Neg-o-Net (v.1.0)

Capturing stakeholder negotiation within FIRMA
Q.) Why do this?
A.) I’ll give one good reason from many.

• If we can capture plausible negotiation processes we can explore many (thousands) of environmental scenarios and “test” different negotiation strategies for robustness – something that would be impossible with stakeholder “gaming” (for example).
Q.) Can we be Generic and Qualitative?  
A.) yes, if we modularize and constrain.

- We want to apply a basic model framework to several FIRMA scenarios. To this end we have modularize by:
  - Agent “Viewpoints”
    - Already much data collected
  - Negotiation “Strategies”
    - On-going (Thames – gaming, other data Zurich)
  - Environmental Simulation
    - Already have several produced by members
Constraining the term “Negotiation”

- Negotiation is viewed as:
- Grounded in the attempt, by agents, to induce desirable actions in others
- Not dependent on shared or even compatible goals or beliefs (agents may have different “viewpoints”)
Unpacking Negotiation - Three types of negotiation “moves”

• In Neg-o-net we have categorized possible negotiation moves into three types:
  • 1. Action haggling – e.g. “I’ll do A if you do B”
  • 2. Belief communication – e.g. “if citizens protest, government become less popular”
  • 3. Goal communication – “It is important to protect the environment”
• (2 and 3 above come in regular and “meta” flavors).
Representing agent viewpoints with *digraphs*

- Each agent has a set of digraphs representing their subjective “viewpoint”
- Nodes represent subjective world states
- Arcs give causal links between nodes
- Nodes may have associated “trigger” conditions which cause them to become active
Digraph representation of viewpoints in Neg-o-Net

- Each node contains set of “indicator values” characterizing desirability (e.g. pollution, employment etc.).
- Each node lists the actions available to the agent (action repertoire) with an optional cost values.
- Each arc has associated conditions which need to be satisfied to traverse the arc.
An agent

Objectives (overall goal)

Haggling, Belief and Goal

Viewpoint node

Current active node

Agent

Indicator weights

Negotiation strategy

Viewpoint – digraph(s)
**Company** — max profit first, some env concern — (profit 1, env 0.5)

- New-regulation
  - High Profit
    - Profit=2, Env=1
    - Donation
  - Deregulate
  - Acceptable Profit
    - Profit=1, Env=2
    - Donation
  - New-regulation
  - Deregulate
  - Possible Loss
    - Profit=0, Env=3
    - Donation

**Politician** — max pop and hence get votes — (pop 1)

- High-Pop
  - Pop=3
  - Deregulation
  - New-regulation
  - Donation
  - Direct-action

- Low-Pop
  - Pop=2
  - Deregulation
  - New-regulation
  - Donation
  - Direct-action
  - Pop-Problem
    - Pop=0
    - Pop-campaign
  - Pop-campaign

**Citizen** — max env but keep costs low (env 1.5, cost –1)

- Env-Good
  - Cost=3, Env=2
  - Political-pressure
  - New-regulation
- Env-Concerns
  - Cost=2, Env=1
  - Political-pressure
  - Deregulation
  - Donation
- Env-Problems
  - Cost=2, Env=0
  - Political-pressure
  - Pop-campaign
  - Direct-action
Current implementation (v.1.0)

Three example haggling strategies:
- No haggling
- Some (open dyadic coalition) haggling
- Best possible coordinated action

- Single active node in viewpoint diagraph
- No belief or goal communication yet
- No environmental model hooked-up
- Conditions on arcs just a conjunction of atomic actions actions
- All agents follow same negotiation strategy and only “look-a-head” by one link
Example script (input)

# Neg-o-Net script - very simple viewpoint fragments#
#
#=========

Agent: Company : The water company         # agent name and description
IndicatorWeights:profit 1 env 0.5          # weights applied to indicators

# now we have a set of nodes and links which belong to the agent

Node: Acceptable-Profit                  : the company is in profit
Indicators: profit 1 env 2
Action: Donation                        : the company donates to the politician
Link: New-Regulation => Possible-Loss    : the company moves to a possible loss
Link: Deregulation => High-Profit        : the company moves to high profit

Node: Possible-Loss                      : the company is in a possible loss situation
Indicators: profit 0 env 3
Action: Donation                        : the company donates to the politician
Link: Deregulation => High-Profit        : the company moves to high profit

Node: High-Profit                       : the company is in high profit
Indicators: profit 2 env 1
Action: Donation                        : the company donates to the politician
Link: New-Regulation => Possible-Loss    : the company moves to a possible loss
Example run 1 (output)

>>> Iteration 1

Perception phase:
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The water company (Company):
the company is in profit (Acceptable-Profit)
The politician (Politician):
the politician has a low popularity (Low-Pop)
The citizens (Citizen):
the citizens have concerns about the environment (Env-Concerns)

Negotiation phase: The agents are attempting some coordination of actions via haggling
--------------------------------------------------------------------------------------------------------------------------
agent Company says to all: I require action Deregulation. Can anyone help?
agent Politician says to all: I require action Donation. Can anyone help?
agent Company says to all: I can offer action Donation.
agent Politician says to agent Company: will you agree to do actions { Donation } ?
agent Company replies: only if you can offer actions { Deregulation } in return.
agent Politician says to agent Company: Okay, I can do that
agent Politician says to all: I have agreed to perform action(s) { Deregulation }
agent Company says to all: I have agreed to perform action(s) { Donation }

Action phase:
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The water company (Company):
the company donates to the politician (Donation)
The politician (Politician):
the politician secures deregulation (Deregulation)
Example run 2 (output)

>>> Iteration 2

Perception phase:
-----------------
The water company (Company):
  the company moves to high profit
  the company is in high profit (High-Profit)
The politician (Politician):
  donations will help popularity
  the politician has a high popularity (High-Pop)
The citizens (Citizen):
  the citizens think deregulation will lead to problems
  the citizens are deeply concerned about environmental problems (Env-Problems)

Negotiation phase: The agents are attempting some coordination of actions via haggling
------------------------------------------------------------------------------------------------------------------------
  agent Politician says to all: I require action Donation. Can anyone help?
  agent Politician says to all: I'm getting nowhere, I retract my previous offers and requirements!

Action phase:
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The citizens (Citizen):
  the citizens take direct action (Direct-Action)
Example run 3 (output)

>>> Iteration 3

Perception phase:
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The water company (Company):
    the company is in high profit (High-Profit)
The politician (Politician):
    direct action by citizens will lead to low popularity
    the politician has a very low popularity (Pop-Problem)
The citizens (Citizen):
    direct action is sometimes necessary
    the citizens have concerns about the environment (Env-Concerns)

Negotiation phase: The agents are attempting some coordination of actions via haggling
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Action phase:
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The politician (Politician):
    the politician tries a popularity campaign (Pop-Campaign)
Example run 4 (output)

>>> Iteration 4

Perception phase:
-----------------
The water company (Company):
  the company is in high profit (High-Profit)
The politician (Politician):
  the popularity campaign has done some good
  the politician has a low popularity (Low-Pop)
The citizens (Citizen):
  the citizens have concerns about the environment (Env-Concerns)

Negotiation phase: The agents are attempting some coordination of actions via haggling
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  agent Politician says to all: I require action Donation. Can anyone help?
  agent Politician says to all: I'm getting nowhere, I retract my previous offers and requirements!

Action phase:
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The next step with FIRMA partners – the next 6 Months

- We are hoping to closely collaborate with at least two regional partners to:
  - Develop viewpoints in detail
  - Develop plausible negotiation strategies
  - Integrate existing environmental models
  - We envisage adding and amending features to accommodate real data!
  - This task is not trivial!
  - We want to start simple – get some detailed viewpoints and ask “what do we need to change / add to make the model more plausible”