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INTERNATIONAL CONFLICT RESEARCH

Advanced Computational Modeling of Social Systems

# GeoContest V.2

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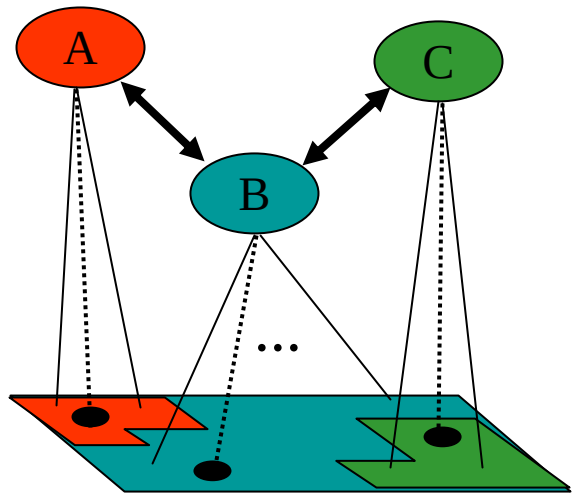
# Model Setting



Two layers:

States `Actor`
`Relation`

Space `SpatialUnit`



# A single time step



- *Parallel activation*:
  All actors
  - decide on which front to attack (decision made by strategy)
  - allocate resources to their active fronts (proportional to opponent size)
  - fight battles along their relations
- Model carries out structural change based on battle results

# Accessors



- Model objects are hidden from a strategy by their accessor objects
- Accessor objects control all operations on the model objects made by a strategy
- Accessors available: ModelAccessor, ActorAccessor, RelationAccessor

# Java 1.5 new features



- Generics: Typed collections

```
ArrayList<Actor> actors = new ArrayList<Actor>();
actors.add(new Actor());
Actor anActor = actors.get(i);
```

No cast needed: safe and efficient.

- For-each loop: Iterate over list elements

```
for (Actor active : actors) {
    active.step();
}
```

# RelationAccessor



```
public ActorAccessor owner();
```
The owner of the relation (relations are directed)

```
public ActorAccessor other();
```
The target actor

```
public HistoryEntry prevResult();
```
The result of the previous interaction along this relation

```
public List<HistoryEntry> getHistory();
```
The complete history

Relation.Action: COOPERATE, DEFECT

```
public void setAction(Relation.Action action);
```
Sets the action for the next move intended by the owner

# History



- A relation history is an ordered collection of HistoryEntries
- Each HistoryEntry stores
  - The owner‘s action: COOPERATE, DEFECT
  - The other‘s (=target) action: COOPERATE, DEFECT
  - The battle outcome: WIN, LOSE, DRAW or NO (= no battle)

Relation.BattleOutcome:
WIN, LOSE, DRAW, NO

# ActorAccessor



```
public ArrayList<ActorAccessor> neighbors();
```
A list of the actor's neighbors

```
public double resources();
```
The resources the actor has at its disposal

```
public int numProvinces();
```
The number of provinces (N.B. equal to `resources()`)

```
public ArrayList<RelationAccessor> relations();
```
The relations of this actor

```
public RelationAccessor getRelationWith(ActorAccessor other);
```
Pick a relation to a specified actor – **`null`** if there is none

```
public int strategyType();
```
The strategy type

```
public int getX(); public int getY();
```
The position of the capital

```
public boolean isAtom();
```
Actor is atomic iff it has just one province

# ModelAccessor



```
public int numStrategies();
```
The number of strategies taking part

```
public int numActors(int s);
```
The number of actors of a given strategy s

```
public int worldXSize();
public int worldYSize();
```
The grid size

```
public double winProb(double attRes, double
   targetRes);
```
The probability of winning for an attacker with resources attRes against a target actor with resources targetRes

# Example: AlwaysAttackingStrategy



```
public class AlwaysAttackingStrategy extends Strategy {

    public void decide() {
        for (RelationAccessor rel : actor.relations()) {
            rel.setAction(Relation.Action.DEFECT);
        }
    }

    public String getName() {
        return “AlwaysAttackingStrategy";
    }

    public String getAuthor() {
        return "Nils Weidmann";
    }
}
```

# Example: TitForTatStrategy



```
public class TitForTatStrategy extends Strategy {

    public void decide() {

        for (RelationAccessor rel : actor.relations()) {
            if (rel.getHistory().isEmpty()) {
                rel.setAction(Relation.Action.COOPERATE);
            }
            else rel.setAction(rel.prevResult().otherAction());
        }
    }

    public String getName() {
        return "TitForTatStrategy";
    }

    public String getAuthor() {
        return "Nils Weidmann";
    }

}
```

# Demo runs



- AlwaysAttacking vs. NeverAttacking
- Cautious vs. Random1

-> what results do you expect?

- KantianStrategy vs. CautiousStrategy

-> different outcomes demonstrate impact of activation regime!

# Possible extensions



- Symmetric (D,D) and asymmetric (C,D; D,C) attack decisions are treated the same way: Battle. -> Change this?
- Resources allocated by strategy

If you are interested in submitting a GeoContest V.2 strategy, please let me know (*weidmann@icr.gess.ethz.ch*).