Computational Creativity in Literary Artifacts: Narrative and Poetry

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Artificial creativity
Linguistic creativity

Why Artificial Poets
Articulation
Artificial Poets: Articulation in Poetry
WASP

Narratology
Representing Stories
Plot and Causality
Narrative Discourse
Inventing and Telling
Artificial Storytellers
A Grand View

Conclusions
Artificial Creativity
AI mirrors reality
Creativity?
attempted by engineers

how do engineers address difficult problems?
Linguistic Creativity
linguistic creativity

understanding of language

understanding of creativity
understanding of language

linguistic

creativity

understanding of creativity
linguistic creativity

linguistic elements

creativity elements
A princess lives in a castle.
She is pretty.
She is in love with a knight.
The knight is brave.
He rescues the princess.
Basic NLG tasks as rewriting

**Pronouns**

- she → the princess
- she → the pretty princess

**Adjectives**

- the pretty princess → the blonde princess
- the pretty blonde princess → she

**Descriptions**

- A blonde princess lived in a castle.  →  A princess lived in a castle.  She was blonde.
- A princess lived in a castle.
  She loved a knight. She was pretty.
  The castle had towers.  →  A pretty princess lived in a castle.
  She loved a knight.
  The castle had towers.
A month earlier three squares northwest, the white queen was three squares south of the centre of the board. (...) The white queen saw the black queen arriving. The black queen attacked the white queen. The white queen died. The black queen saw the white right bishop arriving. The white right bishop attacked the black queen. The black queen died.

The black queen was four squares north of the centre of the board. The third black pawn was to the right. (...) The black queen saw the third black pawn leaving to the right. (...) Three days later, the black queen moved southeast. The third white pawn remained behind. (...) The black queen saw the white queen appearing ahead. The black queen attacked the white queen.

Three days later, the black queen moved southeast. The third white pawn remained behind. (...) The black queen saw the white queen appearing ahead. The black queen attacked the white queen.

Narrative composition
Gervás, CMN (2012)
Pereira & Gervás, LREC (2004)

Analogy & metaphor

Domains

Mapping between structures

Selective Projection

Factory (GA)

Input 1  Input 2

Blend

Knowledge Base

Concept Maps

Frames
Integrity
Constraints
Rules

Mapper

Constraints

Query

Factories (GA)
"I heard the attractive sound of the mermaid"

"I heard the attractive song of the guitar"

"I heard the mermaid song of the guitar"
1. El ruido con que rueda la ronca tempestad
2. Bajo el ala aleve del leve abanico

Alliteration
Different population sizes and number of generations
Why Artificial Poets
A poem is really a kind of machine for producing the poetic state of mind by means of words.

Paul Valery
Poetry and Abstract Thought
1939
The Poem

What your brain does
<table>
<thead>
<tr>
<th>Semantics</th>
<th>Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>(generated implicitly)</td>
<td>generated explicitly</td>
</tr>
<tr>
<td>given as input</td>
<td>generated from input</td>
</tr>
</tbody>
</table>

even more generated implicitly!
Articulation
Articulation in Poetry: Artificial Poets
**Graeme Ritchie (2001)**

**Inspiring set**: the set of (usually highly valued) artefacts that the programmer is guided by when designing a creative program.
Exploratory creativity in terms of explicit representation of:

- universe under consideration (U)
- conceptual spaces (R)
- traversal of a conceptual space (T)
- evaluation function for a conceptual space (E)
Poem-based generation

Poem 1
Poem 2
...
Poem n

SELECT

Poem
Poem 1
Poem 2
...
Poem n

EXTRACT

lines

COMBINE

Line-based generation

Poem
Raymond Queneau

Cent mille milliards de poèmes
Template-based generation

Problem:
1) Little flexibility
Rimbaudelaire *

Le ------- du -------

C'est un c--- de -----re où ----e une chimère 
------ant ----ément aux --es des ------s 
D'------- ; où le brûlot de la -------e ---re
_uoit : c'est un petit ------- qui rêve de -------

Un ------- gauche, ------- -------, ----- ----- 
Et la ------- roulant dans le ---- ravin ----
-----t ; il est a------ dans l'--e, sous la ----e, 
Gauche, dans son c---- ----- où la -------e ---.

Les ------s dans les --------s, il ----t. {Comme} un ---- -------- 
-----rait un ------ --------, il --- [la,un] ------: 
---ure, ------le ------ment : il [est sourd,sourit].

Les matins ne font pas -------r sa ------e ; 
Il ----t dans le -------, la ---- sur sa ------e, 
-------e. Il a cent ----s frêles au -------ir -----.
Rimbaudelaire 1

Le Rêveur du bonheur

C'est un cri de chimère où laisse une chimère
Contemplant longuement aux îles des soleils
D'enfer ; où le brûlot de la médaille claire
Luit : c'est un petit bonheur qui rêve de sommeil

Un démon gauche, langue obscure, jambe peinte
Et la taille roulant dans le gris ravin blond
Bout ; il est allongé dans l'île, sous la feinte,
Gauche, dans son cri lourd où la nature fond.

Les trous dans les grelots, il bout. Un parfum vague
Sortirait un soldat sublime, il suit la vague :
Verdure, chéris-le chaudement : il sourit.

Les matins ne font pas retentir sa narine ;
Il bout dans le chagrin, la fleur sur sa poitrine,
Sublime. Il a cent trous frêles au désir gris.
Rimbaudelaire 2

Le Gardien du soleil

C'est un ciel de verdure où fume une chimère
Regardant lentement aux âmes des secrets
D'argent ; où le brûlot de la caresse fière
Fuit : c'est un petit soleil qui rêve de regret

Un archer gauche, boucle aimable, paume frêle
Et la bouche roulant dans le rond ravin plat
Ment ; il est assoupi dans l'âme, sous la grêle,
Gauche, dans son cœur froid où la musique va.

Les mains dans les haillons, il ment. Comme un ciel vierge
Nagerait un géant terrible, il met un cierge :

Les matins ne font pas abreuver sa menace ;
Il ment dans le secret, la dent sur sa grimace,
Terrible. Il a cent mains frêles au plaisir court.
Template-based generation

Poem A1
Poem A2
...
Poem An

Poem B1
Poem B2
...
Poem Bm

CREATIVE
EXTRACT

template

lexicon

GENERATIVE
COMBINE

Poem
(Gervás, 2000)  ASPERA

✓ retrieves a case (verse example) for each sentence of the intended message
✓ generates a line of the poem draft by mirroring the POS structure of the chosen case - using additional vocabulary and following metric criteria
✓ presents the draft to be validated by the user
✓ analyses validated poems and adds them to its data files

Ladrará la verdad el viento airado
en tal corazón por una planta dulce
al arbusto que volais mudo o helado.

Andando con arbusto fui pesado
vuestras hermosas nubes por mirarme
quien antes en la liebre fue templado.

Line pattern-based generation

a prose-to-poetry semiautomatic translator

System selects appropriate metre, stanza and vocabulary
<table>
<thead>
<tr>
<th>Case-Based Reasoning</th>
<th>cases</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>adaptation procedure</td>
</tr>
<tr>
<td></td>
<td>similarity function</td>
</tr>
<tr>
<td>Markov models</td>
<td>ngram</td>
</tr>
<tr>
<td>Grammars</td>
<td>terminal symbols</td>
</tr>
<tr>
<td></td>
<td>non-terminal symbols</td>
</tr>
<tr>
<td>Evolutionary</td>
<td>genes</td>
</tr>
<tr>
<td></td>
<td>operators</td>
</tr>
<tr>
<td></td>
<td>fitness function</td>
</tr>
</tbody>
</table>
RKCP

✓ poetry analysis from a collection of poems by a single author generates “Markov model” of the author’s style and a poet personality file
✓ poetry generation from the “Markov model”, guided by additional constraints:
  - choice of stanza
  - plagiarism avoidance algorithms
  - thematic consistency algorithms

Oh! did appear
A half-formed tear, a Tear.
By the man of the heart.

(after Lord Byron)

0 thou,
Who moved among some fierce Maenad, even among noise and blue
Between the bones sang, scattered and the silent seas.

(after William Carlos Williams)

Problem:
1) Risk of poor grammar

Ngram-based generation
The Policeman’s Beard is Half Constructed: Computer Prose and Poetry by Racter.
Racter is short for ‘raconteur’
little detail known, supposedly based on grammars

Two problems:
1) Form no longer poem like
2) Content starts to go wild

More than iron
More than lead
More than gold I need electricity
I need it more than I need lamb or pork or lettuce or cucumber
I need it for my dreams

Grammar-based generation
the bread is the bread which is gone
the cat which is dead is the cat
the cat is the cat
which ate with the bread
the bread is the bread which is gone

the cat is the cat which is dead
the bread which is gone is the bread
the cat which consumed
the bread is the cat
which gobbled the bread which is gone

Semantics-based generation

(Manurung, 1999)

✓ chart generation of rhythm-patterned text
✓ given a semantic + metric input, generate all possible forms
McGONAGALL
(Manurung, 2003)

Facts, they are round. African facts, they are in a child. A bill is rare.

In facts, with a bill with a shocking town in a tail in his fish,
his blubber will boil
his jaws in a bean
in mothers. His boy is a mind.

(haiku)

(limerick)

✓ given target semantics and target surface form
✓ poetry generation as stochastic state-space search
✓ evolutionary algorithms (fitness function + operators)

Evolutionary semantics-based generation
Target semantics: \( \text{john}(\text{)}, \text{walk}(\text{w,}\text{)}, \text{sleep}(\text{s,}\text{)} \)
Target surface:
\[ w_1, s_1, s_2, s_3, s_4, s_5, w_2, s_6, s_7, s_8, s_9, s_{10} \]

### Semantics
- \( \text{john}(\text{)}, \text{walk}(\text{w,}\text{)}, \text{sleep}(\text{s,}\text{)} \)
- John walked.
- John slept.

### Surface
- John walked to the store.
- John slept.

**Operator:** Semantic edition (walk destination = store)

### Semantics
- \( \text{john}(\text{)}, \text{walk}(\text{w,}\text{)}, \text{sleep}(\text{s,}\text{)} \)
- \( \text{store}(\text{st,}\text{)}, \text{destination}(\text{w,}\text{st}) \)
- John crept to the store.
- John slept.

**Operator:** Lexical choice (walk \( \rightarrow \) creep)

### Semantics
- \( \text{john}(\text{)}, \text{walk}(\text{w,}\text{)}, \text{sleep}(\text{s,}\text{)} \)
- \( \text{store}(\text{st,}\text{)}, \text{destination}(\text{w,}\text{st}) \)
- John crept to the store.
- He slept.

**Operator:** Pronounization (john \( \rightarrow \) he)

### Semantics
- \( \text{john}(\text{)}, \text{walk}(\text{w,}\text{)}, \text{sleep}(\text{s,}\text{)} \)
- \( \text{store}(\text{st,}\text{)}, \text{destination}(\text{w,}\text{st}) \)
- To the store John crept.
- He slept.

**Operator:** Clause re-ordering (topicalization)

### Output:

\[
\text{into the bookshop john did slowly creep,}
\]
\[
\text{inside he fell into a peaceful sleep.}
\]

---

**Figure 4.1:** An idealization of poetry generation as state space search
WASP
wasp

wishful

automatic

spanish

poet
WASP: the Wishful Automatic Spanish Poet

- Composed formal poetry in Spanish in a semiautomatic interactive fashion
- Had a kind of creative impulse
- Worked upon an intended message
- Had a simplified model of aesthetic sensibility
- Results were always judged as poor by human evaluators
a set of families of automatic experts:

✓ content generators or babblers
  (generate a flow of text)

✓ poets
  (convert flows of text into given strophic forms)

✓ judges
  (evaluate different aspects)

✓ revisers
  (edit the drafts they receive, based on score)
✓ cooperative society of readers/critics/editors/writers
✓ generate a population of drafts
✓ modifying it and pruning it in an evolutionary manner
✓ over a pre-established number of generations
✓ the best valued effort of the lot is chosen as final result
¿PUEDE UN COMPUTADOR ESCRIBIR UN POEMA DE AMOR?
Tecnorromanticismo y poesía electrónica

Colabora Pablo Gervás

Con una entrevista inédita de
LUISS ANTONIO DE VILLENA

Editorial Devenir, Madrid, España, marzo del 2010
Odio vida, cuánto odio. Sólo por tu audición se ha desangrado. Ay de mi índice! Oh limón amarillo! Me darás un minuto de mar, vida como de alpistes, la tierra que no dejarán desiertos. Ni las halles, guardalas en dos cajitas, hermano, como para niñas blancas.

I hate life, how much hate. Only by your hearing has it bled to death. Alas, my index! Oh, yellow you will give me a minute of sea, life as if made of bird seeds, the earth that will not leave them deserted. Do not even find them, put them away in two little boxes, brother, as if for white girls.

Babbler(Miguel Hernandez), ParametrisedPoet(8,24), LineBreakManager.recomputeLineBreaks8, LineBreakJudgementShifter, LineBreakManager.recomputeLineBreaks8, SentenceDropper, LineBreakManager.recomputeLineBreaks8, LineBreakJudgementShifter, LineBreakManager.recomputeLineBreaks8

target metre = 8 syllables long
verses 1 and 2 longer: no alternative cut by poet to babbler choice verse 9 longer: there is a better alternative!
Newspaper as Inspiration for Poetry

Daily procedure:

✓ download text for newspaper articles

✓ train n-gram model

✓ generate poems
<table>
<thead>
<tr>
<th>Pop Size</th>
<th># gen</th>
<th>Av Score</th>
<th>Time in ms.</th>
</tr>
</thead>
<tbody>
<tr>
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<td>81</td>
<td>3159934</td>
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<td>20</td>
<td>77</td>
<td>1369584</td>
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<td>10</td>
<td>73</td>
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<tr>
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<td>100</td>
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<td>100</td>
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<td>80</td>
<td>1028309</td>
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<tr>
<td>10</td>
<td>10</td>
<td>77</td>
<td>209875</td>
</tr>
</tbody>
</table>

Average scores for different configurations of evolutionary parameters
Valdano. Nosotros. Mourinho le había unos alumnos había hecho música pero ambos chiítas los procedimientos sancionadores y de cómo se apuntó una mancha de justicia.

Tengo nada que figuran con nuestra cultura es un laboratorio financiado con preferentes está convirtiendo cada año.

(10 generations, Population of 50 drafts, aiming for 8 verses 8 syllables long. Score: 74 23rd of its generation)

(10 generations, Population of 50 drafts, aiming for 8 verses 8 syllables long. Score: 75 18th of its generation)
balance between form and content
  almost correct metrical form (with a few transgressions)
  just enough grammaticality to allow some possible interpretation
  bringing words together in surprising combinations.

use of ngrams as articulation choice
  very tight local coherence between adjoining words
  surprising freedom for words beyond a single ngram.
Narratology
Narrative

• Seymour Chatman (1978: 31) defines narrative as a structure which is made up of narrative statements.

• Shlomith Rimmon-Kenan (1983: 2) defines narrative fiction as ‘the narration of a succession of fictional events’.

• Mieke Bal (1985: 3) defines narrative as a corpus which should consist ‘of all narrative texts and only those texts which are narrative’.

• Minimal narrative (Labov 1972): two states and a transition or movement between the two states
Freytag’s Dramatic Arc
A Story?

• A discourse...
• ... that conveys a set of events...
• ... that happen to some characters...
• ...over time
1a mother pig tells boys to build
1b pig1 builds house of straw
1c pig2 builds house of sticks
1d pig3 builds house of bricks
2 wolf blows house of straw away
3 pig1 runs to house of sticks
4 wolf blows house of sticks away
5 pigs 1 & 2 run to house of bricks
6 wolf fails on house of bricks
1. Mother pig tells boys to build
2. Pig1 builds house of straw
3. Pig2 builds house of sticks
4. Pig3 builds house of bricks
5. Wolf blows house of straw away
6. Pig1 runs to house of sticks
7. Wolf blows house of sticks away
8. Pigs 1 & 2 run to house of bricks
9. Wolf fails on house of bricks

FOCALIZATION
Focalization

• Also described as *point of view, or perspective*
• (The term *focalization* was introduced by Genette and has been preferred since.)
• A story as a telling of what someone has seen or perceived
• Definitions:
  – The *focalizer* is the person who sees in a story
  – The *focalized* is the objects that are perceived by the focalizer.
  – External focalization: not bound to a particular character
  – Internal focalization: bound to a particular character
The Role of Focalization

• Focalization provides a rational way of partitioning the space/time volume:
  – Into “threads” defined as what may have been perceived by the focalizer
  – Different threads may be traversed by switching from one focalizer to another
Mother pig tells boys to build
1. Pig1 builds house of straw
2. Pig2 builds house of sticks
3. Pig3 builds house of bricks
4. Wolf blows house of straw away
5. Wolf fails on house of bricks
6. Pig1 runs to house of sticks
7. Wolf blows house of sticks away
8. Pigs 1 & 2 run to house of bricks
9. Wolf fails on house of bricks

CHRONOLOGY

DISCOURSE PLANNING
Chronology

• The order in which events are told (story time) as opposed to the the order in which they happened (real time).

• Chronology provides a way of going back to tell bits of the story we left out when we focalised on a particular branch.

• Chronology allows us to decide at which point of the narration the reader starts knowing each piece of information we want him to know about.
1. Dead body A found
2. Catherine and Grissom show up
3. Investigation by C & G
4. Hypothesis crime A
5. Dead body B found
6. Sarah and Nick show up
7. Investigation by S & N
8. Hypothesis crime B

32. Solution crime A
33. Solution crime B
What is told and How it is told

Narrative has two components:

- **What is told** (what narrative is: its content, consisting of events, actions, time and location)
- **How it is told** (how the narrative is told: arrangement, emphasis / de-emphasis, magnification / diminution, of any of the elements of the content)

These have been named different ways by different researchers:

<table>
<thead>
<tr>
<th></th>
<th>English</th>
<th>French</th>
<th>Russian</th>
</tr>
</thead>
<tbody>
<tr>
<td>what</td>
<td>story</td>
<td>histoire</td>
<td>fabula</td>
</tr>
<tr>
<td>how</td>
<td>discourse</td>
<td>discours</td>
<td>sjuzet</td>
</tr>
</tbody>
</table>
Representing Stories
Once upon a time it was the middle of winter; the flakes of snow were falling like feathers from the sky; a Queen sat at a window sewing, and the frame of the window was made of black ebony. As she was sewing and looking out of the window at the snow, she pricked her finger with the needle, and three drops of blood fell upon the snow. And the red looked pretty upon the white snow, and she thought to herself:

"Would that I had a child as white as snow, as red as blood, and as black as the wood of the window-frame!" Soon after that she had a little daughter, who was as white as snow, and as red as blood, and her hair was as black as ebony; so she was called Little Snow-white. And when the child was born, the Queen died.

A year after, the King took to himself another wife. She was beautiful but proud, and she could not bear to have any one else more beautiful. She had a wonderful Looking-glass, and when she stood in front of it, and looked at herself in it, and said:

"Looking-glass, Looking-glass, on the wall. Who in this land is the fairest of all?"

the Looking-glass answered:
1 queen2 wishes for girl
2 snowhite is born & queen1 dies
3 king marries queen2
4 queen2 gets favourable reply
5 snowhite grows
6 queen2 gets unfavourable reply
7 queen2 talks to hunter
8 hunter takes snowhite to wood
9 hunter lies to queen2
10 snowhite flees
11 snowhite finds dwarves
12 queen2 gets unfavourable reply
13 queen2 poisons snowhite
14 dwarves find snowhite
15 queen2 gets favourable reply
16 prince revives snowhite
17 prince marries snowhite
18 queen2 gets unfavourable reply
19 queen2 dies of rage
1 queen1 wishes for girl
2 snowhite is born & queen1 dies
3 king marries queen2
4 queen2 gets favourable reply
5 snowhite grows
6 queen2 gets unfavourable reply
7 queen2 talks to hunter
8 hunter takes snowhite to wood
9 hunter lies to queen2
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12 queen2 gets unfavourable reply
13 queen2 poisons snowhite
14 dwarves find snowhite
15 queen2 gets favourable reply
16 prince revives snowhite
17 prince marries snowhite
18 queen2 gets unfavourable reply
19 queen2 dies of rage
1. queen1 wishes for girl
2. snowhite is born & queen1 dies
3. king marries queen2
4. queen2 gets favourable reply
5. snowhite grows
6. queen2 gets unfavourable reply
7. queen2 talks to hunter
8. hunter takes snowhite to wood
9. hunter lies to queen2
10. snowhite flees
11. snowhite finds dwarves
12. queen2 gets unfavourable reply
13. queen2 poisons snowhite
14. dwarves find snowhite
15. queen2 gets favourable reply
16. prince revives snowhite
17. prince marries snowhite
18. queen2 gets unfavourable reply
19. queen2 dies of rage
Layers of Representation of a Story

- **text representation** the linguistic realisation of the story
- **explicit representation** the linear sequence of facts mentioned in the story (in some kind of conceptual representation)
- **underlying selected representation** all facts relevant to the story that are mentioned in the explicit representation (the set of facts that are mentioned in the story, but not necessarily organised in a linear sequence and following a chronological partial order not necessarily equivalent to the one in which they appear in the story)
- **underlying extensive representation** all possible facts relevant to the story (including causes, effects, emotional reactions, common knowledge, and generally all the additional material that will be inferred by a reader on reading the story)
Once upon a time it was the middle of winter; the flakes of snow were falling like feathers from the sky; a Queen sat at a window sewing, and the frame of the window was made of black ebony. As she was sewing and looking out of the window at the snow, she pricked her finger with the needle, and three drops of blood fell upon the snow. And the red looked pretty upon the white snow, and she thought to herself:

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"Looking-glass, Looking-glass, on the wall. Who in this land is the fairest of all?"

the Looking-glass answered:
explicit representation

1 queen1 wishes for girl
2 snowhite is born & queen1 dies
3 king marries queen2
4 queen2 gets favourable reply
5 snowhite grows
6 queen2 gets unfavourable reply
7 queen2 talks to hunter
8 hunter takes snowhite to wood
9 hunter lies to queen2
10 snowhite flees
11 snowhite finds dwarves
12 queen2 gets unfavourable reply
13 queen2 poisons snowhite
14 dwarves find snowhite
15 queen2 gets favourable reply
16 prince revives snowhite
17 prince marries snowhite
18 queen2 gets unfavourable reply
19 queen2 dies of rage
underlying extensive representation
Caveat

• No claim of cognitive plausibility.
• The human brain probably deals with these problems in radically different ways.
• A computational analysis of the problem must handle such elements as we can represent and handle in symbolic terms.
Plot and Causality
Story and Plot

E.M. Forster’s (1927):

- narrative requires only events in time sequence (chronology)
- "plot" however, also requires cause

The famous example:

- "The king died and then the queen died"
  chronology = narrative.
- "The king died and then the queen died of grief"
  chronology + causality = plot
1 queen1 wishes for girl
2 snowhite is born & queen1 dies
3 king marries queen2
4 queen2 gets favourable reply
5  snowhite grows
6  queen2 gets unfavourable reply
7  queen2 talks to hunter
8  hunter takes snowhite to wood
9  hunter lies to queen2
10 snowhite flees
11 snowhite finds dwarves
12  queen2 gets unfavourable reply
13  queen2 poisons snowhite
14  dwarves find snowhite
15  queen2 gets favourable reply
16  prince revives snowhite
17  prince marries snowhite
18  queen2 gets unfavourable reply
19  queen2 dies of rage
1. queen1 wishes for girl
2. snowhite is born & queen1 dies
3. king marries queen2
4. queen2 gets favourable reply
5. snowhite grows
6. queen2 gets unfavourable reply
7. queen2 talks to hunter
8. hunter takes snowhite to wood
9. hunter lies to queen2
10. snowhite flees
11. snowhite finds dwarves
12. queen2 gets unfavourable reply
13. queen2 poisons snowhite
14. dwarves find snowhite
15. queen2 gets favourable reply
16. prince revives snowhite
17. prince marries snowhite
18. queen2 gets unfavourable reply
19. queen2 dies of rage
The Planning Approach

✓ A line of research has focused in the production of narrative by means of planning algorithms.

✓ The set of events to be included in a narrative are generated as the solution to a planning problem (reach a desired outcome from a given initial state)

✓ This ensures that all the events in the resulting narrative are, by construction, linked by causal chains

✓ Such narratives provide explicit examples of the causal relations behind a given story.
Preconditions, Actions, Effects

**Preconditions:**
- X not married
- Y very beautiful
- X sees Y

**Action:**
- X falls in love Y

**Effects:**
- X wants to marry Y
Causal Links

Preconditions A
Action A

Preconditions C
Effects C

Preconditions D
Action D

Effects D
Plan A
(go to granny’s)

Plan B
(pick flowers)

Plan C
(short cut)

Plan D
(eat girl)

Little Red Riding Hood
Wolf

Multiple plans
Change of plans
Conflicting plans
Narrative Discourse
Genette’s Narrative Discourse

Narrative mood
- Narrative distance
- Function

Narrative instance
- Narrative voice
- Time of narration
- Focalization

Narrative time
- Order
- Speed
- Frequency
Function

• Narrative function
  – he just tells

• Directing function
  – he interrupts the story to comment on its organization

• Communication function
  – he addresses the text's potential reader in order to establish or maintain contact with him or her

• Testimonial function
  – he comments on the truth, precision, or sources of the story, or his emotional involvement with it

• Ideological function
  – he interrupts his story to introduce instructive comments or general wisdom concerning it
Order

Relation between the sequencing of events as they actually occurred and their arrangement in the narrative.

Departure from chronological order is called anachrony.

- **analepsis** (the narrator recounts after the fact an event that took place earlier than the present point in the main story) and

- **prolepsis** (the narrator anticipates events that will occur after the present point in the main story).
Speed

Introducing differences between the time the story takes to happen and the time taken to tell it.

Four narrative movements:

• **pause** (the event-story is interrupted to make room exclusively for narratorial discourse such as static descriptions),

• **scene** (narrative time corresponds to the story's time, as in dialogue),

• **summary** (some part of the event-story is summarized in the narrative, creating an acceleration), and

• **ellipsis** (the narrative says absolutely nothing about some part of the event-story).
Then she pulled the bobbin, and the latch went up, and Red Riding-Hood pushed open the door, and stepped inside the cottage.

It seemed very dark in there after the bright sunlight outside, and all Red Riding-Hood could see was that the window-curtains and the bed-curtains were still drawn, and her grandmother seemed to be lying in bed with the bed-clothes pulled almost over her head, and her great white-frilled nightcap nearly hiding her face.

Now, you and I have guessed by this time, although poor Red Riding-Hood never even thought of such a thing, that it was not her Grannie at all, but the wicked Wolf, who had hurried to the cottage and put on Grannie's nightcap and popped into her bed, to pretend that he was Grannie herself.

And where was Grannie all this time, you will say? Well, we shall see presently.
Then she pulled the bobbin, and the latch went up, and Red Riding-Hood pushed open the door, and stepped inside the cottage.

It seemed very dark in there after the bright sunlight outside, and all Red Riding-Hood could see was that the window-curtains and the bed-curtains were still drawn, and her grandmother seemed to be lying in bed with the bed-clothes pulled almost over her head, and her great white-frilled nightcap nearly hiding her face.

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And where was Grannie all this time, you will say? Well, we shall see presently.
Inventing and Telling
AI

Reality

human behaviour
telling about human behaviour
telling stories

inventing plausible human behaviour
inventing stories

fiction
Artificial Storytellers
An experiment by the author to program a computer to write a book in the same exact style and language of best-selling author Jacqueline Susann. The author spent years programming the computer. He wanted to know what kind of book Jackie would have written had she been alive in 1993. The result is "Just This Once", a beautifully written (albeit computer generated) piece of literature that very much resembles Ms. Susann's other works.

(French, 1994)

TaleSpin (Meehan 1977)

✓ writes short stories about woodland creatures
✓ gives each a goal and runs simulation

John Bear is somewhat hungry. John Bear wants to get some berries. John Bear wants to get near the blueberries. John Bear walks from a cave entrance to the bush by going through a pass through a valley through a meadow. John Bear takes the blueberries. John Bear eats the blueberries. The blueberries are gone. John Bear is not very hungry.

Simulation-based
writes short stories about betrayal
relies heavily on grammars

BRUTUS
Grammar-based

Artificial Intelligence and Literary Creativity
Inside the Mind of BRUTUS, a Storytelling Machine
Selmer Bringsjord & David A. Ferrucci

[Diagram of BRUTUS's story generation process]

[(Bringsjord & Ferruci 2000)]
Dave Striver loved the university. He loved its ivy-covered clocktowers, its ancient and sturdy brick, and its sun-splashed verdant greens and eager youth. He also loved the fact that the university is free of the stark unforgiving trials of the business world -- only this isn't a fact: academia has its own tests, and some are as merciless as any in the marketplace. A prime example is the dissertation defense: to earn the PhD, to become a doctor, one must pass an oral examination on one's dissertation.

Dave wanted desperately to be a doctor. But he needed the signatures of three people on the first page of his dissertation, the priceless inscriptions which, together, would certify that he had passed his defense. One of the signatures had to come from Professor Hart.

Well before the defense, Striver gave Hart a penultimate copy of his thesis. Hart read it and told Striver that it was absolutely first-rate, and that he would gladly sign it at the defense. They even shook hands in Hart's book-lined office. Dave noticed that Hart's eyes were bright and trustful, and his bearing paternal.

At the defense, Dave thought that he eloquently summarized Chapter 3 of his dissertation. There were two questions, one from Professor Rodman and one from Dr. Teer; Dave answered both, apparently to everyone's satisfaction. There were no further objections.

Professor Rodman signed. He slid the tome to Teer; she too signed, and then slid it in front of Hart. Hart didn't move.

``Ed?'' Rodman said.
Hart still sat motionless. Dave felt slightly dizzy.
``Edward, are you going to sign?''
Later, Hart sat alone in his office, in his big leather chair, underneath his framed PhD diploma.
STORYBOOK

Grammar-based

✓ produces multi-page stories in the Little Red Riding Hood domain
✓ uses: narrative planning, sentence planning, discourse history, lexical choice, revision, full-scale lexicon, and a surface realiser

(Callaway, 2000)

STORYBOOK

Grammar-based
FABULIST (Riedl, 2004)

- an architecture for automated story generation and presentation
- given a desired outcome state, generates a plan that meets the outcome objective

FABULIST is a plan-based, story action-based system. It takes an input of author goals and generates a plan that meets the desired outcome.
An Example Story by Fabulist

✓ Inputs include:
  ✓ A domain model describing propositional facts about the initial state of the Aladdin world (including characters, locations, objects, and relations), and possible operations that can be enacted by characters.
  ✓ An outcome state: Jasmine and Jafar are married, and the genie is dead.
  ✓ Heuristic guidance function.
  ✓ A discourse model.
  ✓ Natural language templates.
✓ Fabulist first generates a narrative plan that meets the outcome objective, ensuring all character actions and goals are justified by events within the narrative itself.

✓ Partial order models relative chronology
✓ Causal links model causality
There is a woman named Jasmine. There is a king named Jafar. This is a story about how King Jafar becomes married to Jasmine. There is a magic genie. This is also a story about how the genie dies.

There is a magic lamp. There is a dragon. The dragon has the magic lamp. The genie is confined within the magic lamp.

King Jafar is not married. Jasmine is very beautiful. King Jafar sees Jasmine and instantly falls in love with her. King Jafar wants to marry Jasmine. There is a brave knight named Aladdin. Aladdin is loyal to the death to King Jafar. King Jafar orders Aladdin to get the magic lamp for him. Aladdin wants King Jafar to have the magic lamp. Aladdin travels from the castle to the mountains. Aladdin slays the dragon. The dragon is dead. Aladdin takes the magic lamp from the dead body of the dragon. Aladdin travels from the mountains to the castle. Aladdin hands the magic lamp to King Jafar. The genie is in the magic lamp. King Jafar rubs the magic lamp and summons the genie out of it. The genie is not confined within the magic lamp. King Jafar controls the genie with the magic lamp. King Jafar uses the magic lamp to command the genie to make Jasmine love him. The genie wants Jasmine to be in love with King Jafar. The genie casts a spell on Jasmine making her fall in love with King Jafar. Jasmine is madly in love with King Jafar. Jasmine wants to marry King Jafar. The genie has a frightening appearance. The genie appears threatening to Aladdin. Aladdin wants the genie to die. Aladdin slays the genie. King Jafar and Jasmine wed in an extravagant ceremony.

The genie is dead. King Jafar and Jasmine are married. The end.
• Initial state:
  – hungry(John), bank(TheBank), store(TheStore), has(John, y), gun(y),
  – has(John, Mia), cat(Mia), has(TheBank, z), money(z),
  – has(TheStore, The99¢Burger), edible(The99¢Burger)

• Goal state:
  – not(hungry(John))

• Domain theory:
  – eat(x, y): pre: hungry(x), has(z, y), edible(y); post: not(hungry(x))
  – buy(x, y): pre: money(z), has(x, z), has(p, y), store(p); post: has(x, y), has(p, z)
  – rob(x, y): pre: has(x, z), gun(z), has(y, p), money(p); post: has(x, p)

• Plan A:
(Turner, 1992)

MINSTREL

Case-based
Plan-based

✓ tells stories about King Arthur and his Knights of the Round Table
✓ pursues storytelling goals, looking up solutions in its case memory
Problem solving with TRAMs

1. Problem Specification
2. Transform Original Problem
3. Imaginative Memory
4. Adapt Past Solutions
5. Assess Solutions
6. Solution

Episodic Memory
Domain Assessments Boredom Assessment

Active TRAM
TRAM: Standard Problem-Solving & Other TRAMs
Minstrel’s author goals

✓ Thematic goals – the stories illustrate a theme, in Minstrel’s case, Planning Advice Themes (e.g. “A bird in the hand is worth two in the bush.”)

✓ Drama goals – goals regarding the unity of action (tragedy, foreshadowing)

✓ Consistency goals – motivate and explain story actions

✓ Presentation goals – goals about which events must be fully described, and which can be summarized or omitted (in general diegetic goals)
Figure 3.1 Author-Level Processes
The Vengeful Princess

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.

MORAL: Deception is a weapon difficult to aim.
✓ study the creative process in writing in terms of a psychological model (engagement and reflection, Sharples, 1999)
✓ takes into account emotional links and tensions between the characters

MEXICA

(Pérez y Pérez, 1999)

Story action-based
Emotion-based
actions have preconditions and postconditions defined in terms of emotional links and tensions

system reads previous stories, interprets them in terms of these links, and abstracts from these interpretations patterns for chaining actions into stories

Fig. 3. Graphical representation of emotional links and tensions between characters. Part (a) represents the fact that a knight hates an enemy (an emotional link of type 1 and intensity −3); Parts (b) and (c) represent the fact that the princess is in love with a knight and that the knight is also in love with the princess (an emotional links of type 2 and intensity +3). Part (d) represents a tension of type love competition (Lc) between the knight and the tlatoani.
Table 1
Types of tensions employed by MEXICA

<table>
<thead>
<tr>
<th>Tension</th>
<th>Mnemonic</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actor dead</td>
<td>Ad</td>
<td>When a character in the story dies (except the enemy)</td>
</tr>
<tr>
<td>Life at risk</td>
<td>Lr</td>
<td>When the life of a character is at risk</td>
</tr>
<tr>
<td>Health at risk</td>
<td>Hr</td>
<td>When the health of a character is at risk due to an injury or an illness</td>
</tr>
<tr>
<td>Prisoner</td>
<td>Pr</td>
<td>When a character is kidnapped or is made a prisoner</td>
</tr>
<tr>
<td>Life normal</td>
<td>Ln</td>
<td>Deactivates the tension Life at risk</td>
</tr>
<tr>
<td>Health normal</td>
<td>Hn</td>
<td>Deactivates the tension Health at risk</td>
</tr>
<tr>
<td>Prisoner free</td>
<td>Pf</td>
<td>Deactivates the tension Prisoner</td>
</tr>
<tr>
<td>Clashing emotions</td>
<td>Ce</td>
<td>When a character feels two opposite emotions towards other one</td>
</tr>
<tr>
<td>Potential danger</td>
<td>Pd</td>
<td>When one character hates other character (an emotional link of any type an intensity −3) and both are situated in the same location</td>
</tr>
<tr>
<td>Love competition</td>
<td>Lc</td>
<td>When two different characters are in love with a third one (emotional link of type 2 an intensity +3) producing a love competition</td>
</tr>
</tbody>
</table>
“Creativity in writing occurs through a mutually promotive cycle of engagement and reflection, both guided by constraints.”

“A session of engaged ‘knowledge telling’ generates written material for consideration.”

“Reflection involves reviewing and interpreting the material as a source for contemplation.”

(Sharples, 1999)
Jaguar_knight was an inhabitant of the Great Tenochtitlan. Princess was an inhabitant of the Great Tenochtitlan. Jaguar_knight was walking when Ehecatl (god of the wind) blew and an old tree collapsed injuring badly Jaguar_knight. Princess went in search of some medical plants and cured Jaguar_knight. As a result Jaguar_knight was very grateful to Princess. Jaguar_knight rewarded Princess with some cacauatl (cacao beans) and quetzalli (quetzal) feathers.
Character function-based Story action-based

(Gervás, 2013)

PROPPER

- revisit Vladimir Propp’s “Morphology of the Folk Tale” as articulation mechanism for plot generation
- explored the actual procedures explicitly described by Propp
- combines top-down articulation of plot into character functions with bottom-up articulation into story actions
- modular and declarative manner
- refinements and extensions possible
<table>
<thead>
<tr>
<th>A</th>
<th>C</th>
<th>H</th>
<th>I</th>
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<tr>
<td>: kidnap X Y villain X</td>
<td>kidnap X Y</td>
<td>decides_to.react Z hero Z</td>
<td>hero Z villain X fight Z X wins Z</td>
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<tr>
<td>brother Z Y</td>
<td></td>
<td>fight Z X</td>
<td></td>
</tr>
<tr>
<td>decides_to.react Z hero Z</td>
<td></td>
<td></td>
<td>wins Z</td>
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<table>
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<tr>
<td>kidnap 10 20 villain 10</td>
</tr>
<tr>
<td>brother 30 20</td>
</tr>
<tr>
<td>decides_to.react 30 hero 30</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>fabula</th>
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<tbody>
<tr>
<td>kidnap 10 20 villain 10</td>
</tr>
<tr>
<td>brother 30 20</td>
</tr>
<tr>
<td>decides_to.react 30 hero 30</td>
</tr>
<tr>
<td>fight 30 10</td>
</tr>
<tr>
<td>wins 30</td>
</tr>
</tbody>
</table>
**Fabula**

- kidnap 10 20
- villain 10
  - brother 30 20
  - decides_to.react 30
  - hero 30
  - fight 30 10
  - wins 30

**Flow**

- kidnap 10 20
- villain 10
  - brother 30 20
  - decides_to.react 30
  - hero 30
  - fight 30 10
  - wins 30
plot driver relying on Propp’s sequence
fabula generator relying on unification with accommodation

about character 296
who behaves badly at the start of the story
is banished, is tested by a donor, finds a trail that leads him home,
arrives disguised as an apprentice to an artisan, suffers an impostor
and returns.

villain and the false hero go unpunished!
Story action-based generation

STELLA
(Story TELLing Algorithm)

✓ exhaustive search over space of possible stories
✓ articulation of plots into hand-crafted set of story actions
✓ very careful knowledge engineering effort
✓ specificacion of desired result based on curves describing evolution of features over story time

(León & Gervás, 2012)
stella

**Ideas from other systems**
- causality
- chronology
- emotions
- planning
- character modelling

**Usable**
- GUI
- command line
- library

**Top-down design**
- carefully designed knowledge base
- corpus-based development

**Engine**
- abstract relations
- dictionary

**Facts**
- 153 dictionary rules
- > 500 stories
  - date(x, y) & late(x)
  - can cause angry(y)
  - friend(x, y) & die(x)
  - provokes sad(y)
Michael worked in an office. He had a boring job and a boring life. Michael attended a conference in a city far from his hometown. He met Sarah there. She was pretty. Michael wasn't brave enough and he didn't get her phone number. When he got back to his hometown, he wanted to look for Sarah, but he wasn't sure about it. He spent time thinking about it. Michael thought that Sarah might not like him. He thought he had a very boring life. He finally decided to travel to meet Sarah again.
A Grand View
a toolkit? or a set of requirements?

- ✓ generate & test
- ✓ grammars
- ✓ case-based reasoning
- ✓ planning
- ✓ emotions
- ✓ n-grams
- ✓ evolutionary algorithms

- ✓ draft and check
- ✓ linguistic knowledge
- ✓ reuse
- ✓ causality
- ✓ emotions
- ✓ language models
- ✓ parallel drafts
Draft

compos

lexicon
grammar
ontology

plot

invent

metre
stanza

word order
line breaks
lexical choice
syntax choice
referring expressions
descriptive structure
narrative structure

characters
objects
locations

events
Draft

Domain A

- lexicon
- grammar
- ontology
- metaphors
- analogies
- select

Domain n

Domain 2

Domain 1

compose

- word order
- line breaks
- lexical choice
- syntax choice
- referring expressions
- descriptive structure
- narrative structure

plot

invent

map

metre

stanza

emotions

characters

objects

locations

events

- events
- characters
- objects
- locations

analogies

metaphors
Domain A

- ontology
- lexicon
- grammar
- composition
- lexical choice
- syntax choice
- referring expressions
- line breaks
- word order
- descriptive structure
- narrative structure

Domain n

- plot
- characters
- events
- locations

Domain 1
- analogies
- metaphors
- alliteration
- ngrams

Domain 2

...
<table>
<thead>
<tr>
<th></th>
<th>Fabula</th>
<th>Discourse</th>
<th>Text</th>
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</thead>
<tbody>
<tr>
<td>narrative NLG</td>
<td></td>
<td>given as input</td>
<td>generated from input</td>
</tr>
<tr>
<td>narrative composition</td>
<td></td>
<td>given as input</td>
<td>generated from input</td>
</tr>
<tr>
<td>simulation based approach</td>
<td>generated explicitly</td>
<td>generated from fabula</td>
<td>generated from discourse</td>
</tr>
<tr>
<td>most popular!</td>
<td>(generated implicitly)</td>
<td>generated explicitly</td>
<td>generated from discourse</td>
</tr>
</tbody>
</table>
Conclusions
sustained innovation in creativity: relates to the ability of an agent to produce significantly different results on a given generation attempt from those obtained earlier
Role of Interpretation In Revision

N's Own Reading Ability

<Tentative text>

N's Writing Ability

<N's idea>

N's Model of Public Reading Abilities

<Interpretation A of text>

<Interpretation C of text>

N
N’s Writing Schemas

N’s Own Reading Schemas

Interpretation A of text

Interpretation B of text

Interpretation C of text

Interpretation D of text

N’s Model B of Public Reading Schemas

N’s Model C of Public Reading Schemas

N’s Model D of Public Reading Schemas

N’s idea

Tentative text
How does one learn to write good stories?

✓ you read good stories
✓ you write stories
✓ you show your stories to others

EVALUATION ➔ CREATIVE TECHNIQUE
thank you!

http://nil.fdi.ucm.es