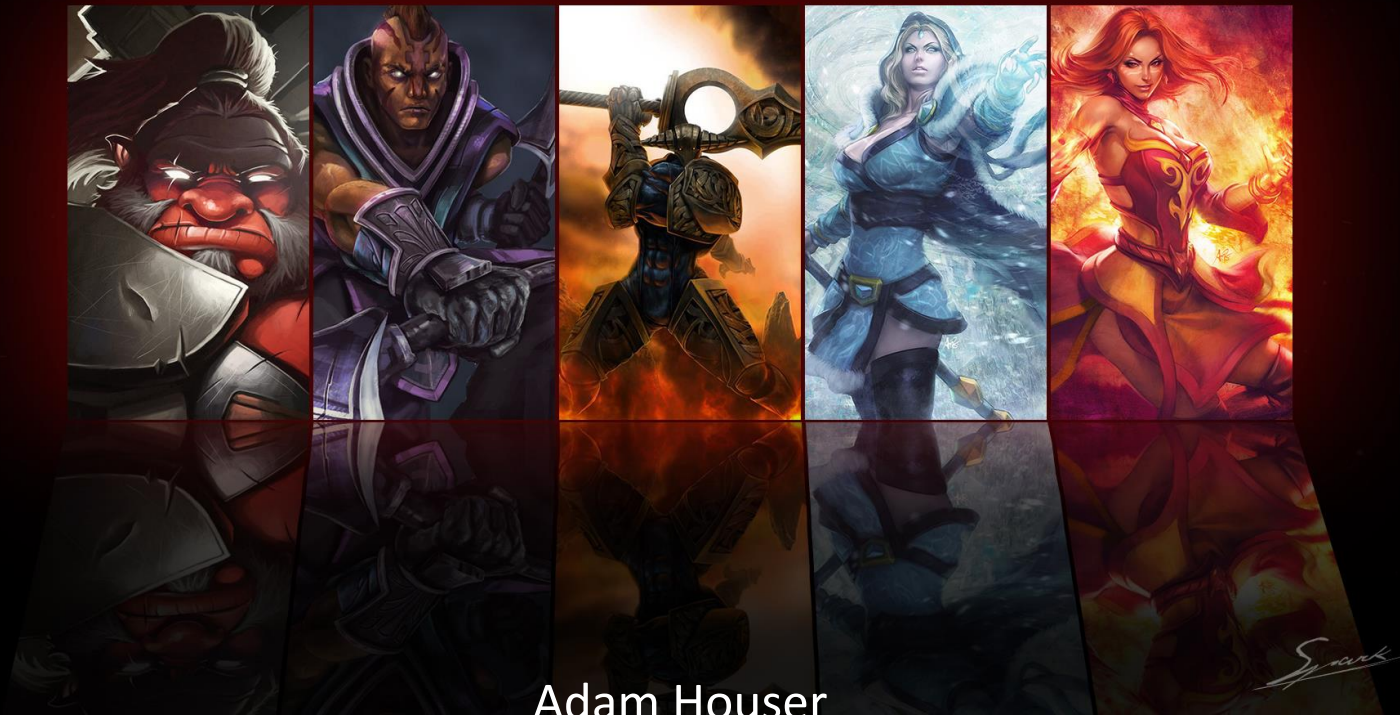


# Worlds Collide: Initial Developments in DOTA 2 Ontologies



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\$1.43 million



# What is DOTA 2?

Defense of the Ancients ... 2

Online multiplayer game

Humans control heroes, one of 103 characters

Goal: destroy the other teams primary structure, "The Ancient"



# DOTA 2 Ontology

Problem statement: the problem space is huge,  
being a new player is hard.

Problem question: how can we help the noobs  
and level the playing field?

Problem answer: an ontology!

# DOTA 2 Ontology

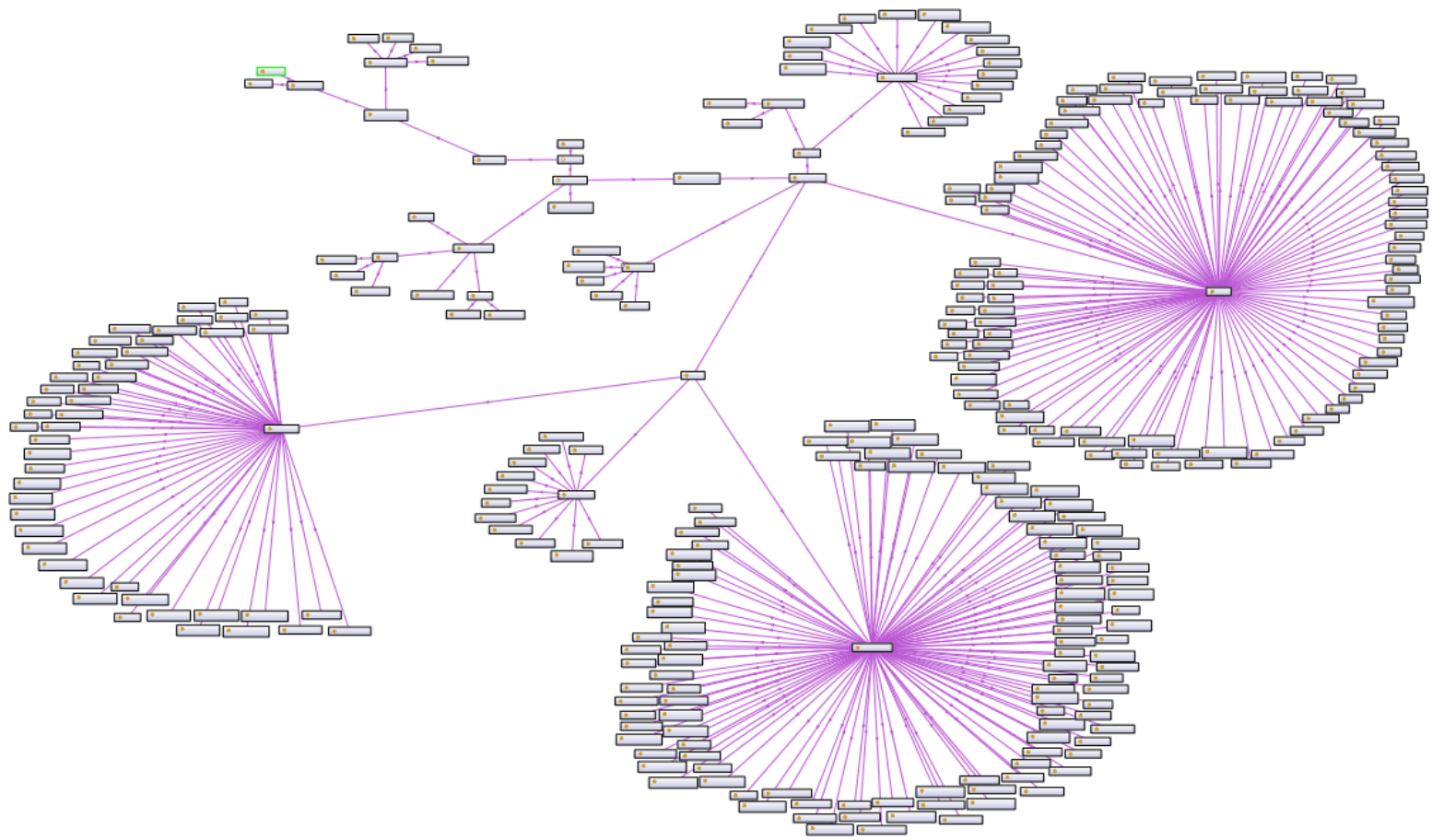
Initial Goal: handle item creation (complicated process)

End product covered the following

- Items (basic, upgrade, secret): 128
- Heroes: 103
- Structures and spatial regions
- Character states and game states

Total lines: 322





DOTA2\_Ontology (http://http://www.buffalo.edu/IE500/adamhous/DOTA2\_Ontology)

Active Ontology | Entities | Classes | Object Properties | Data Properties | Annotation Properties | Individuals | OWLViz | DL Query | OntoGraf | Ontology Differences | SPARQL Query

Class hierarchy: **continuant**

- Thing
  - entity
    - continuant**
      - dependent\_continuant
      - independent\_continuant
        - DigitalEntity
          - Creep
            - AffiliatedCreep
            - NeutralCreep
          - Hero
          - Item
            - basic\_item
            - secret\_item
            - upgrade\_item
          - Structure
            - Ancient
            - Fountain
            - Melee\_Barracks
            - Ranged\_Barracks
            - Tertiary\_Building
            - Tower
        - spatial\_region
          - Base
            - Dire\_Base
            - Radiant\_Base
          - JungleLocation
          - Lane
            - Bottom\_Lane
            - Middle\_Lane
            - Top\_Lane
          - River
      - occurrent
        - processual\_entity
          - CharacterState
            - Farming
            - Ganking
            - Jungling
            - Lane\_Pushing
          - GameState
            - Defeat
            - Victory

Annotations: **continuant**

Annotations +

label [type: string]  
continuant

comment [type: string]  
Definition: A **continuant** is a substantial entity (bfo:Entity) that exists in full at any time in which it exists at all, persists through time while maintaining its identity and has no temporal parts.

comment [type: string]  
Examples: a hero, an item, an item recipe, a creep that exists somewhere on the map, or even perhaps a role or designation given to specific heroes. These things are distinct entities that persist in a nonchanging state so long as they exist within the game.

Description: **continuant**

Equivalent To +

- dependent\_continuant**
- or **independent\_continuant**
- or **spatial\_region**

SubClass Of +

- entity**

SubClass Of (Anonymous Ancestor)

- continuant**
- or **occurent**

Members +

Target for Key +

Disjoint With +

- occurent**

Disjoint Union Of +

Reasoner active  Show Inferences

While we're at it ... true path rule and spatial region vs. structure.

# DOTA 2 Ontology

Construction based on BFO v1.1 and IAO

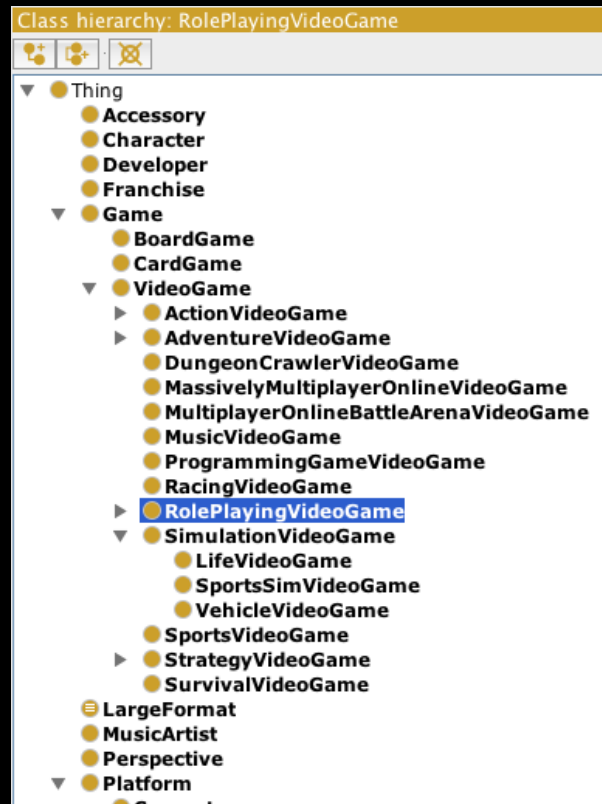
Purpose: integration and relevance

Existing work: not much

- Papers on “big-O Ontology” of games
- Scattered attempts, one .owl file

# Video Game Ontology

Cutalo, Conway, and Bashore (2013)



# DOTA 2 Ontology

Problem statement: how does an ontology help the noobs?

Description: Aghanim's\_Scepter

Equivalent To

- **has\_component only**  
(Blade\_of\_Alacrity  
and Ogre\_Club  
and Point\_Booster  
and Staff\_of\_Wizardry)

Abysal\_Blade

SubClass Of

- **upgrade\_item**

SubClass Of (Anonymous Ancestor)

- **continuant**  
or **occurrent**
- **dependent\_continuant**  
or **independent\_continuant**  
or **spatial\_region**

Members

Target for Key

Disjoint With

Disjoint Union Of

- **Blade\_of\_Alacrity, Ogre\_Club, Point\_Booster, Staff\_of\_Wizardry**

Description: Blade\_of\_Alacrity

Equivalent To

SubClass Of

- **basic\_item**

Abysal\_Blade

Aghanim's\_Scepter

SubClass Of (Anonymous Ancestor)

- **continuant**  
or **occurrent**
- **dependent\_continuant**  
or **independent\_continuant**  
or **spatial\_region**

has\_component only  
(Sacred\_Relic  
and Skull\_Basher)

has\_component only  
(Blade\_of\_Alacrity  
and Ogre\_Club  
and Point\_Booster  
and Staff\_of\_Wizardry)

Members

Target for Key

Disjoint With

# DOTA 2 Ontology

## Ontology already covers:

- Basic, upgrade, secret items
- Some creation details
- Gold cost
- Heroes
- Spatial regions
- Structures
- Character states
- Game states

## Ontology future work:

- Full item creation details
- Bonuses (buffs, attrinutes, dmg)
- Hero details (main attribute, speed)
- Hero roles (nuker, pusher, carry)
- Hero + item best combos
- Strategies (jungling, farming)

# DOTA 2 Ontology

Making it useful: SPARQL queries with GUI frontend

- Item creation: current gold + current items = what a hero can or should purchase
- Specific for heroes: select your hero, repeat for particular items
- Specific for roles: jungling vs. pushing items

Questions?

