Personality and Emotion in Strong-Story Narrative Planning

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Overview

- **Background**
- **Novelty**
- **Emotions**
- **Personality**
- **Algorithm**
- **Experiments**

Background

Continuation of previously reviewed papers in narrative planning

Primary Goal: Make more believable characters and create a larger narrative space

Previous Contributions: **Conflict**, **Intentionality**, and **Belief**

New Contributions: **Emotion** and **Personality**

Strong Story Vs Strong Autonomy

The battle between the experience manager and the NPCs

Strong Story

- Experience manager given more control to enforce the author goals

Strong Autonomy

- NPCs decide their actions with little to no coordination

Proposed model desires to satisfy author goals while maintaining explainable character goals

Strong Story ←——————————————→ **Strong Autonomy**

AUTHOR

Reactive vs Proactive

How to handle the emotions of characters?

Reactive

- Events trigger emotions and the characters emotions react accordingly

Proactive

- Explore the space of stories and foresee the emotions that will trigger among characters

Previous models focused on generating reactive systems.

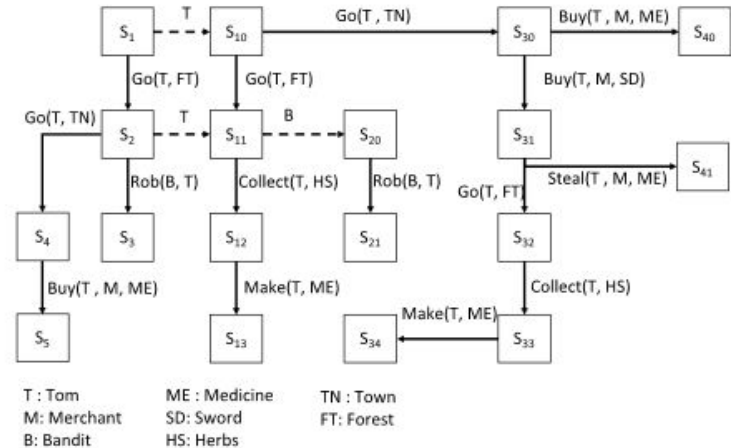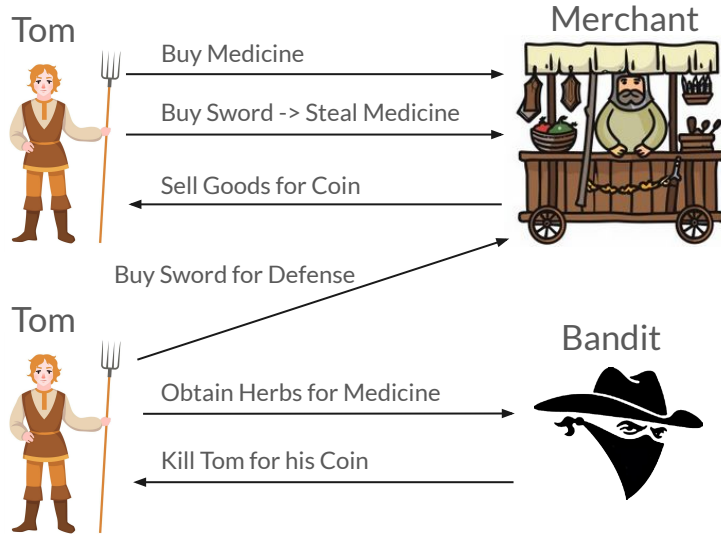The proposed model wants to leverage both reactiveness and proactivity

- Handle emotions related to events
- Integrate emotion into story generation

Notable Contributions

- Introduce a larger space of personality and emotions
- Integrate model emotion into existing narrative structures to further generalizability
- Account for interactions between characters
- Manifest emotion through visible behavior rather NLP or physiology

Example Domain: Tom's Tale

Tom

Merchant

Buy Medicine

Buy Sword -> Steal Medicine

Sell Goods for Coin

Buy Sword for Defense

Tom

Bandit

Obtain Herbs for Medicine

Kill Tom for his Coin

T : Tom
M: Merchant
B: Bandit

ME : Medicine
SD: Sword
HS: Herbs

TN : Town
FT: Forest

Definitions

Multivalued Planning Task

Narrative Planning Problem:

$$\langle s_0, U, A, C, U_C \rangle$$

Proposition

$$p \rightarrow True | False | v = u | b(c, p) | p \wedge p$$

Actions/Characters maintain previous definitions concerning consent, observability, explainability, anticipation

Utility functions defined for the author's goals and for each character

Models of Emotion

Paper utilizes pruned OCC model of emotion (12 emotions)

Pruned emotions based on ability of independence from domain

Each emotion has a respective intensity based on value of utility

Emotion	Trigger
Joy	Utility increases
Distress	Utility decreases
Hope	Expects a higher utility
Fear	Expects a lower utility
Satisfaction	Achieves the expected higher utility
FearsConfirmed	Achieves the expected lower utility
Disappointment	No longer expects the higher utility
Relief	No longer expects the lower utility
HappyFor	Own utility does not decrease Other's utility increases
Resentment	Own utility decreases Other's utility increases
Gloating	Own utility does not decrease Other's utility decreases
Pity	Own utility decreases Other's utility decreases

Positive Emotions

1. **Joy** - utility increases after taking/observing action
2. **Hope** - at least one expected plan that increases utility
3. **Satisfaction** - cashed hoped utility
4. **Relief** - enters state that removes fear
5. **HappyFor** - other character receives utility w/ no detriment to primary character
6. **Gloating** - other character losses utility w/ no detriment to primary character

Emotion	Trigger
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FearsConfirmed	Achieves the expected lower utility
Disappointment	No longer expects the higher utility
Relief	No longer expects the lower utility
HappyFor	Own utility does not decrease / Other's utility increases
Resentment	Own utility decreases / Other's utility increases
Gloating	Own utility does not decrease / Other's utility decreases
Pity	Own utility decreases / Other's utility decreases

Negative Emotions

1. **Distress** - losses utility after taking/observing action
2. **Fear** - one expected plan that results in a loss of utility
3. **FearsConfirmed** - fear comes to fruition
4. **Disappointment** - expected utility gain becomes null
5. **Resentment** - other character gains utility while primary character losses utility
6. **Pity** - character losses utility and another character losses utility

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Emotions in Planning

New Definition: action a in subplan (sequence of actions) p is explained for character when

1. a is first action in p
2. **A positive emotion is triggered for c in p based on beliefs**
3. Every action after a in p is explained
4. p does not contain a strict subsequence that also meets these four requirements

New Story Concepts Enabled:

Characters pursue friendship or rivalries due to HappyFor or Gloating,

Characters act in response to fear in order to obtain relief.

Example: Tom buys a sword which lowers his utility from losing a coin but now he doesn't live in fear of the bandit

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Personality

Why do characters choose to act? To feel positive emotions.

How do characters act? Their personality.

Adapt the FFM model of personality for narrative planning

Main drawback? The application of this model is constrained to the existing narrative structure. Certain features like Openness are constrained and internal thoughts can't be applied.

F	Facet	Feat.	Description (High scores)
O	Openness	CPF	The intensity of Satisfaction
	Intellect	IPF	Average intensity of the Fear (R)
C	Orderliness	SEF	# of actions with self as a consenting character
	Industriousness	EPF	# of actions in a plan (R)
E	Enthusiasm	SPF	# of actions with non-self consenting characters
	Assertiveness	APF	# of actions with non-self non-consenting characters
A	Compassion	COF	Average intensity of HappyFor
	Politeness	PPF	Average intensity of Gloating (R)
N	Withdrawal	SRF	The intensity of Relief
	Volatility	NBF	# of times the character changes their mind

Personality Plan Features

1. **Creative Plan Feature** - prioritize satisfaction -> create more creative plans
2. **Intelligent Plan Feature** - minimize fear -> solve problem with minimal failure
3. **Self-Efficacy Feature** - consent to more actions -> master of your own fate
4. **Efficient Plan Feature** - limit plan length -> do things efficiently
5. **Social Plan Feature** - complete more consented actions w/ others -> Sociable

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Personality Plan Features cont.

6. **Assertive Plan Feature** - complete more nonconsented actions w/ others -> forceful
7. **Compassionate Plan Feature** - seek high HappyFor plans -> help other characters
8. **Politeness Plan Feature** - seek low Gloating plans -> prevent harm to others
9. **Stress Relief Feature** - seek plans with relief -> character avoids stress
10. **Neurotic Behavior Feature** - how many times the character mind changes -> indecisive

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Algorithm

This algorithm will output the best plan for a character based on the personality plan features

Calculate five values each representing the two sides of each plan feature

Preference for a plan is represented by plan's utility which is calculated as Euclidean norm of preference vector

Algorithm 1: $Preference(\Pi, P_c, c, s)$.

1: Let Π be the set of valid plans for character c at state s, and P_c be personality of character c with five values $p_\alpha, \alpha \in \{O, C, E, A, N\}$.

2: **for** each plan $\pi_i \in \Pi$ **do**

3:   Calculate the set of feature values $\{f_{iO_1}, f_{iO_2}, f_{iC_1}, f_{iC_2}, \ldots, f_{iN_1}, f_{iN_2}\}$, representing two features for each factor as in Table II for plan π_i.

4:   Let
$$F_\alpha = p_\alpha \times \frac{f_{i\alpha_1} + f_{i\alpha_2}}{2}, \alpha \in \{O, C, E, A, N\}$$
$$U_i = \sqrt{\sum_{\alpha \in \{O,C,E,A,C\}} F_\alpha^2}$$
return $\text{argmax}_{\pi_i \in \Pi} U_i$

Experiments

Verify:

1. Generate more stories than models w/o emotion+personality
2. Emotion labels are similar to human expectations
3. Humans find character behavior more believable than planners w/o emotions+personality

Experiment 1: Character Emotion Validation

Evaluate how accurate the model represents: Joy, Distress, Hope, Fear, Disappointment, and Relief

68 participants who answered all questions

5 questions the participants agreed on one emotion

2 questions the participants agreed on two emotions (Relief and Sadness from buying Sword)

Model had 100% accuracy

Experiment 2: Believability and Empathy in an Interactive Story

Tom's Tale w/ two new NPCs, participants play as Tom. 55 valid participants

34/55 of participants buy the sword before going to forest. Validating Relief emotion

27/55 of participants gave emotional characters a sword or coin. Validating HappyFor emotion

51/55 of participants agreed that emotional characters were somewhat to very believable

Experiment 3: Character Personality Perception and Recognition

Hypothesis 1: humans can identify behavior is based on personality

Hypothesis 2: Humans recognize other stories in which character exhibits the same personality traits

Give participants four plans for Tom then have them rate personality off the one that happens

Give participants four more plans after original four and ask which one Tom would take based off previous personality

1) Finds creative solutions to problems [56].
2) Gets things done quickly [56].
3) Feels comfortable around people [57].
4) Takes charge [56].
5) Avoids conflict [56].
6) Cannot be bothered with other's needs [56].
7) Is filled with doubts about things [56].

TABLE III
RESULTS OF EXPERIMENT 3

	Hypothesis 1		Hypothesis 2	
	p-value	Effect Size	p-value	Effect Size
O	0.072	1.160	**0.026**	1.60
C	**0.016**	1.160	**0.001**	1.73
E	**0.024**	1.167	**0.014**	1.61
A	**0.048**	1.167	**≺0.001**	2.80
N	0.063	1.128	**0.002**	2.04

Experiment 4: Evaluating the Space of All Stories

Generated four types of stories: Only personality, only emotion, both, or none

Give participants two stories from different sets to evaluate

TABLE IV
CLM RESULTS (p-VALUES) IN EXPERIMENT 4

Question	Emotion	Personality	Both
Tom feels like a realistic lifelike character	0.252	0.422	0.532
Tom has a unique personality based on his actions	0.590	0.468	0.236
The story provides good descriptions of Tom's internal thoughts	0.655	**<0.001**	0.174
Tom's actions in act 1 were inconsistent to his actions in act 2	**<0.001**	0.215	0.235

TABLE V
LINEAR REGRESSION RESULTS (p-VALUE) IN EXPERIMENT 4

Question	Personality p	Emotion p	Both p
Choose the story that Tom's actions were consistent in both acts.	**<0.001**	0.229	0.447
Choose the story that makes Tom feel more human like.	**0.0117**	**<0.001**	0.0942
Choose the story that you found more realistic.	**0.0253**	**0.0252**	0.861
Choose the story that you personally prefer to read.	0.288	**0.005**	0.957

Conclusion

Developed a model that allows for personality and emotion in narrative planning

Model integrates into current existing narrative structures which eases implementation

Various experiments verify the application of personality and emotion systems in narrative planning

Questions?