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# Procedurally Generating History in *Caves of Qud*

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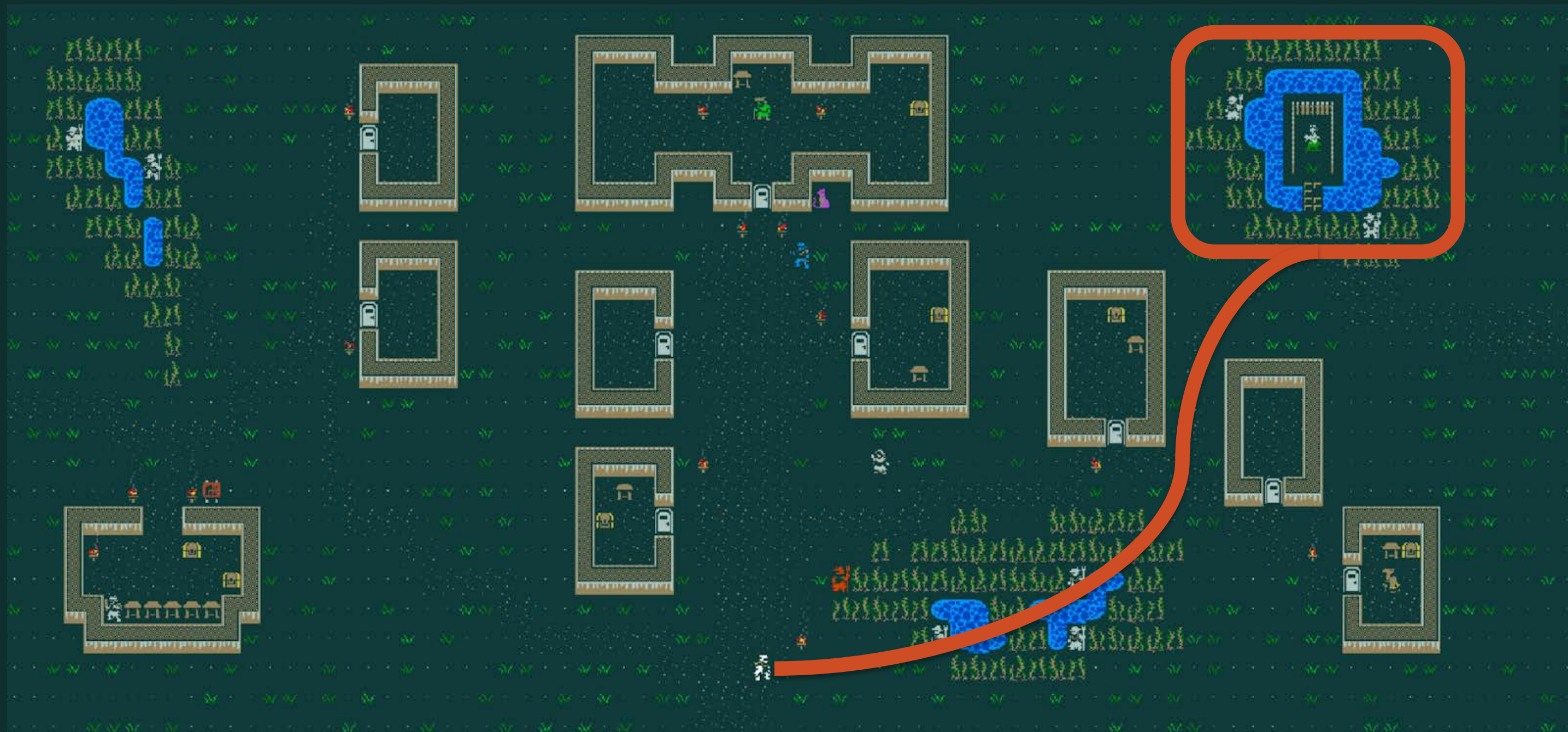


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# Agenda

- Proceduralizing History w/ Examples
- Caves of Qud*
- Constraints & Aesthetics
- Generated Histories & Our Model
- Crash Course on Replacement Grammars
- Text Generation
- Causality & Narrative Coherence
- Resources
- Takeaways





# Proceduralizing History

## History:

- “A continuous, systematic narrative of past events relating to a particular people, country, period, person, etc.”<sup>1</sup>

<sup>1</sup> dictionary.com





# Proceduralizing History

- Procgen history systems:
  - Model historical **entities**
  - Model historical **events**
  - Relate events together via an underlying logic
  - Expose events to players, often via text generation







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# *Dwarf Fortress*



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# *Dwarf Fortress*

- Most granular simulation
- Events are “newsworthy” picks from a larger pool
- Events are related via the logic of the underlying simulation

## The Age of Myth

The Age of Myth was a time when living gods and mighty beasts still held sway.

In 1, the dwarf ùshrìr Netfilled became the queen of The Unseen Mines.  
In 1, The Living Flags of The Unseen Mines founded Muteurn.  
In 1, the elf Fela Twoincenses became the druid of The Weather of Chucking.  
In 1, The Bright Satins of The Weather of Chucking founded Borntrust.  
In 1, The Tall Councils of The Confederacy of Blushes founded Frecklestatic.  
In a time before time, the red-purple devil Uno Callusdrools the Putrid Boil thrust a spire of slade up from the underworld, naming it The Citadel of Gristle, and established a gateway between worlds in Plagueslithered.  
In a time before time, the red-purple devil Uno Callusdrools the Putrid Boil became the master of The Kindled Nightmare.  
In 1, The Heroic Scorpion of The Kindled Nightmare founded Plagueslithered.  
In 1, the dwarf ìteb Tomeacts became the queen of The Adventurous Tongs.  
In 1, The Silver of Stilling of The Adventurous Tongs founded Grizzlymetals.  
In 1, The Council of Quests of The Confederations of Bending founded Scoldedchannels.  
In a time before time, the black demon Cuthefi Scaldedsweats the Spit of Manges thrust a spire of slade up from the underworld, naming it The Citadel of Whips, and established a gateway between worlds in Renowndemons.  
In a time before time, the black demon Cuthefi Scaldedsweats the Spit of Manges became the master of The Curses of Voice.  
In 1, The Scourge of Holes of The Curses of Voice founded Renowndemons.  
In 1, the elf Elana Wiltbuds became the druid of The Armored Tulip.  
In 1, The Brilliant Lyrics of The Armored Tulip founded Weekendusk.  
In 1, The Rite-Fellowship of Grapes of The Kingdom of Tubs founded Tametrick.  
In 1, the dwarf necromancer Kogsak Furnacespark became the queen of The Mountainous Handle.  
In 1, The Ordered Armory of The Mountainous Handle founded Pastcrypt.  
In 1, the elf Ada Closedbearded became the druid of The Sweet Periwinkle.  
In 1, The Reputed Summer of The Sweet Periwinkle founded Catwarm.

ESC: done.      p: show all events.







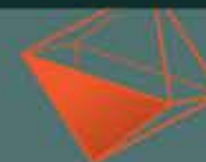
# *Epitaph*

Stardate 2375

## Uzxa

We first became aware of the Uzxa in 2370. They inhabit the temperate planet Imzi in the Axiz system. They are playful, taciturn, and vengeful.

We could teach them the secrets of **toolmaking**, or of **agriculture**, or of **fishing**, or of **writing**, or of **astronomy**.







# *Epitaph*

- Coarse-grain simulation
- Player influences course of history
- Events change the likelihoods of future events

Stardate 2503

## Uzxa

We first became aware of the Uzxa in 2370. They inhabit the temperate planet Imzi in the Axiz system. They are playful, taciturn, and vengeful.

The Uzxa have developed a simple system of writing, which they use primarily for storytelling.







# Proceduralizing History

- Challenges:
  - History's complexity
  - History's rhetorical function
  - Integrating with other systems & contributing to a vision







# *Caves of Qud*

- Open-world, science fantasy roguelike & RPG
- Handcrafted narrative + simulative systems
- “Chisel through a layer cake of thousand-year-old civilizations”







# Constraints & Aesthetics

Constraint or Aesthetic	Approach
Interested in history as an 'artifact'	Simulate <i>historical accounts</i>
Constrained by resources and game's voice	Center histories around mythic lives of five <i>sultans</i>
Value novelty in our output	<ul style="list-style-type: none"><li>• Avoid prescribing a narrative arc for sultans' lives</li><li>• Rely on rich narrative context and apophenia</li></ul>
Desired characteristic personality and mythic quality	Assign each sultan an archetypal unit of culture called a <i>domain</i>







# Generated Histories

- New history each game
  - Segmented into five periods
  - Periods are comprised of events
  - Each event generates a descriptive text snippet
    - *Gospel*
  - Gospels are the basic units of historical record





# Generated Histories

- Players engage with history via gospels
  - Shared by NPCs
  - In the descriptions of cultural artifacts







# Generated Histories

`painted` clay pitcher [`Empty`]

A clay pitcher with a decorative slip. The style hints that it was fired in the home-kiln of a canyon dweller.

Painted: This item is painted with a scene from the life of the ancient sultan `Artaram`:

At twilight under a strange and onyx sky, the people of the Hermitage of the Unfamiliar saw an image on the horizon that looked like an atomic clock bathed in onyx. It was Artaram, and after he came and left the Hermitage of the Unfamiliar, the people built a monument to him, and thenceforth called him Clock-in-Onyx.

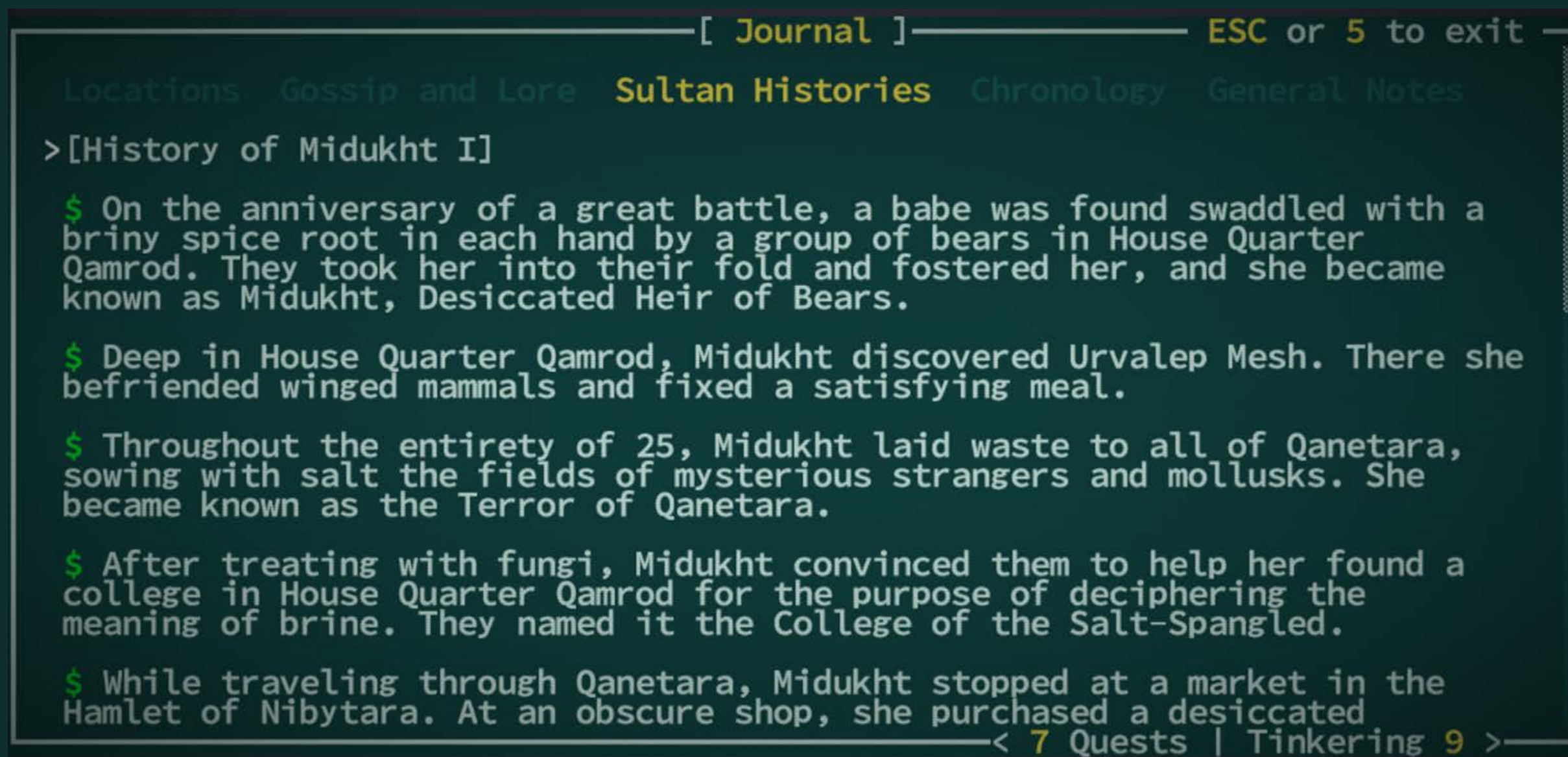
Perfect







# Generated Histories







# Generated Histories

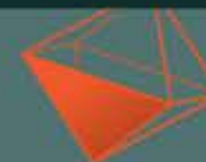
- Historic sites and relics placed in the world
- Sites populated with sultan-worshipping cults





# Generative Model

- History modeled as the interplay between **entities** and **events**
- Entities:
  - Places, items, & sultans represented as data structures
- Events:
  - Modify entities
  - Ex: “sieges a city”, “builds an important building”, “gets captured by bandits”
- Events are parameterized by existing entities

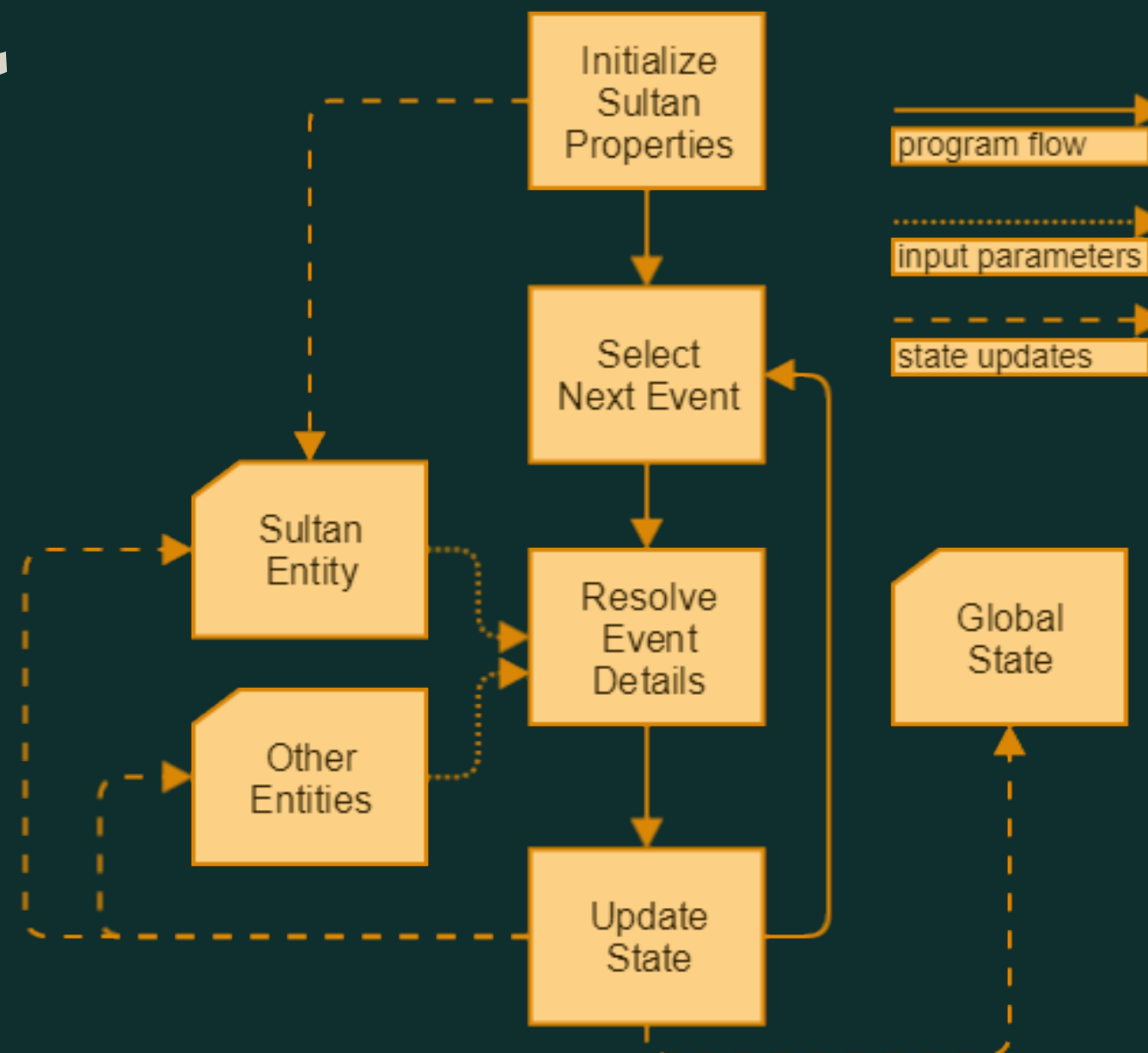






# Generative Model

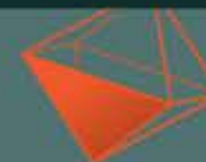
1. Initialize sultan properties
2. Choose event
3. Resolve event details
4. Generate gospel via grammar and update state
5. Repeat ~12 times
6. Kill sultan





# Causality

- No logic behind choice of events
- Cause and effect aren't intrinsic
- But gospels profess causes...
  - ...rationalizations mediated by the sultan's state

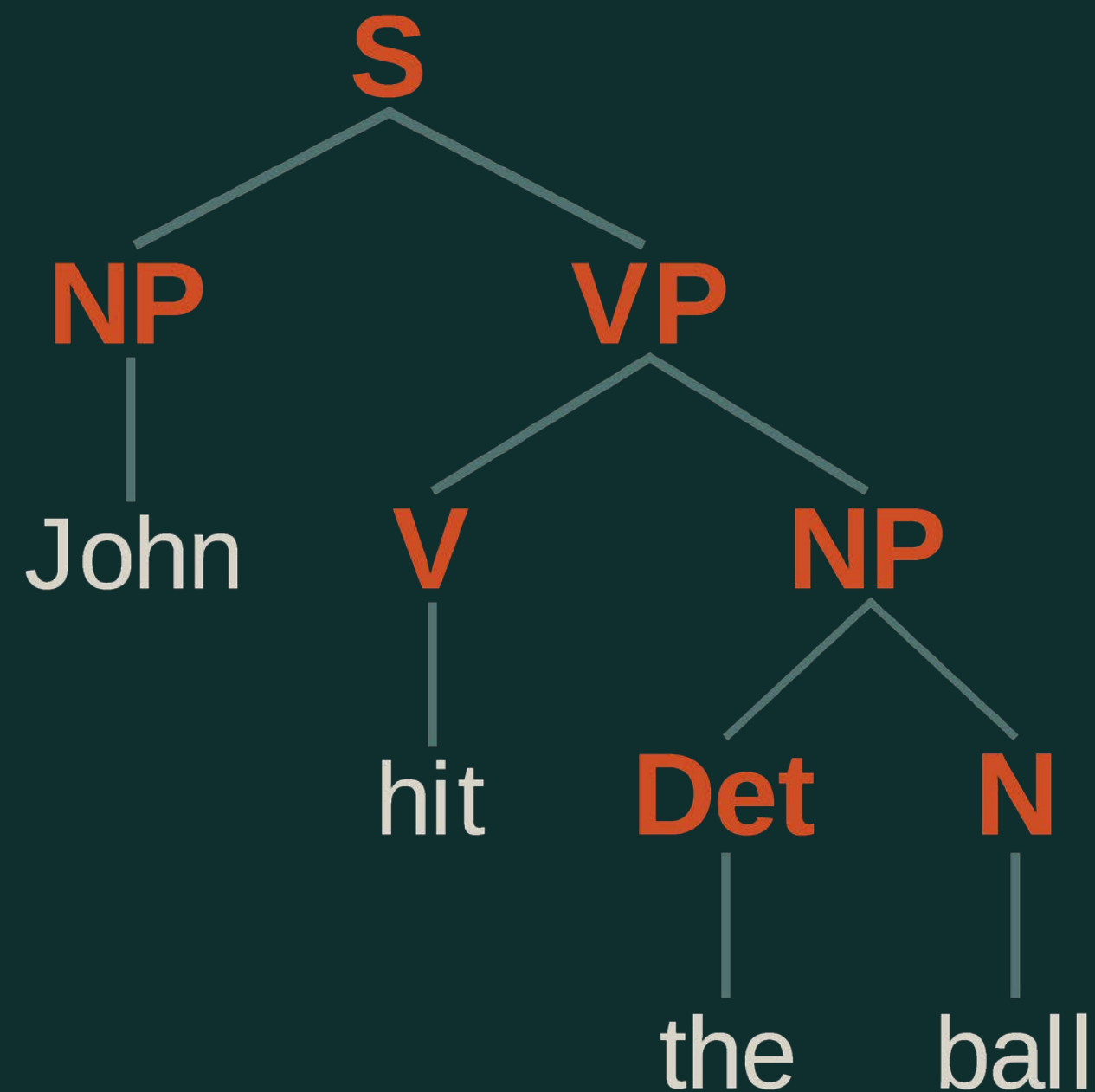






# Grammars

- Grammar
  - A way of defining things in terms of smaller things
- Replacement grammar
  - A string of symbols and rules for replacing the symbols





# Text Generation

“Acting against *#injustice#*, *#sultanName#* led an army to the gates of *#location#*.”







# Text Generation

“Acting against the persecution of frogs, Othridates led an army to the gates of Uppir.”





# Causality

“Acting against *#injustice#*, *#sultanName#* led an army to the gates of *#location#*.”







# Causality

“Acting against *#injustice#*, *#sultanName#* led an army to the gates of *#location#*.”

```
sultan state: {  
    “alliedFactions” : [frogs]  
    “profession” : geologist }
```





# Causality

“Acting against *#injustice#*, *#sultanName#* led an army to the gates of *#location#*.”

Grammar rule for alliedFactions:  
*#injustice#* -> “the persecution of *#factionName#*”







# Causality

“Acting against the **persecution of frogs**, *#sultanName#*  
led an army to the gates of *#location#*.”

```
sultan state: {  
    “alliedFactions” : [frogs]  
    “profession” : geologist }
```





# Narrative Coherence

After treating with cats, Antixerpur convinced them to help her found a dig site in the Philosophers' Quarter of Shaneruk for the purpose of excavating ancient blocks of ice. They named it the Freezing Dig Site.

At the Battle of Old Teggash, Antixerpur fought to liberate cats. She wielded a frosty hammer with such prowess that it became forever known as Frostycus Catsfriend.







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# Narrative Coherence

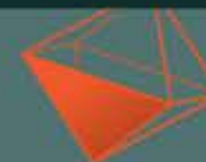
- Sultan's state acts as a glue
- Event parameterization promotes player-interpreted causalities
- Domains act as recurring narrative threads in a sultan's life





# Resources

- [“Generation of Mythic Biographies in \*Caves of Qud\*”](#), J. Grinblat & C. Bucklew
- [Epitaph’s source code](#), M. Kreminski
- [Microscope](#), a fractal role-playing game of epic histories, B. Robbins
- [Opera Omnia](#), S. Lavelle (increpare)
- [“So you want to build a generator”](#), K. Compton
- [“Procedural meaning: Pragmatic procgen in Voyageur”](#), B. Dias







# Takeaways

1. Think carefully about your narrative context
2. Break your histories up into **entities** and **events**
3. Create a logic to relate your events
4. Use replacement grammars to generate text





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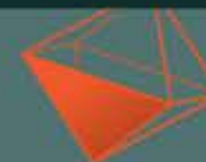
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