Automatic Scripting

Jonathan Lessard

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Image d'accroche/header image
Extrait du catalogue n° 175 des films de la Edison Manufacturing Company, mai 1903. Voir la fiche.
Excerpt from the Edison Manufacturing Company film catalogue no. 175, May 1903. See database entry.

Base de données TECHNÈS/TECHNÈS database
Une base de données documentaire recensant tous les contenus de l'*Encyclopédie* est en libre accès. Des renvois vers la base sont également indiqués pour chaque image intégrée à ce livre.
A documentary database listing all the contents of the *Encyclopedia* is in open access. References to the database are also provided for each image included in this book.

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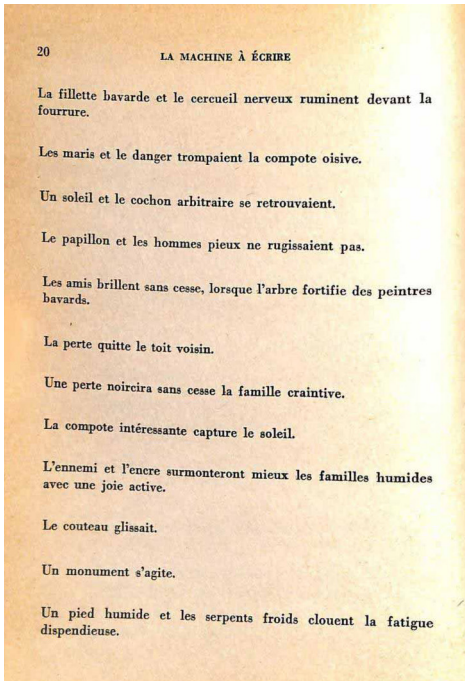
ENCYCLOPÉDIE RAISONNÉE DES TECHNIQUES DU CINÉMA
CINÉMÉDIAS
CINEXMEDIA

L'intelligence artificielle et la scénarisation automatique

par Jonathan Lessard

L'idée d'utiliser l'ordinateur pour la production automatique de récits fictionnels est apparue dès l'émergence de l'intelligence artificielle comme champ de recherche. À ce jour, le plus ancien exemple connu de ce type est un générateur de contes de fées conçu par Joseph E. Grimes, un linguiste, au début des années 1960[1]. Peu de temps après, le premier livre répertorié de poésie produite par ordinateur paraît au Québec : *La machine à écrire, mise en marche et programmée* par Jean A. Baudot[2]. Les textes y sont accompagnés de commentaires de plusieurs artistes contemporains, dont Jacques Godbout, Félix Leclerc et Raymond Queneau.



20 LA MACHINE À ÉCRIRE

La fillette bavarde et le cercueil nerveux ruminent devant la fourrure.

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Un soleil et le cochon arbitraire se retrouvaient.

Le papillon et les hommes pieux ne rugissaient pas.

Les amis brillent sans cesse, lorsque l'arbre fortifie des peintres bavards.

La perte quitte le toit voisin.

Une perte noircira sans cesse la famille craintive.

La compote intéressante capture le soleil.

L'ennemi et l'encre surmonteront mieux les familles humides avec une joie active.

Le couteau glissait.

Un monument s'agite.

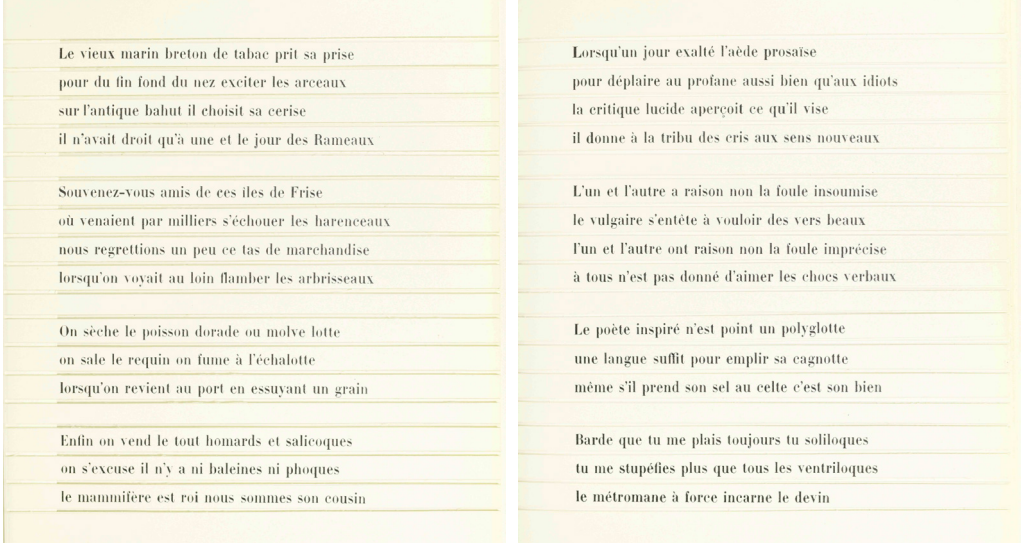
Un pied humide et les serpents froids clouent la fatigue dispendieuse.

Extrait de vers du recueil *La machine à écrire, mise en marche et programmée par Jean A. Baudot*. Voir la fiche.

Jusqu'à tout récemment, ce champ d'étude oscillait entre la recherche fondamentale et l'art expérimental sans vraiment influencer les principaux sites de production et de consommation de fictions. Même les systèmes les plus sophistiqués ne rivalisent pas avec la scénarisation « à la main ». L'émergence et la démocratisation du jeu vidéo est cependant venue changer cet état de fait en créant un contexte d'application pour la génération automatique de récits. L'adaptation « en direct » du récit aux actions du joueur est l'un des fantasmes du jeu vidéo (incarné par le *holodeck* de la série *Star Trek*) dont la réalisation passe nécessairement par des méthodes de scénarisation automatique. Dans les pages qui suivent, nous discuterons des principales approches développées pour s'attaquer à ce problème épineux.

Combinatoire et grammaires non contextuelles

La méthode la plus simple pour produire automatiquement de nouveaux textes est de remplacer aléatoirement certains éléments au sein d'une structure fixe. Un exemple classique de cette approche est le livre *Cent mille milliards de poèmes* (Raymond Queneau, 1961), qui permet de produire autant de sonnets uniques qu'indiqué dans le titre en substituant des vers par d'autres répondant aux mêmes critères poétiques (rime et métrique). Cette structure garantit une certaine cohérence poétique malgré l'instabilité des éléments constitutifs. L'informatique s'appropriera rapidement ce genre d'approche, les ordinateurs excellant dans les manipulations combinatoires.



Dans *Cent mille milliards de poèmes*, les vers sont découpés en lamelles pour pouvoir juxtaposer ceux provenant de différentes pages et ainsi créer un nouveau poème. Voir la fiche.

La recherche en intelligence artificielle sur le traitement du langage naturel s'est inspirée des travaux des linguistes structuralistes (notamment Noam Chomsky) pour la modélisation de productions langagières et narratives qui prendront le nom de « grammaires non contextuelles[3] ». À l'instar des poèmes de Queneau, il s'agit de structures syntaxiques dont certains termes peuvent être remplacés récursivement par d'autres. Cette approche permet de facilement et rapidement générer de grandes quantités de variations cohérentes structurellement, mais pas nécessairement sémantiquement. À l'instar des poèmes de Queneau, les différents éléments sont sélectionnés indépendamment et risquent fortement de produire des discours décousus, voire contradictoires. Récemment, le logiciel Tracery[4], de Kate Compton, a popularisé l'utilisation de grammaires non contextuelles pour des usages créatifs, et particulièrement pour la génération automatique de gazouillis, un format court et autonome se prêtant bien à la créativité débridée et inconséquente de ce genre de système.

Histoire et narration

Les grammaires non contextuelles amalgament la production d'une histoire et sa narration textuelle. Cela signifie que l'histoire racontée ne préexiste pas à sa mise en mots, produit d'une sélection aléatoire récursive. Rapidement, cependant, la recherche envisagera ces deux niveaux comme des problèmes distincts. On cherchera à produire des histoires à partir de personnages, de motivations, d'objets, d'actions, d'événements, etc., et ce, indépendamment de leur représentation discursive. L'avantage de cette séparation est qu'il est plus facile pour un ordinateur de « raisonner » sur des entités abstraites plutôt que sur du texte. Dans ce contexte, des systèmes inspirés des grammaires non contextuelles ont récemment été mis au point précisément pour la « mise en narration » finale, une fois l'histoire conçue par d'autres moyens[5].

La planification automatique

L'une des principales approches pour la génération d'histoires cohérentes est la planification automatique. Il s'agit, pour un système, de trouver une séquence d'actions permettant d'atteindre un objectif, par exemple déterminer le trajet optimal pour se rendre d'un point A à un point B en tenant compte des horaires et des trajets des autobus de la ville. Au milieu des années 1970, Jim Meehan développe Tale-Spin, un système générant de courtes histoires inspirées des fables d'Ésope[6]. Les personnages y tentent d'accomplir des objectifs en planifiant certaines actions fondées sur leur perception d'un monde simplement modélisé.

L'image ci-contre montre un extrait de fable générée par Tale-Spin. Il y apparaît que la narration n'était pas au cœur de ce projet, celle-ci ne servant qu'à exposer explicitement le raisonnement interne des personnages, les actions qu'ils entreprennent, ainsi que leurs conséquences. La planification automatique reste une des approches principales dans la recherche sur la génération narrative[7]. L'un de ses avantages est de pouvoir tenir compte des changements de contexte : si un joueur intervient sur le monde, les « plans » de tous les agents peuvent être réactualisés. Toutefois, elle dépend d'une formalisation stricte de ce qu'est une « bonne » histoire, et les résultats peuvent rapidement sembler rigides. Incidemment, beaucoup de systèmes reposent sur des structures théoriques très classiques telles que la *Morphologie du conte* de Propp ou le *Héros aux mille et un visages* de Joseph Campbell.

but are, instead, concerned with general lessons, notions from a higher domain. To produce a story with a given moral, we must first understand the correspondence between the moral and the real-world level. For example, the moral of "The Fox and the Crow" is never trust flatter-ers ers. The analysis is as follows:

"Never do X" means that if you do X, then something "bad" will happen. "A flatters B" means that A says something "nice" to B, but is insincere, doing it for some ulterior motive. Since a consequence of saying something nice to B is that B will become more kindly disposed towards A, then it's reasonable to assume that B's kind disposition towards A will enable something to happen which is "good" for A. Putting this all together, we predict that A has some goal which requires that B be kindly disposed towards A, so A says something nice to B, B reacts accordingly, and something happens that causes A to achieve his goal and also causes B to suffer. Since transfer of ownership is an event that is simultaneously good for the recipient and Bad for the unwilling donor, we know that DELTA-OWTROL can be the main problem, when the program operates in this mode, it sets some of the initial parameters of the world in such a way that when characters behave reasonably in that environment -- and reasonable behavior is what the simulator does — the desired story will result. In other words, to make a certain point in a story, it figures out in advance what some of the world model has to look like, how the stage must be set before the characters arrive.

THE ENGLISH GENERATOR

As a problem domain, this one is unique in that it provides no information to the other domains, although it uses their information extensively. For example, in order to be able to say "Joe Bear returned to the cave" instead of "Joe Bear went to the cave," the generator needs access to the memory to check whether Joe Bear has been in that cave before... when describing someone's trip, it uses the MAP system's knowledge and expresses the route in detail; e.g., "Tom walked from the ground by the redwood tree across the meadow through the valley across a meadow to the patch of ground." But apart from making use of all the domains in order to find a better way to express something, the generator is very straightforward. It doesn't even use a grammar, given such a rich set of meaning representations to start with. Interested readers should consult the thesis [3] for details.

MORE STORIES

Here are two stories generated by TALE-SPIN. I present here a translation done by hand, for ease of reading. All the events in the story were produced by the program; only the English is mine.

The Fox and the Crow

"Once upon a time, there was a dishonest fox named Henry who lived in a cave, and a vain and trusting crow named Joe who lived in an elm tree. Joe had gotten a piece of cheese and was holding it in his mouth. One day, Henry walked from his cave, across the meadow to the elm tree. He saw Joe Crow and the cheese and became hungry. He decided that he might get the cheese if Joe Crow spoke, so he told Joe that he liked his singing very much and wanted to hear him sing. Joe was very pleased with Henry and began to sing. The cheese fell out of his mouth, down to the ground. Henry picked up the cheese and told Joe Crow that he was stupid. Joe was angry, and didn't trust Henry anymore. Henry returned to his cave.

Joe Bear and Jack Bear

"Once upon a time, there were two bears named Jack and Joe, and a bee named Sam. Jack was very friendly with Sam but very competitive with Joe, who was a dishonest bear. One day, Jack was hungry. He knew that Sam Bee had some honey and that he might be able to persuade Sam to give him some. He walked from his cave, down the mountain trail, across the valley, over the bridge, to the oak tree where Sam Bee lived. He asked Sam for some honey. Sam gave him some. Then Joe Bear walked over to the oak tree and saw Jack Bear holding the honey. He thought that he might get the honey if Jack put it down, so he told him that he didn't think Jack could run very fast. Jack accepted this challenge and decided to run. He put down the honey and ran over the bridge and across the valley. Joe picked up the honey and went home."

CONCLUSIONS

Storytelling is a natural"" language processing activity that requires many kinds of knowledge, not simply large quantities of it. It's not a limited-domain task, and rather than try to make all the knowledge look the same, I take the opposite position — use the primitives, problems, and procedures that seem most appropriate to the domain. The control structure itself, the goal calculus, is a second-order problem domain that integrates various forms of knowledge and simulates goal-driven characters, avoiding the use of such "formal" techniques as backtracking. With this knowledge, we can write simple, reasonable stories; without it we get some bizarre tales.

Natural Language
97

Deux récits produits par le système Tale-Spin en 1977. Voir la fiche.

Simulation et récits émergents

À l'opposé de l'approche par planification se trouve celle des récits dit « émergents ». Plutôt que de s'attarder à définir, à formaliser et à générer des trames narratives, il s'agit de modéliser et de simuler un monde fictionnel complexe dans l'espoir que des histoires intéressantes s'y produisent « naturellement », comme cela arrive dans le monde réel. Dans un tel système, le « récit » s'adapte également aux actions du joueur non pas en tant que récit, justement, mais simplement en tant que monde dynamique. Cette approche permet de ne pas définir *a priori* ce qui constitue une « bonne » histoire et laisse aux joueurs le soin de déterminer et de désigner eux-mêmes ce qu'ils jugent être des récits intéressants. Certains jeux vidéo existants sont fortement associés à cette approche, comme la populaire franchise *The Sims* (EA), mais aussi *Crusader Kings* (Paradox) et *Dwarf Fortress* (Bay 12). Le problème fondamental des récits

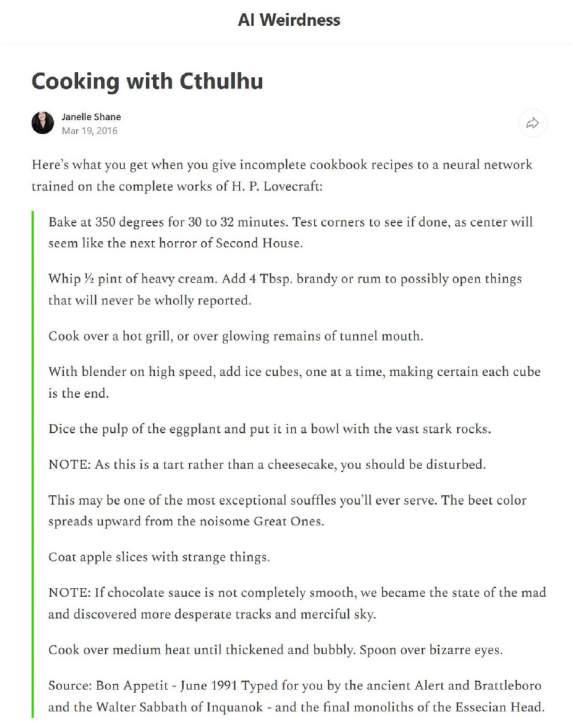
émergents est qu'ils peuvent ne pas émerger, émerger rarement, ou ne pas être intéressants[8]. Il faut typiquement jouer un grand nombre d'heures aux jeux mentionnés avant d'être témoin d'une anecdote digne d'être racontée.

Apprentissage profond

La recherche sur la scénarisation automatique n'a pas échappé au tsunami de l'apprentissage profond dans le secteur de l'intelligence artificielle. Cette méthode a été explorée tant pour la génération d'histoires que pour la production directe de textes narratifs. La première est plus problématique, car l'apprentissage profond dépend de la disponibilité massive de données standardisées. Comme il n'existe pas de tels corpus pour les entités narratives abstraites, ceux-ci doivent être laborieusement constitués par l'étiquetage manuel de récit[9]. La génération textuelle directe, quant à elle, peut facilement s'alimenter de millions de textes disponibles sur Internet et a fait des progrès impressionnants. On pense, par exemple, aux systèmes GPT-2 et GPT-3 de OpenAI, qui peuvent générer des textes parfaitement crédibles. On y retrouve cependant le même problème que celui décrit pour les grammaires non contextuelles, c'est-à-dire qu'en générant par le même processus l'histoire et sa narration, le système ne conserve pas naturellement de représentation interne de ses éléments constitutifs, et des problèmes de cohérence surviennent rapidement. Il se développe cependant des approches pour « retenir en mémoire » certains éléments du texte afin d'influencer les générations subséquentes[10].

Un autre enjeu est celui de la « créativité ». L'apprentissage profond excelle dans le repérage de motifs communs au sein de ses données et tend donc à générer des prototypes, allant ainsi à l'encontre de ce qui est fréquemment recherché dans une fiction : la surprise et la nouveauté (quoique la littérature et le cinéma de genre viennent régulièrement contredire cette présupposition). Une voie de contournement consiste à mélanger les types de données pour forcer un apprentissage hybride et potentiellement surprenant. On pense par exemple à Janelle Shane, qui a alimenté un réseau neuronal avec des recettes culinaires ainsi que des nouvelles de Lovecraft et obtenu des résultats très déconcertants[11].

Au final, la production de ce genre de systèmes reste difficile à contrôler et il est fréquent, par exemple, de les voir tenir des propos inappropriés (racistes, sexistes ou autres) « appris » dans leurs corpus.


AI Weirdness

Cooking with Cthulhu

Janelle Shane
Mar 19, 2016

Here's what you get when you give incomplete cookbook recipes to a neural network trained on the complete works of H. P. Lovecraft:

> Bake at 350 degrees for 30 to 32 minutes. Test corners to see if done, as center will seem like the next horror of Second House.
>
> Whip ½ pint of heavy cream. Add 4 Tbsp. brandy or rum to possibly open things that will never be wholly reported.
>
> Cook over a hot grill, or over glowing remains of tunnel mouth.
>
> With blender on high speed, add ice cubes, one at a time, making certain each cube is the end.
>
> Dice the pulp of the eggplant and put it in a bowl with the vast stark rocks.
>
> NOTE: As this is a tart rather than a cheesecake, you should be disturbed.
>
> This may be one of the most exceptional souffles you'll ever serve. The beet color spreads upward from the noisome Great Ones.
>
> Coat apple slices with strange things.
>
> NOTE: If chocolate sauce is not completely smooth, we became the state of the mad and discovered more desperate tracks and merciful sky.
>
> Cook over medium heat until thickened and bubbly. Spoon over bizarre eyes.
>
> Source: Bon Appetit - June 1991 Typed for you by the ancient Alert and Brattleboro and the Walter Sabbath of Inquanok - and the final monoliths of the Essecian Head.

Texte généré par une intelligence artificielle mélangeant une recette de cuisine et des passages de la nouvelle de H. P. Lovecraft *L'appel de Cthulhu*.
Voir la fiche.

Conclusion

Malgré des développements importants depuis les années 1960, la scénarisation automatique reste un problème ouvert. Chaque approche disponible nécessite pour l'instant de sacrifier soit la créativité, soit la cohérence, et de se concentrer soit sur l'histoire, soit sur sa représentation. Ces problèmes n'apparaissent cependant que si l'on applique à ces produits de la créativité informatique des critères de lecture « humains ». Or, il est aussi possible de faire un pas de côté et d'en apprécier la différence, la beauté étrange et non humaine.

[1] James Ryan, « Grimes' Fairy Tales: A 1960s Story Generator », dans *Interactive storytelling: 10th International Conference on Interactive Digital Storytelling, Funchal, Madeira, Portugal, 14-17 November 2017*, dir. Nuno Nunes, Ian Oakley et Valentina Isi (New York : Springer, 2017), 89-103.

[2] Jean A. Baudot, *La machine à écrire, mise en marche et programmée par Jean A. Baudot* (Montréal : Les Éditions du jour, 1964).

[3] Il s'agit de structures syntaxiques formelles ne nécessitant pas de référer à une langue ou à un domaine particulier.

[4] Voir le site Web du projet : http://tracery.io/.

[5] Voir par exemple James Ryan, Ethan Seither, Michael Mateas et Noah Wardrip-Fruin, « Expressionist: An Authoring Tool for In-Game Text Generation », dans *Interactive Storytelling Lecture Notes in Computer Science* 10045, dir. Frank Nack et Andrew S. Gordon (New York : Springer, 2016) : 221-233.

[6] James R. Meehan, « Tale-Spin, An Interactive Program that Writes Stories », dans *Proceedings of the Fifth International Joint Conference on Artificial Intelligence* 1 (1977) : 91-98.

[7] Michael R. Young, Stephen G. Ware, Brad A. Cassell et Justus Robertson, « Plans and Planning in Narrative Generation: A Review of Plan-Based Approaches to the Generation of Story, Discourse and Interactivity in Narratives », *Sprache und Datenverarbeitung, Special Issue on Formal and Computational Models of Narrative* 37, nos 1-2 (janvier 2013) : 41-64.

[8] La thèse de James Ryan reste la meilleure référence sur le sujet : James Ryan, « Curating Simulated Storyworlds » (thèse de doctorat, UC Santa Cruz, 2018).

[9] Voir, par exemple, Boyang Li, Stephen Lee-Urban, George Johnston et Mark O. Riedl, « Story Generation with Crowdsourced Plot Graphs », dans *Proceedings of the AAAI Conference on Artificial Intelligence* 27, no 1 (2013) : 598-604.

[10] *AI Dungeon* est l'un des exemples les plus convaincants de cette approche. Voir le site Web du projet : https://play.aidungeon.com/.

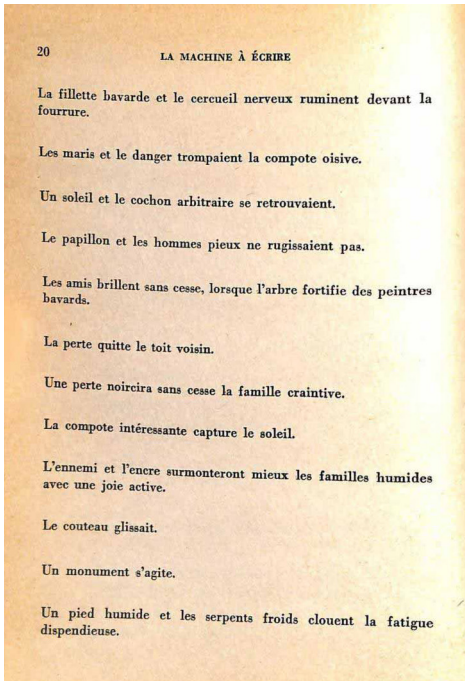
[11] Voir Janelle Shane, « Cooking with Cthulhu », *AI Weirdness* (blogue), 19 mars 2016, https://www.aiweirdness.com/cooking-with-cthulhu-16-03-19/.

Artificial Intelligence and Automatic Scripting

by Jonathan Lessard

Translation: Timothy Barnard

The idea of using a computer for the automatic production of fictional narrative appeared with the emergence of artificial intelligence as a field of research. The oldest known example of this kind is a fairytale generator conceived by the linguist Joseph E. Grimes in the early 1960s.[1] Soon afterwards, the first recorded book of poetry produced by a computer appeared in Quebec: *La machine à écrire, mise en marche et programmé par Jean A. Baudo*t (*The Typewriter, Set in Motion and Programmed by Jean A. Baudot*).[2] These texts were accompanied by commentary by several contemporary artists, including Jacques Godbout, Félix Leclerc and Raymond Queneau.



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Le couteau glissait.

Un monument s'agite.

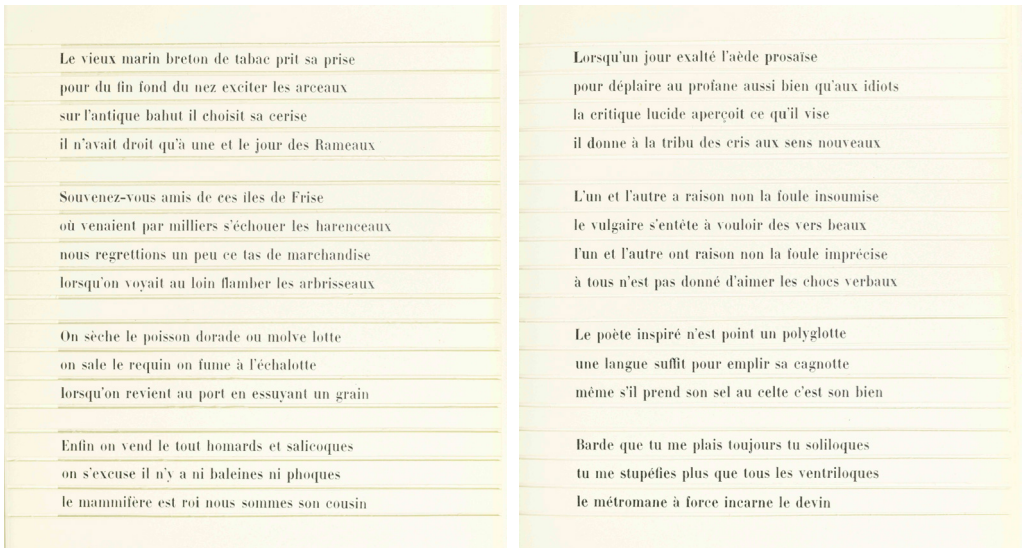
Un pied humide et les serpents froids clouent la fatigue dispendieuse.

Excerpt of verses in *La machine à écrire, mise en marche et programmée par Jean A. Baudot*. See database entry.

Until quite recently, this field of study oscillated between fundamental research and experimental art, without truly influencing the main sites for producing and consuming fiction. Even the most sophisticated systems cannot compete with "handmade" scripting. The emergence and democratization of video games, however, would change this state of affairs by creating a context for applying the automatic generation of narrative. "Live" adaptation of narrative to the player's actions is a fantasy of video games (embodied by the holodeck in the television series *Star Trek*); achieving this necessarily passes through methods for automatic scriptwriting. In the following pages, we will take up the main approaches which have been adopted to attack this thorny problem.

Random Combinations and Non-contextual Grammars

The simplest method for producing new texts aromatically is to haphazardly replace certain elements within a fixed structure. A classic example of this approach is the book *A Hundred Thousand Billion Poems* by Raymond Queneau, published in 1961, which makes it possible to produce as many unique sonnets as indicated in the book's title by means of replacing lines of poetry with others which meet the same criteria (rhyme and metre). The poem's structure ensures a kind of poetic coherence despite the instability of its constituent elements. Computer technology would quickly take up this sort of approach, as computers excel in manipulating combinations.



Le vieux marin breton de tabac prit sa prise
pour du fin fond du nez exciter les arceaux
sur l'antique bahut il choisit sa cerise
il n'avait droit qu'à une et le jour des Rameaux

Souvenez-vous amis de ces iles de Frise
où venaient par milliers s'échouer les harenceaux
nous regrettions un peu ce tas de marchandise
lorsqu'on voyait au loin flamber les arbrisseaux

On sèche le poisson dorade ou molve lotte
on sale le requin on fume à l'échalotte
lorsqu'on revient au port en essuyant un grain

Enfin on vend le tout homards et salicoques
on s'excuse il n'y a ni baleines ni phoques
le mammifère est roi nous sommes son cousin

Lorsqu'un jour exalté l'aède prosaïse
pour déplaire au profane aussi bien qu'aux idiots
la critique lucide aperçoit ce qu'il vise
il donne à la tribu des cris aux sens nouveaux

L'un et l'autre a raison non la foule insoumise
le vulgaire s'entête à vouloir des vers beaux
l'un et l'autre ont raison non la foule imprécise
à tous n'est pas donné d'aimer les chocs verbaux

Le poète inspiré n'est point un polyglotte
une langue suffit pour emplir sa cagnotte
même s'il prend son sel au celte c'est son bien

Barde que tu me plais toujours tu soliloques
tu me stupéfies plus que tous les ventriloques
le métromane à force incarne le devin

In *A Hundred Thousand Billion Poems*, each line of poetry is cut into a strip so that it can be juxtaposed with lines from other pages to create a new poem. See database entry.

In the field of artificial intelligence, research into manipulating natural language has drawn on the work of structural linguists (in particular Noam Chomsky) to model linguistic and narrative production; this takes the name "non-contextual grammars."[3] Like Queneau's poems, these are syntactical structures of which some terms can be replaced recursively by others. This approach makes it possible, easily and quickly, to generate structurally great quantities of structurally coherent but not necessarily semantically coherent variants. Like Queneau's poems, the different elements are selected independently and have a strong tendency to produce incoherent and even contradictory discourses. Recently, Kate Compton's software program Tracery[4] has popularized the use of non-contextual grammars for creative purposes, and in particular for the automatic generation of blather, a short and autonomous format which lends itself well to the unbridled and inconsistent creativity of this kind of system.

Story and Narration

Non-contextual grammars amalgamate the production of a story and its textual narration. This means that the story told does not pre-exist its being put into words and is the product of a chance recursive selection. Research soon saw these two levels as distinct problems, however. Attempts were made to produce stories out of characters, motivations, objects, actions, events, etc., independently of their discursive representation. The advantage of such separation is that it is easier for a computer to "think about" abstract entities than it is the text. In this context, systems inspired by non-contextual grammars have recently been developed precisely for the final "putting into narrative" once the story has been conceived by other means.[5]

Automatic Planning

One of the main approaches for generating coherent stories is automatic planning. In a system, this consists in finding a sequence of actions which make it possible to achieve an objective,

for example determining the optimal route for getting from point A to point B, taking into account the schedules and routes of a city's buses. In the mid-1970s, Jim Meehan developed Tale-Spin, a system which generated brief stories inspired by Aesop's fables.[6] In these stories, characters try to accomplish objectives by planning certain actions based on their perception of a simply modelled world.

The picture opposite shows an excerpt from a fable generated by Tale-Spin. Here it is apparent that narrative was not at the heart of the project, as this narrative served only to set out explicitly the characters' internal reasoning, the actions they undertake, and their consequences. Automatic planning remains one of the main approaches in research into generating narrative.[7] One of its advantages is the ability to take changes in the context into account: if a player takes action in the world, the "plans" of all agents can be updated.

but are, instead, concerned with general lessons, notions from a higher domain. To produce a story with a given moral, we must first understand the correspondence between the moral and the real-world level. For example, the moral of "The Fox and the Crow" is never trust flatter-ers. The analysis is as follows:

"Never do X" means that if you do X, then something "bad" will happen. "A flatters B" means that A says something "nice" to B, but is insincere, doing it for some ulterior motive. Since a consequence of saying something nice to B is that B will become more kindly disposed towards A, then it's reasonable to assume that B's kind disposition towards A will enable something to happen which is "good" for A. Putting this all together, we predict that A has some goal which requires that B be kindly disposed towards A, so A says something nice to B, B reacts accordingly, and something happens that causes A to achieve his goal and also causes B to suffer. Since transfer of ownership is an event that is simultaneously good for the recipient and Bad for the unwilling donor, we know that DELTA-OWTROL can be the main problem, when the program operates in this mode, it sets some of the initial parameters of the world in such a way that when characters behave reasonably in that environment -- and reasonable behavior is what the simulator does — the desired story will result. In other words, to make a certain point in a story, it figures out in advance what some of the world model has to look like, how the stage must be set before the characters arrive.

THE ENGLISH GENERATOR

As a problem cTomain, this one is unique in that it provides no information to the other domains, although it uses their information extensively. For example, in order to be able to say "Joe Bear returned to the cave" instead of "Joe Bear went to the cave," the generator needs access to the memory to check whether Joe Bear has been in that cave before. when describing someone's trip, it uses the MAP"system 's knowledge and expresses the route in detail; e.g., "Tom walked from the ground by the redwood tree across the meadow through the valley across a meadow to the patch of ground." But apart from making use of all the domains in order to find a better way to express something, the generator is very straightforward. It doesn't even use a grammar, given such a rich set of meaning representations to start with. Interested readers should consult the thesis [3] for details.

MORE STORIES

Here are two stories generated by TALE-SPIN, I present here a translation done by hand, for ease of reading. All the events in the story were produced by the program; only the English is mine.

The Fox and the Crow

"Once upon a time, there was a dishonest fox named Henrry who lived in a cave, and a vain and trusting crow named Joe who lived in an elm tree. Joe had gotten a piece of cheese and was holding it in his mouth. One day, Henry walked from his cave, across the meadow to the elm tree. He saw Joe Crow and the cheese and became hungry. He decided that he might get the cheese if Joe Crow spoke, so he told Joe that he liked his singing very much and wanted to hear him sing. Joe was very pleased with Henry and began to sing. The cheesee fell out of his mouth, down to the ground. Henry picked up the cheese and told Joe Crow that he was stupid. Joe was angry, and didn't trust Henry anymore. Henry returned to his cave.

Joe Bear and Jack Bear

"Once upon a time, there were two bears named Jack and Joe, and a bee named Sam. Jack was very friendly with Sam but very competitive with Joe, who was a dishonest bear. One day, Jack was hungry. He knew that Sam Bee had some honey and that he might be able to persuade Sam to give him some. He walked from his cave, down the mountain trail, across the valley, over the bridge, to the oak tree where Sam Bee lived. He asked Sam for some honey. Sam gave him some. Then Joe Bear walked over to the oak tree and saw Jack Bear holding the honey. He thought that he might get the honey if Jack put it down, so he told him that he didn't think Jack could run very fast. Jack accepted this challenge and decided to run. He put down the honey and ran over the bridge and across the valley. Joe picked up the honey and went home."

CONCLUSIONS

Storytelling is a natural"" language processing activity that requires many kinds of knowledge, not simply large quantities of it. It's not a limited-domain task, and rather than try to make all the knowledge look the same, I take the opposite position — use the primitives, problems, and procedures that seem most appropriate to the domain. The control structure itself, the goal calculus, is a second-order problem domain that integrates various forms of knowledge and simulates goal-driven characters, avoiding the use of such "formal" techniques as backtracking. With this knowledge, we can write simple, reasonable stories; without it we get some bizarre tales.

Two stories produced by the Tale-Spin system in 1977. See database entry.

And yet this depends on a strict formalization of what constitutes a "good" story, and the results may quickly appear rigid. Incidentally, many systems are based on quite classical theoretical structures, such as Propp's *Morphology of the Folktale* and Joseph Campbell's *The Hero with a Thousand Faces*.

Simulation and Emergent Narratives

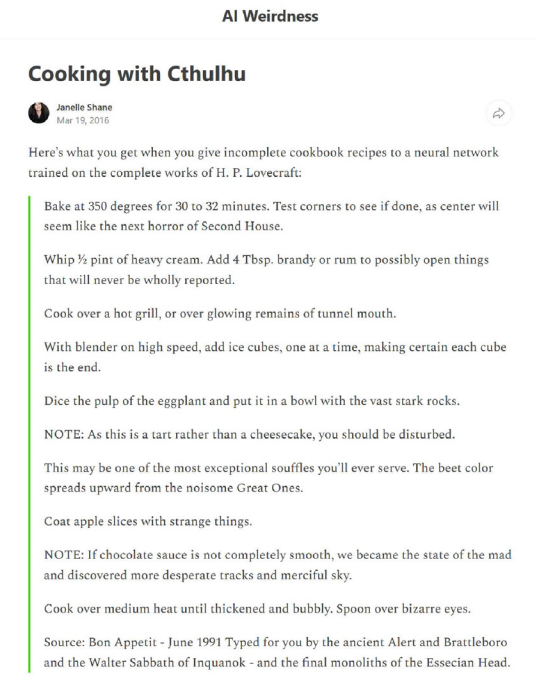
In contrast with the planning approach is the so-called "emergent" narratives approach. Rather than spending time defining, formalizing and generating narrative frameworks, an emergent narrative models and simulates a complex fictional world in the hope that interesting stories will arise there "naturally," like in the real world. In a system such as this, the "narrative" also adapts to the players' actions not as narrative, precisely, but simply as a dynamic world. This approach makes it possible not to define beforehand what constitutes a "good" story and gives players the freedom to determine and design on their own what they deem to be interesting narratives. Some existing video games are strongly associated with this approach, such as the popular *The Sims* (EA) franchise, but also *Crusader Kings* (Paradox) and *Dwarf Fortress* (Bay 12). The fundamental problem with emergent narratives is that it that they may not emerge, may emerge rarely, or may have no interest.[8] Typically, one must play a large number of hours on the games mentioned before witnessing an anecdote worthy of being told.

Deep Learning

Research into automatic scriptwriting has not escaped the deep learning tsunami of the artificial intelligence sector. This method has been explored both for generating stories and for the direct production of narrative texts. The former is more problematic, as deep learning relies on the massive availability of standardized data. As no such bodies of data exist for entities of abstract narratives, these must be laboriously constituted through the manual labelling of narratives.[9] Direct text generation, for its part, can easily draw on millions of texts available on the Internet, and has made impressive advances. Consider, for example OpenAI's GPT-2 and GPT-3 systems, which can generate perfectly credible texts. Here we find the same problem, however, as that described with respect to non-contextual grammars, meaning that by generating the story and its narration through the same process, the system does not naturally preserve an internal representation of its constituent elements, and problems of coherence quickly arise. Nevertheless, approaches are being developed for "keeping in memory" certain elements of a text in order to influence subsequent generations.[10]

Another issue is the question of "creativity." Deep learning excels in finding common motifs in its data and tends to generate prototypes. As such, it goes against what is frequently sought in fiction: surprise and novelty (although genre fiction and genre cinema regularly contradict this supposition). One way around this is to mix the kinds of data in order to force hybrid and potentially surprising learning. Consider for example the work of Janelle Shane, who loaded cooking recipes and Lovecraft short stories into a neuronal network and obtained extremely disconcerting results.[11]

In the end, the output of these kinds of systems is difficult to control, and one frequently sees them, for example, making inappropriate remarks (racist, sexist, etc.) which they have "learned" in their corpus.



AI Weirdness

Cooking with Cthulhu

Janelle Shane
Mar 19, 2016

Here's what you get when you give incomplete cookbook recipes to a neural network trained on the complete works of H. P. Lovecraft:

> Bake at 350 degrees for 30 to 32 minutes. Test corners to see if done, as center will seem like the next horror of Second House.
>
> Whip ½ pint of heavy cream. Add 4 Tbsp. brandy or rum to possibly open things that will never be wholly reported.
>
> Cook over a hot grill, or over glowing remains of tunnel mouth.
>
> With blender on high speed, add ice cubes, one at a time, making certain each cube is the end.
>
> Dice the pulp of the eggplant and put it in a bowl with the vast stark rocks.
>
> NOTE: As this is a tart rather than a cheesecake, you should be disturbed.
>
> This may be one of the most exceptional souffles you'll ever serve. The beet color spreads upward from the noisome Great Ones.
>
> Coat apple slices with strange things.
>
> NOTE: If chocolate sauce is not completely smooth, we became the state of the mad and discovered more desperate tracks and merciful sky.
>
> Cook over medium heat until thickened and bubbly. Spoon over bizarre eyes.
>
> Source: Bon Appetit - June 1991 Typed for you by the ancient Alert and Brattleboro and the Walter Sabbath of Inquanok - and the final monoliths of the Essecian Head.

Text generated by artificial intelligence which blends cooking recipes with passages from H.P. Lovecraft's short story "The Call of Cthulhu." See database entry.

Conclusion

Despite major developments since the 1960s, automatic scriptwriting remains an ongoing problem. For the moment, each available approach requires that either creativity or coherence be sacrificed and that one focus on either the story or its representation. Nevertheless, these problems only appear if one applies criteria of "human" reading to these problems of computerized creativity. And yet it is also possible to step back and appreciate their difference and their strange and non-human beauty.

[1] James Ryan, "Grimes' Fairy Tales: A 1960s Story Generator," dans *Interactive storytelling: 10th International Conference on Interactive Digital Storytelling, Funchal, Madeira, Portugal, 14-17 November 2017*, eds. Nuno Nunes, Ian Oakley and Valentina Isi (New York: Springer, 2017), 89-103.

[2] Jean A. Baudot, *La machine à écrire, mise en marche et programmée par Jean A. Baudot* (Montréal: Les Éditions du jour, 1964).

[3] These are formal syntactical structures which have no need to refer to a particular language or domain.

[4] See the project's website: http://tracery.io/.

[5] See, for example, James Ryan, Ethan Seither, Michael Mateas and Noah Wardrip-Fruin, "Expressionist: An Authoring Tool for In-Game Text Generation," in *Interactive Storytelling Lecture Notes in Computer Science* 10045, eds. Frank Nack and Andrew S. Gordon (New York: Springer, 2016): 221-233.

[6] James R. Meehan, "Tale-Spin, An Interactive Program that Writes Stories," in *Proceedings of the Fifth International Joint Conference on Artificial Intelligence* 1 (1977): 91-98.

[7] Michael R. Young, Stephen G. Ware, Brad A. Cassell and Justus Robertson, "Plans and Planning in Narrative Generation: A Review of Plan-Based Approaches to the Generation of Story, Discourse and Interactivity in Narratives," *Sprache und Datenverarbeitung, Special Issue on Formal and Computational Models of Narrative* 37, nos. 1-2 (January 2013): 41-64.

[8] James Ryan's doctoral dissertation remains the best reference on this topic: James Ryan, "Curating Simulated Storyworlds" (PhD diss., UC Santa Cruz, 2018).

[9] See, for example, Boyang Li, Stephen Lee-Urban, George Johnston and Mark O. Riedl, "Story Generation with Crowdsourced Plot Graphs," in *Proceedings of the AAAI Conference on Artificial Intelligence* 27, no. 1 (2013): 598-604.

[10] *AI Dungeon* is one of the most persuasive examples of this approach. See the project's website: https://play.aidungeon.com/.

[11] See Janelle Shane, "Cooking with Cthulhu," *AI Weirdness* (blog), 19 March 2016, https://www.aiweirdness.com/cooking-with-cthulhu-16-03-19/.