Ontological Requirements for Analogical, Teleological, and Hypothetical Legal Reasoning

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Batter up…

- On the last day of the 2001 season…
  - S.F. Giants' Barry Bonds sets new record when he hit his 73rd home run.
  - In the stands, **Popov**, a fan, gloved the ball for an instant and then was tackled by others. Bystander **Hayashi** ended up with the ball.
  - Plaintiff (P) Popov sues Defendant (D) Hayashi
- What rule (aka legal test) should govern if P has property rights in the baseball in light of facts, past cases and underlying principles?
  - Court cites two 19th Century property cases:
  - *Pierson* and *Young* involved foxhunting and fishing.
  - P pursued the quarry only to have D intercept it.
- How to model case-based legal arguments about:
  - What the rule for decision should be, where
  - Hypothetical cases used to test rules, and
  - Analogies drawn across superficially different cases that raise similar underlying issues?
- What should an ontology provide for this kind of legal CBR?

The Pitch…

- Case-based (legal) reasoning
  - Drawing (legal) inferences by comparing a problem with relevant cases
- CBR ontology should help support:
  1. *Case-based comparisons*:
     - Find relevant cases, compare them with problem, draw inferences based on comparisons, and make arguments how to decide problem.
  2. *Distinguishing deep and shallow analogies*:
     - Identify cases relevant despite superficial dissimilarities or irrelevant despite superficial similarities.
  3. *Inducing/testing hypotheses*:
     - Induce hypotheses about how to decide problem from database of cases, and evaluate and modify the hypotheses (e.g., using hypothetical reasoning.)
  - Take into account *issues, underlying principles/policies, and factors.*
- From viewpoint of an ontology consumer,
  - can current ontologies for CBR support these roles? No!
  - It's hard even to specify the requirements.
- Example shows what ontology for legal CBR should provide.

The Line-up…

- Define “ontology”
- Extended example of case-based legal reasoning to be supported by ontology.
- Distill requirements of a CBR ontology for each of the 3 specific roles – Supporting:
  1. *Case-based comparisons*
  2. *Distinguishing deep and shallow analogies*
  3. *Inducing/testing hypotheses*
- Discuss extent requirements met and remaining challenges .
- Conclusions

Definitions and Roles

- Ontology ≡
  - "explicit, formal, and general specification of a conceptualization of the properties of and relations between objects in a given domain (citations omitted)" (Wyner, 2008).

- Comprises:
  1. Ontological framework
     - Specifies fundamental types of things that exist for purposes of system
     - Sets out relations among the types or concepts
     - Defines a conceptual syntax for representing more complex concepts
  2. Domain ontology
     - Specifies objects, predicates, relations, and semantic constraints for a given domain.

- General roles: (Breuker et al., 2004; Wyner, 2008)
  1. Make assumptions about concepts explicit so that
     - program can reason with them and manage relations and distinctions among concept types and
     - generate natural language arguments and explanations.
  2. Facilitate exchange and re-use of knowledge and information among knowledge bases and other resources distributed over Internet and Web.

- Specific roles of a CBR ontology in supporting:
  1. *Case-based comparisons*
  2. *Distinguishing deep and shallow analogies*
  3. *Inducing/testing hypotheses*

Intro to Extended Example

- Illustrates intended output of a new case-based legal reasoning system:
  - Simulates arguments law professor and students make in classroom discussion.
    - Case-based arguments students make in explaining how a case should be decided
    - Professors' ways of probing those arguments.
  - Domain is property law course discussion of *Popov v. Hayashi, Pierson v. Post, etc.*
    - Deals with an issue of common (i.e., judge-made as opposed to statutory) law:
    - Under what circumstances may "hunters" have property rights in their quarry?
  - Focus of discussion in AI&Law (Berman & Hafner, 1993; Gordon & Walton, 2006; Atkinson & Bench-Capon, 2007).

- Arguments to include:
  - Propose test or rule for deciding a case
  - Draw analogies to past cases (i.e., precedents)
  - Justify analogies in terms of underlying legal domain's principles/policies
  - Challenge proposed tests by posing hypotheticals
  - Respond to hypotheticals by modifying the proposed test, etc.

- Proposed test ≡
  - ako hypothesis about how to decide the case.
  - rule that advocates or judges propose for deciding a case and defend as consistent with past cases and underlying principles and policies.

- Hypothetical ≡
  - imagined situation that involves a hypothesis (i.e., a proposed test) and is designed to explore its meaning or challenge it as too broad or too narrow.

Extended Example

Argument moves	Transcript
	Part 1. Teacher: In the *Popov* case (Cases/Hypos), what is the appropriate legal test (if any) for deciding if the P has such a property right in the baseball?
▪ Propose test for P ▪ Justify test ito principles & precedents ▪ Analogize precedent ito factors	**Part 2. Student-A:** proposes a test: "If P manifestly intended to gain possession of something of value, and D intentionally interfered causing P to fail, then P can recover." (Proposed Tests, Manifest Intent). The test Protects Fair Play (Principles/Policies). The case is analogous to the *Keeble* case (Cases/Hypos) in which P won where D scared away ducks P had lured to its part of a pond. The cases share relevant factors: Manifest Closing In, Knows Closing In, and Intentional Interference (Factors) .
▪ Pose hypo / challenge test as too broad ▪ Justify challenge ito principles	**Part 3. Teacher:** poses hypothetical: Suppose D school master of a competing new school frightens boys on their way to the old school of the P schoolmaster. Should the P schoolmaster recover? (Cases/Hypos) If so, wouldn't that contradict the law's goal to promote economic competition? (Principles/Policies)
▪ Distinguish hypo ▪ Modify test to remove overbreadth	**Part 4. Student-A:** distinguishes *Popov* case from the Competing Schoolmasters hypothetical (Cases/Hypos) , arguing that P and D are not in economic competition (Factors) and thus a pro-D factor applied in the hypothetical that does not apply in *Popov*. Modifies his test by making it apply more narrowly to errant "baseballs" rather than to "something of value." (Proposed Tests, Manifest Intent-1)

Extended Example (cont.)

Argument moves	Transcript
▪ Distinguish pro-P precedent ito factors ▪ Justify distinction ito principles ▪ Argue principle not legally enforceable ▪ Cite trumping counter example ito factors	**Part 5. Student-B:** responds to pro-P student-A's argument by distinguishing *Keeble* case, emphasizing any pro-P factors present in that case not shared in *Popov.* P in *Keeble* was pursuing his Livelihood on his OwnLand (Factors). This matters, the student argues, because the court may have aimed to Protect Livelihood and Landowner's Rights (Principles/Policies). Suggests that Protects Fair Play, although morally relevant, is not a Legally Protectable Interest (Principles/Policies). Cites the *Pierson* case where D won (Cases/Hypotheticals) *despite* the shared facts associated with Manifest Closing In, Knows Closing In, and Intentional Interference (Factors).
▪ Propose test for D ▪ Justify test ito principles & precedents ▪ Distinguish pro-P precedent on principle	**Part 6. Teacher:** What is your test? **Student-B:** "If P did not gain possession of the baseball (e.g., by catching and securing it), then he cannot recover" (Proposed Tests, Possession). Concedes his test is inconsistent with *Keeble*, but emphasizes that applying it in the *Popov* facts would Promote Certainty by discouraging litigants who "almost caught" the ball or "should have had it", and Avoid Property Rights in Public Property (Principles/Policies), a consideration not present in *Keeble*.

Table 1: A "Microworld" of Cases / Hypotheticals

Case Name, cite (Case or Hypo)	**Explanation (Factors - Side Favored) [Decision: Plaintiff or Defendant]**
Pierson v. Post, 3 Caines R. (N.Y.1805) (C)	Where D killed a fox, a nuisance pest, that P hunted for sport on open land, P lost *claim* of interference with property on *issue* of P's possession where P had not killed or mortally wounded the fox. (NC-D, OL-D, MCI-P, KCI-P, II-P, N-P) [D]
Keeble v. Hickeringill 103 Eng.Rep. 1127 (K.B. 1706) (C)	Where D used guns to scare away ducks that P land owner lured to his part of the pond with decoys, P won *claim* of interference with property despite *issue* of plaintiff's possession where plaintiff had not killed or mortally wounded ducks. (NC-D, OWL-P, L-P, MCI-P, KCI-P, II-P) [P]
Young v. Hitchens, 6 Q.B. 606 (1844) (C)	Where D commercial fisherman caught fish from within the still open nets P commercial fisherman was closing around the fish, D won *claim* of interference with property due to *issue* of P's possession where P had not captured the fish. (NC-D, *OL*-D, L-P, C-D, MCI-P, KCI-P, II-P) [D]
Flushing Quail (H)	Where D, knowing that P was pursuing quail by flushing them out on open land and shooting them, intercepted the quail and killed them, P won?/lost? a *claim* for interference with a property interest where an *issue* involved whether the P had a property interest in quail P had not yet killed (NC-D, OL-D, L-P, C-D, MCI-P, KCI-P, II-P) [?]
Competing Schoolmasters (H)	Where D schoolmaster scared away pupils from attending P's school, P won?/lost? a *claim* for interference with a property interest where an *issue* involved whether the P had a property interest in students attending his school. (*NC-D*, OL-D, L-P, C-D, *MCI-P*, *KCI-P*, II-P) [?]
Escaping Boar (C)	Where D possessed a wild animal nuisance pest that damaged P's property, P won *claim* for negligence/strict liability on *issue* that animal escaped through/without D's fault. (NC-D, OWL-P, L-P, *N-P*) [P]
Popov v. Hayashi, 2002 WL 31833731 (Cal. Superior, 2002) (C)	Where D pocketed Barry Bonds' record-breaking 73d home run baseball that P had caught in the upper part of his mitt, P partially won a *claim* of interference with property despite the *issue* of P's possession where P had not completely secured the ball before being knocked down by other fans (not including D), but was awarded only half the proceeds of sale of baseball. (*NC-D*, *OL-D*, *MCI-P*, *KCI-P*, *II*-P) [Split proceeds]

Table 2: Principles / Policies

Principles or Policies	Meaning
Protect Fair Play	Discourage unsportsmanlike conduct and unfair competition.
Reduce Nuisance Pests	Encourage eradication of deleterious pests
Promote Certainty	Maximize rule's ease and clarity of application
Protect Livelihood	Protect livelihood of working parties
Avoid Property Rights in Public Property	Avoid assigning property rights in things on public property
Promote Economic Competition	Promote economic competition among businessmen
Protect Free Enterprise	Protect free enterprise of businessmen
Legally Protectable Interests	Only protect interests the law recognizes
Protect Landowner's Rights	Protect the rights of the landowner on his own land

Table 3: Factors

Factors	Short Name (Abbreviation) [Side Favored]
Animal not caught or mortally wounded	Not Caught (NC) [D]
Open Land	Open Land (OL) [D]
Own Land	Own Land (OWL) [P]
P Pursuing Livelihood	Livelihood (L) [P]
D in Competition with Plaintiff	Competes (C) [D]
P manifestly closes in on goal	Manifest Closing In (MCI) [P]
D knows P closes in on goal	Knows Closing In (KCI) [P]
D intentionally interferes physically with P's closing in on goal	Intentional Interference (II) [P]
Animal is a nuisance pest	Nuisance (N) [P]

Table 4: Proposed Tests (i.e., Hypotheses)

Proposed Tests	Short Name
If plaintiff did not gain possession of the *baseball* (e.g., by catching and securing it), then he cannot recover.	Possession
If plaintiff did not gain possession of the *quarry* (e.g., by catching and securing it), then he cannot recover.	Possession-1
If plaintiff manifestly intended to gain possession of the *fish*, and the defendant intentionally interfered causing plaintiff to fail, then he can recover.	Manifest Intent-2
If plaintiff manifestly intended to gain possession of the *baseball*, and the defendant intentionally interfered causing plaintiff to fail, then he can recover.	Manifest Intent-1
If plaintiff manifestly intended to gain possession of *something of value*, and the defendant intentionally interfered causing plaintiff to fail, then he can recover.	Manifest Intent

1. Ontological support for case comparison: representing cases

Domain-specific concept classes/values

Hunting/Catching venues: land, pond, ocean, baseball stands*

Restrictions on venues: open, privately owned, or subject to regulatory restriction, by invitation only*

Quarry: animals (wild, domestic, edible, nuisance pests, fox, quail); baseballs*; students*; something of value*; economic goals*

Hunting/catching steps re possession: seeking quarry, closing in on quarry, catching and securing quarry (in a mitt*, killing, in a net); wounding quarry, missing quarry

General Concepts of Human Agency

Interference: not interfering, interfering physically with, preventing someone's reaching a goal, etc.

Intentionality: unintentionally, negligently, knowingly or intentionally

Objectiveness: hiding ones intentions, being ambiguous about them or manifesting them clearly

Factors and their triggers

- E.g., Competition and Livelihood factors
- Triggered (Part 3) when hypo substitutes "students" for "baseball" as quarry.
- If "fox" then Nuisance factor applies

1. Ontological support for case comparison: explain case decisions

Representing Tests as Logical Formulae with:

- General factual concepts
- Intermediate legal concepts
  - possession, manifestly intended, intentionally interfered, causing, and nuisance pest
- Orderings of intermediate legal concept values
  - Certainty of possession (e.g., catching or mortally wounding > seeking or closing in)
  - Intentionality class (i.e., unintentionally < negligently < knowingly or intentionally)

Concept Associations

- Factors related to principles
  - Similarities/differences legally relevant b/c of related principles
  - Own Land (Factors) ~ Protect Landowner's Rights (Principles) in explaining *Keeble* and distinguishing *Pierson*, Part 5.
  - Open Land ~ Avoid Property Rights in Public Property.
- Intermediate legal concepts related to factors & principles
  - "Possession" ~ Not Caught (Factors) and Promote Certainty (Principles/Policies.)
  - "Intentionally interfered" ~ Intentional Interference and with Protect Fair Play.
- Factual concepts related to all of above
  - If "quarry" includes non-nuisance pests, game birds, or economic goals,
  - Then various principles apply more or less strongly.

1. Ontological support for case comparison: model argument schema/moves

- Support argument schema challenging test as too broad with hypothetical
  - Hypothetical that changes a fact may take case out of one policy or into another.
  - E.g., in Part 3, switching quarry from baseball to tuition-paying student and applying Manifest Intent test suddenly leads to result that protects fair play but at the expense of discouraging economic competition!
  - Choreograph ito ontological associations among factors, concepts and principles/policies
- Support argument move modifying test in response
  - Ontological ordering of terms by abstractness and legal "inclusiveness" guides comparing/modifying test versions.
  - E.g., "baseball" is substituted for "something of value" in modifying Manifest Intent test in Part 4 to Manifest Intent-1.

2. Ontological support for distinguishing deep and shallow analogies

Case Name, cite	Explanation (Factors - Side Favored) [Decision: Plaintiff or Defendant]
Popov v. Hayashi (C)	Where D pocketed Barry Bonds' record-breaking 73d home run baseball that P had caught in the upper part of his mitt, P partially won a ***claim*** of interference with property despite the ***issue*** of P's possession where P had not completely secured the ball before being knocked down by other fans (not including D), but was awarded only half the proceeds of sale of baseball. (*NC-D*, *OL-D*, *MCI-P*, *KCI-P*, *II*-P) [Split proceeds]
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3. Ontological support for inducing/testing hypotheses

- Induce legal rules from cases explainable ito:
  - principles, precedents, facts and decisions, issues and other rules.
- Incremental, explainable induction in extended example:
  - process of proposing tests and evaluating them with hypotheticals.
  - Driven by ontologically-supported argument schema.
- Role of case-based adaptation:
  - substitution of facts and concepts from ontology to make hypotheticals and modify tests (Kolodner, 1995).
  - Solution is not a case alone but the test as proposed or modified.
  - Hypothetical case is a case adaptation that helps evaluate test
- Can ontology support "inventing" new terms?
  - Advocates invent intermediate legal concepts to fit tests, cases, principles.
  - Combine terms or borrow analogous terms from different legal domains?
  - Ontology-based automated combinations of elements (Breuker and Hoekstra, 2004a; Zarri, 2007).

Base Hit or Strike 3?

Judge McCarthy's decision rules …

1. An action for conversion may be brought where the plaintiff has title, possession or the right to possession.
2. Professor Gray's rule: "A person who catches a baseball that enters the stands is its *owner*.
   - A ball is *caught* if the person has achieved complete control of the ball at the point in time that the momentum of the ball and the momentum of the fan while attempting to catch the ball ceases.
   - A baseball, which is dislodged by incidental contact with an inanimate object or another person, before momentum has ceased, is not possessed.
   - *Incidental contact* with another person is contact that is not intended by the other person.
   - The first person to pick up a loose ball and secure it becomes its *possessor*."
3. But, where an actor undertakes significant but incomplete steps to achieve possession of a piece of abandoned personal property and the effort is interrupted by the unlawful acts of others, the actor has a legally cognizable pre-possessory interest in the property.

Conclusions

- Described more advanced legal case-based reasoning:
  - Draw inferences about how to decide problem by comparing it with relevant cases
    - But draw more abstract cross-case analogies
  - Reason *about* decision rules
    - How well proposed rule fits past cases, principles / policies.
    - Assess decision rules teleologically with hypothetical reasoning.
- Ontological requirements -- Supporting:
  - *1. Case-based comparisons*
  - *2. Distinguishing deep and shallow analogies*
  - *3. Inducing/testing hypotheses*
- Extended example shows what a legal CBR ontology should provide.
- Microworld approach to implementing legal CBR ontology incrementally.