

Interactive Narrative Planning

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The Challenge

- Conflict between player choice and author control
- Linear Narratives - few game changing choices, storyline is set in stone by the authors
- Sandbox - open world with many choices, but the narrative is not that deep
- Procedural content generation is a solution to this problem



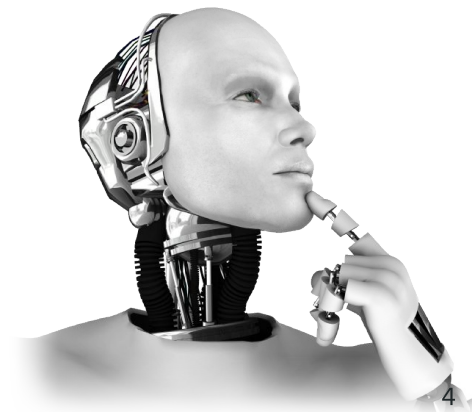
Procedural Content Generation (PCG)

- Text output
 - Displaying text based on the story - actions, events
- Graphics
 - Displaying graphics based on the story - world state, items, characters
- Narrative
 - Creating the story as the game is played
 - Can be accomplished using planning

STRIPS Planning

Given a set of available actions, how do we satisfy specific conditions on a world state?

- **S**tanford **R**esearch **I**nstitute **P**roblem **S**olver
- Uses domain and problem to find solution
- Domain: actions, predicates, object types
- Problem: objects, initial world state, and goal world state



Planning Example

Predicates:

A is in **B**, **A** is asleep

Actions:

Move, Sleep

Objects:

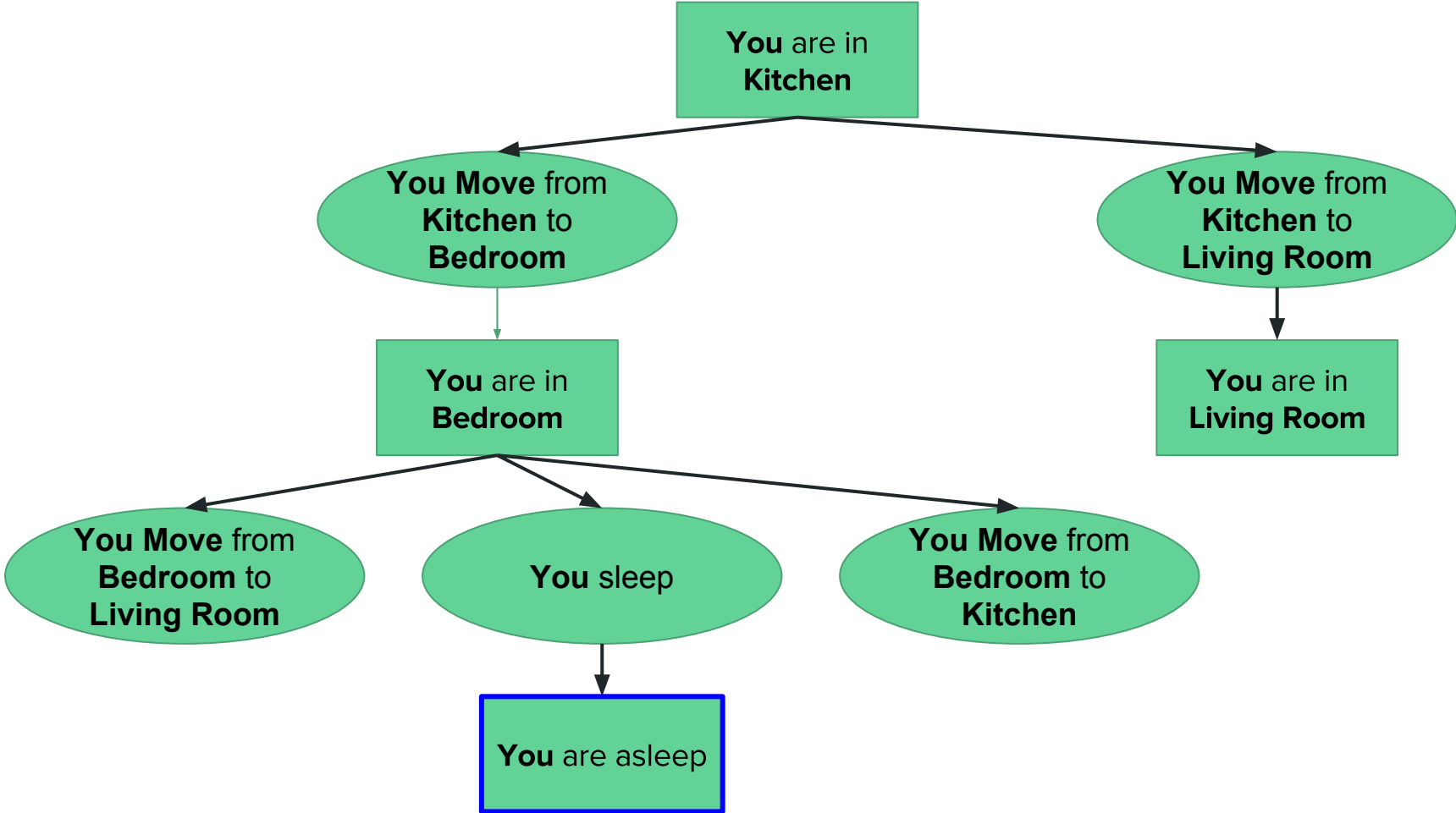
**You, Kitchen, Bedroom,
Living Room, Bed**

Initial World State:

You are in **Kitchen**, **Bed** is in
Bedroom, **You** are not asleep

Goal World State:

You are asleep



Using Planning for Narratives

- Can express complex stories with STRIPS planning
- Raiders of the Lost Ark:
 - Goal World State: US Army has the Ark, Nazis are dead
 - Actions: Indiana excavates the Ark, the Nazis open the Ark, etc.



Source: http://images.mentalfloss.com/sites/default/files/styles/article_640x430/public/indyhed.jpg

Intentionality & Conflict

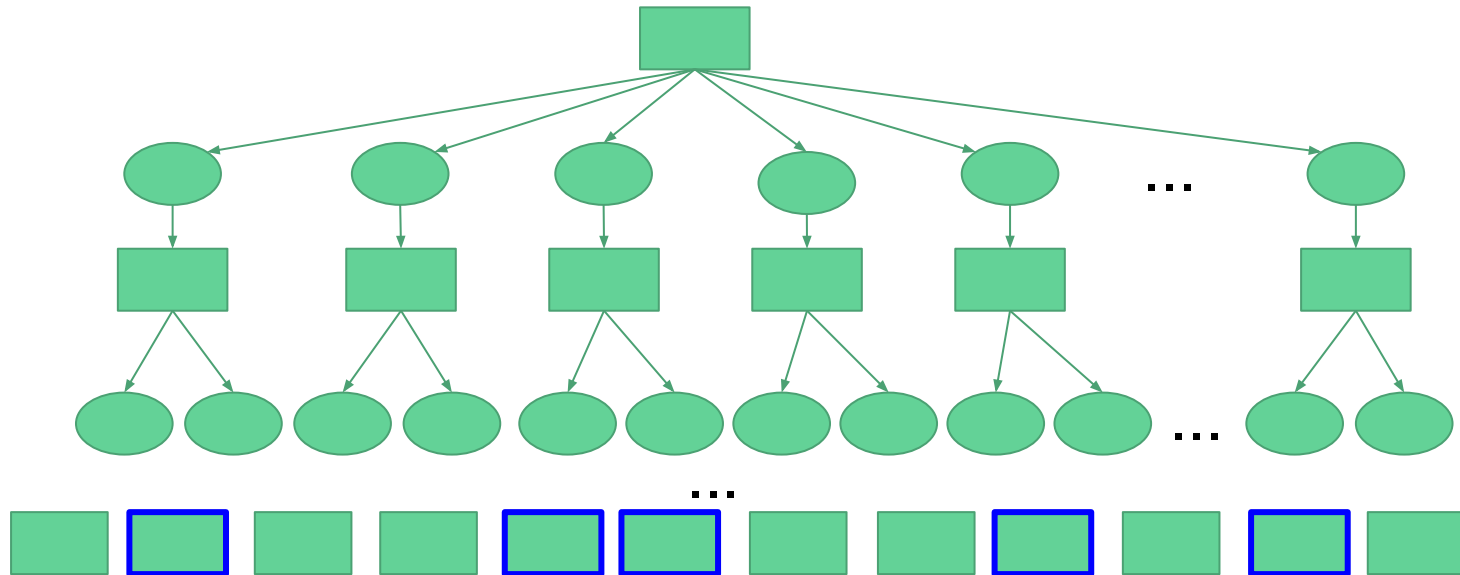
- Problem: all characters will collaborate to reach the goal world state
- Good guys and bad guys must create **conflict** to make a story
- We want characters to only make actions that make sense
 - Characters have goals
 - Actions take steps towards these goals
- All actions in a plan must align with characters' intentions



Demo

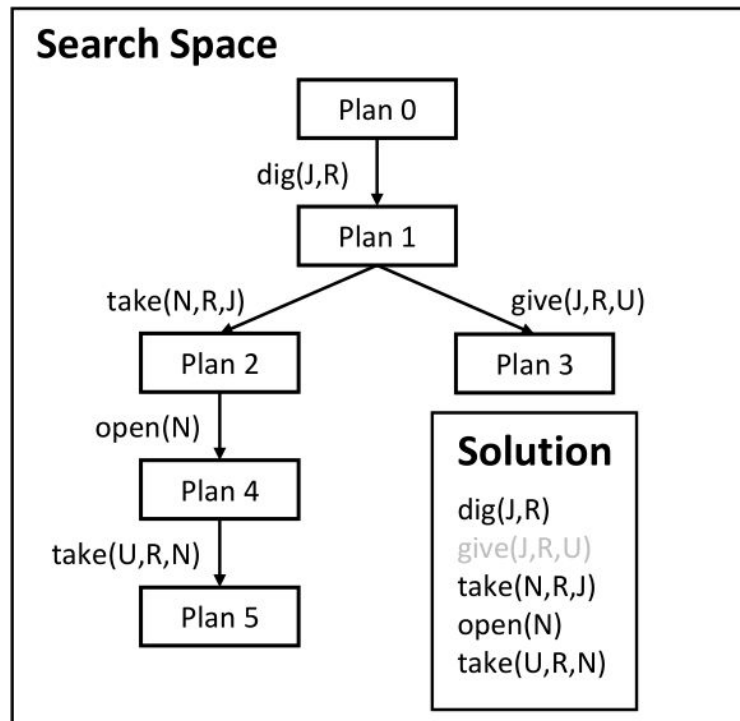
Glaive

- A narrative planner by Stephen Ware (University of New Orleans)
- ***Intentional fast forward-chaining state space heuristic search***



Intentionality & Conflict (revisited)

- How do we define intentionality algorithmically?
 - Mark actions as explained or unexplained
- How do we reconcile conflict?
 - Conflicts are interrupted plans



Ware and Young, 2014

Creating a Planning Domain

How do we create a world for the planner to find narratives in?

```
;; A character moves from one place to an adjacent place
(:action move
  :parameters    (?who - character ?from - place ?to - place)
  :precondition  (and (not (= ?from ?to))
                     (alive ?who)
                     (at ?who ?from))
  :effect        (and (not (at ?who ?from))
                     (at ?who ?to))
  :agents       (?who))
```

Creating a Planning Domain

How do we create a world for the planner to find narratives in?

```
;; Initial world state
(:init
  (alive player)
  (at player home)
  (alive mayor)
  (at mayor town-hall)
  (intends mayor (at mayor sheriff-office))
  (at gasoline general-store)
  (at lighter house-one)
  ...
)
```

Challenge: Making Glaive Interactive

- Glaive is a static planner
 - Has parameters from PDDL
 - Runs algorithm
 - Returns complete narrative
- Our goal is to have a narrative that adapts to player actions
 - Run Glaive
 - Provide player with actions based on preconditions
 - Change state based on player action
 - Update world state
 - Repeat

Text Generation

- Text generation
 - Give the player their current situation and possible actions through text
 - Display the result of his action
 - Define templates for PDDL terms

```
move.string = %1$s moves to %3$s  
move.impstring = move to %3$s
```

- Move.string is the action after it was selected - John moves to Farm
- Move.impstring is the defined action - move to House

Graphics Generation

- Graphics generation
 - Similar to text - Define images for PDDL terms as well as other templates
 - Show the player their current situation through images, and display the actions underneath with text buttons
 - Switch to 'comic book esque' panel to show player their action played out
 - More challenging - Need to procedurally generate the graphics

Version One



Version Two

Home

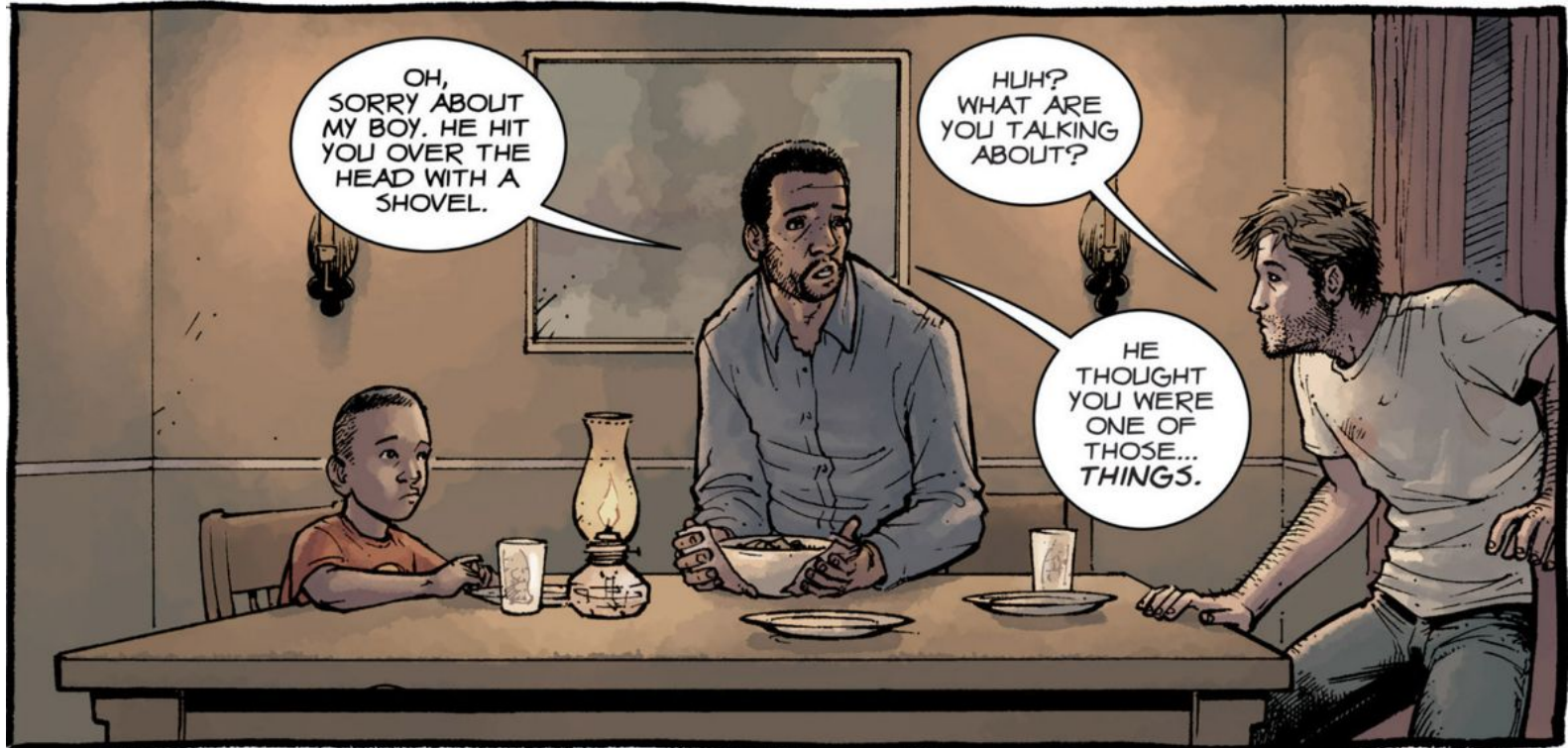


move to the general store move to the town hall move to the sheriff's office
move to the dark forest move to Jack's house pick gasoline up
pick alcohol up put a lighter down

PCG of Panels

- Objects! All PDDL terms are defined as objects and have properties
- Object types:
 - Background/Location
 - Characters
 - Items
- Decorate the objects with associations to other objects
 - Backgrounds can have items and characters
 - Characters can have items
- Each object has defined possible locations based on associations

Our Goal



Where are we now?

- PCG is still in early stages
- Performance
- Authorship
- Comic book style art



Return of the Demo

Questions?

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