Parallax
ADVANCED RESEARCH

4.669…
Evaluation and Planning

SCAMP (**S**ocial **C**ausality with **A**gents using **M**ultiple **P**erspectives)

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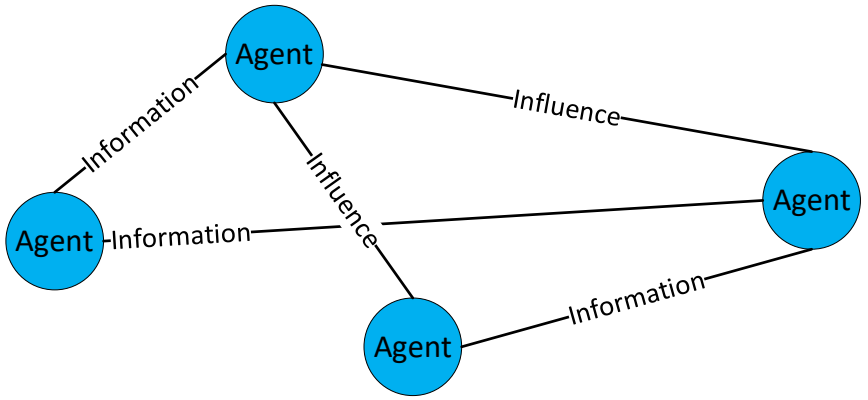
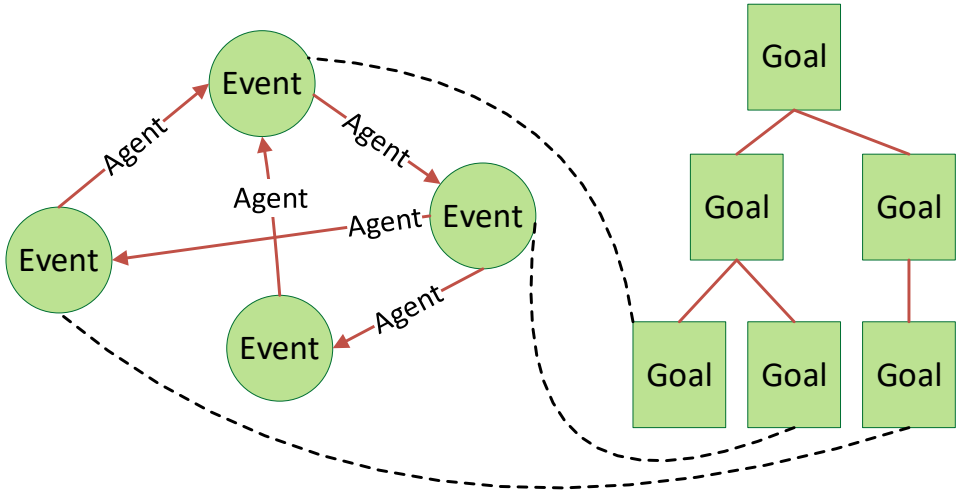




SCAMP was developed between December 2017 and November 2020 with the support of the Ground Truth program of DARPA's Defense Sciences Office, under the leadership of Adam Russell and Phil Root, through Cooperative Agreement HR00111820003 with Wright State Research Institute (now Parallax Advanced Research) in Beavercreek, OH.

Objective of presentation

Scamp is a networking tool that can reveal knowledge about social phenomena that traditional networking tools cannot.

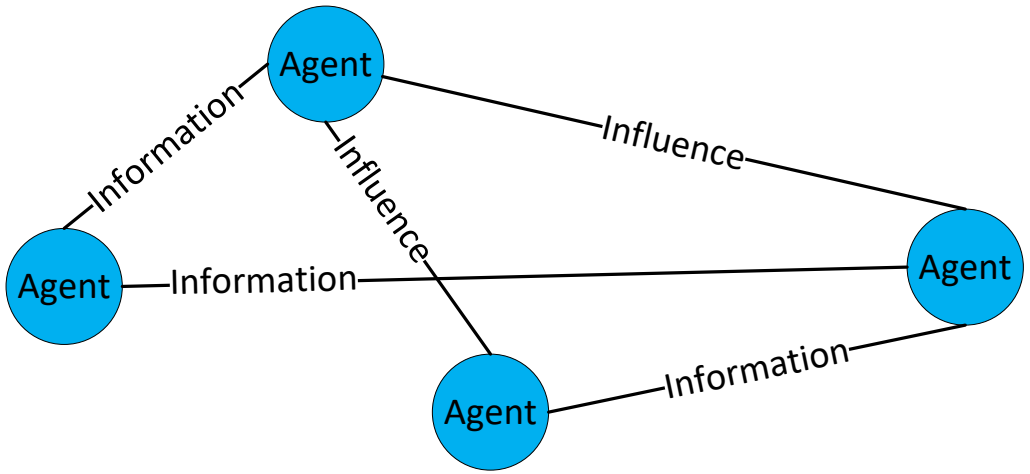
We are seeking partners whose research agenda and funding prospects would benefit from partnering with the SCAMP team.

Further reading:

- For technical detail on SCAMP go to: Parunak et al. (2020) SCAMP's Stigmergic Model of Social Conflict. Computational and Mathematical Organization Theory.
- For an explanation of how we see SCAMP as a social research tool, see Social Causality with Agents using Multiple Perspectives: A Novel Approach to Understanding Network-based Social Phenomena

SCAMP-network based research is radically different from traditional methods.

Traditional network-based research

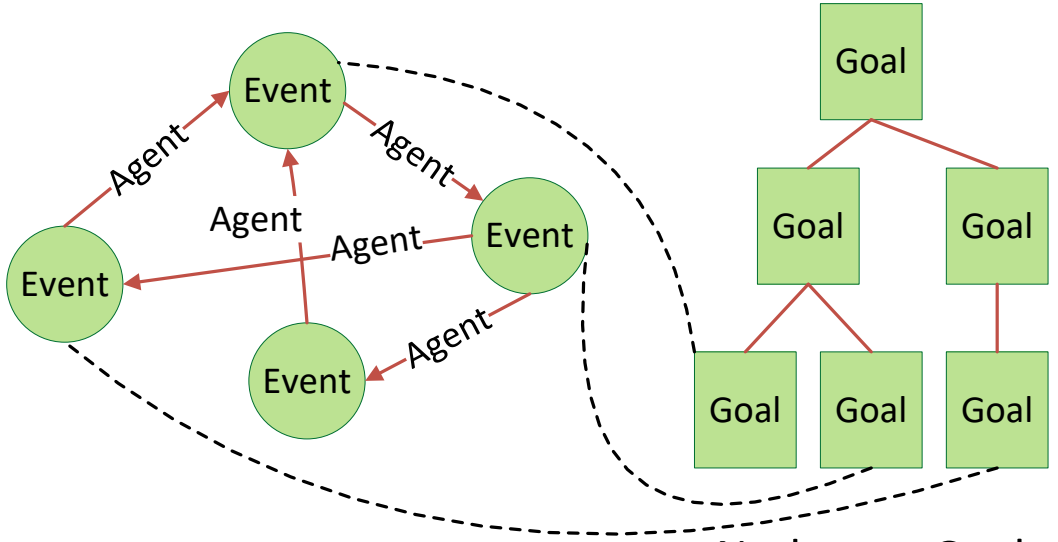


Nodes = Agents, e.g., people, groups

Edges = Communication, influence

Agent/influence networks reveal deep understanding of social behavior

SCAMP



Nodes = Events

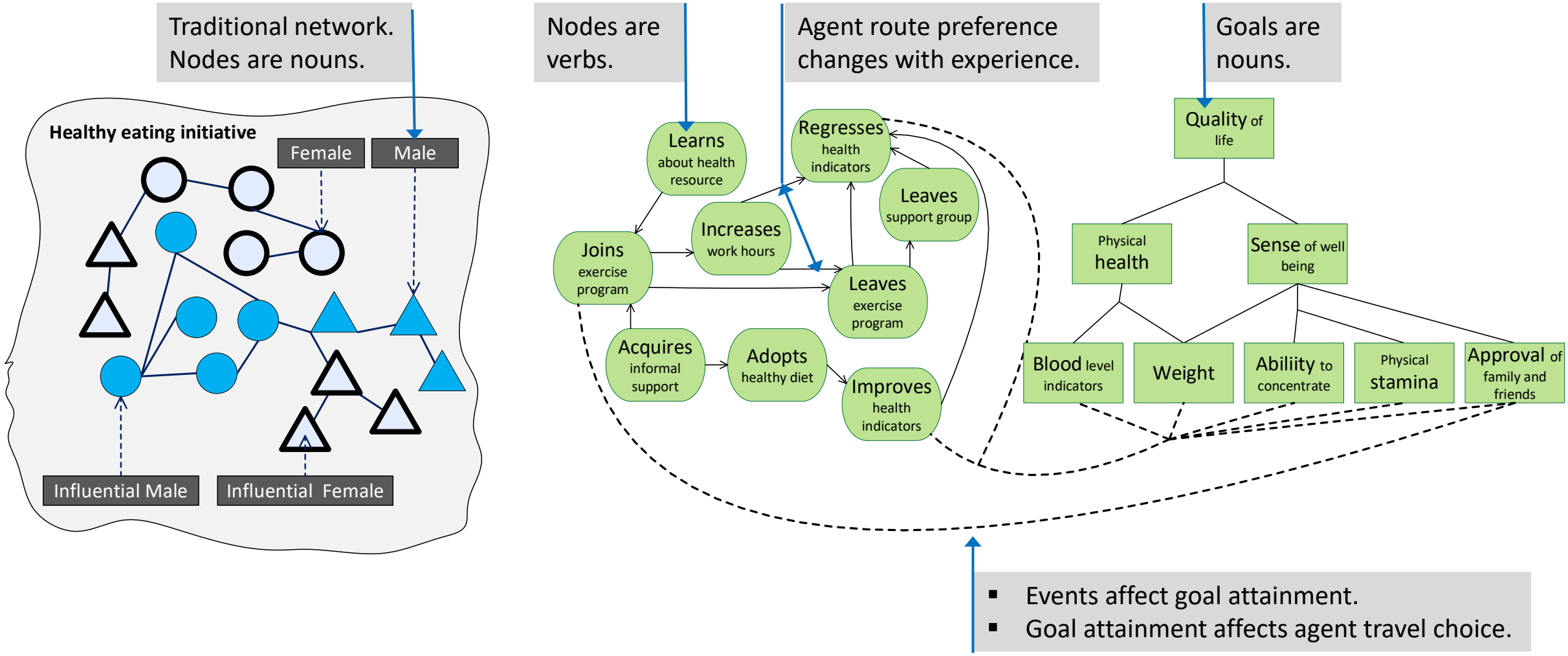
Edges = Agents travel events

Nodes = Goals

Edges = satisfaction, urgency

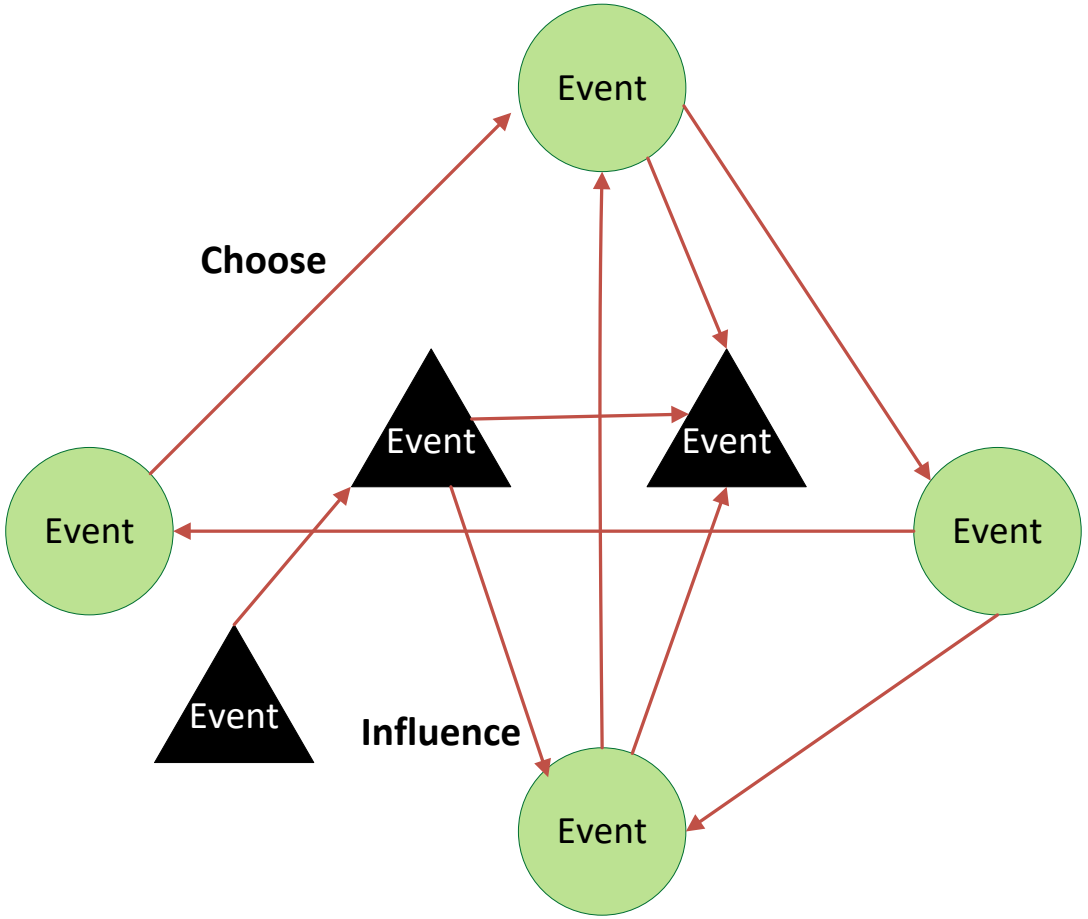
- Stories — best describe social behavior
- Agents — participate in events
- Events — travel affects goals
- Goals — affect agent travel

Example of Traditional and SCAMP Network Model of a "Healthy Eating Initiative"

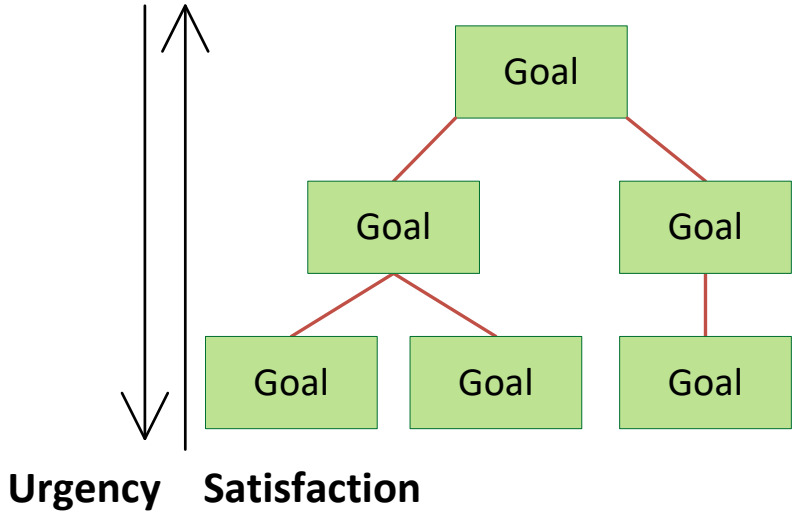


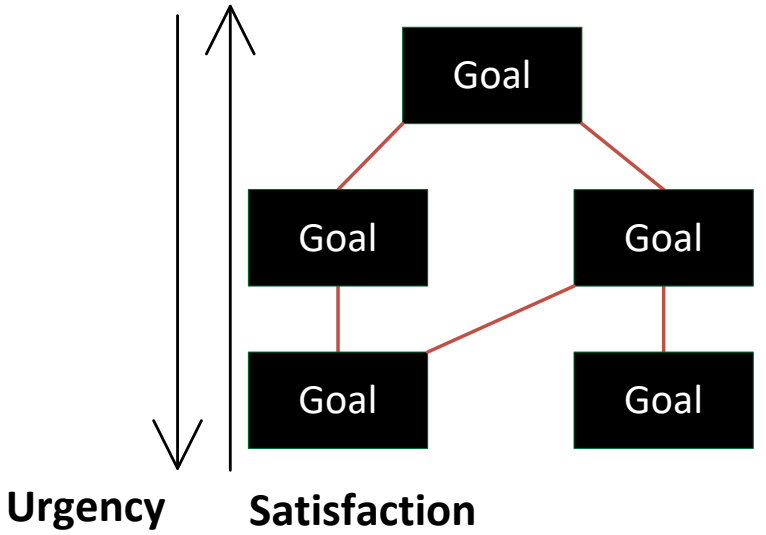
Types of relationships in multiple-agent event and goal networks

SCAMP can have different types of agents and event relationships



Each agent type has it own goal hierarchy



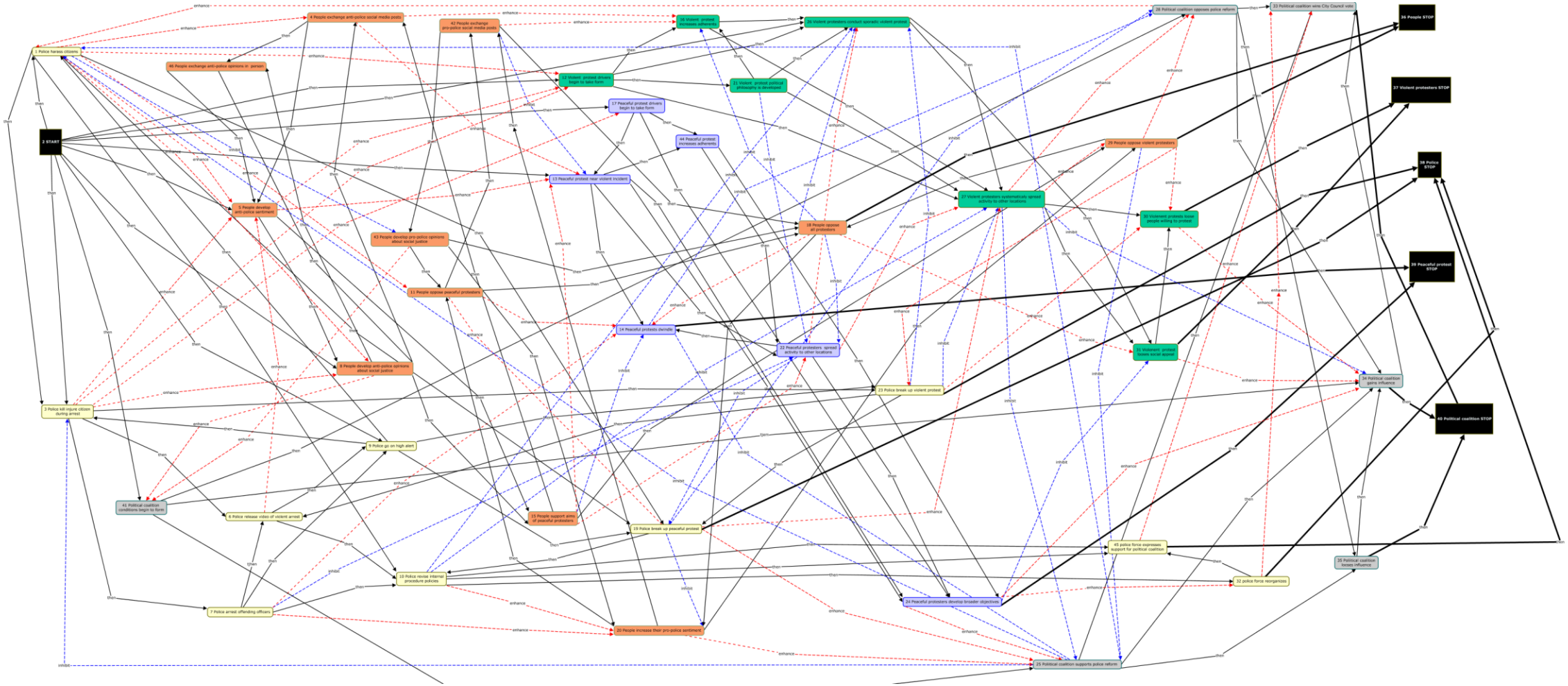


We built a SCAMP model of civil protest with 5 types of agents.

Violent presters | Political coalition | Police | People | Peaceful protesters

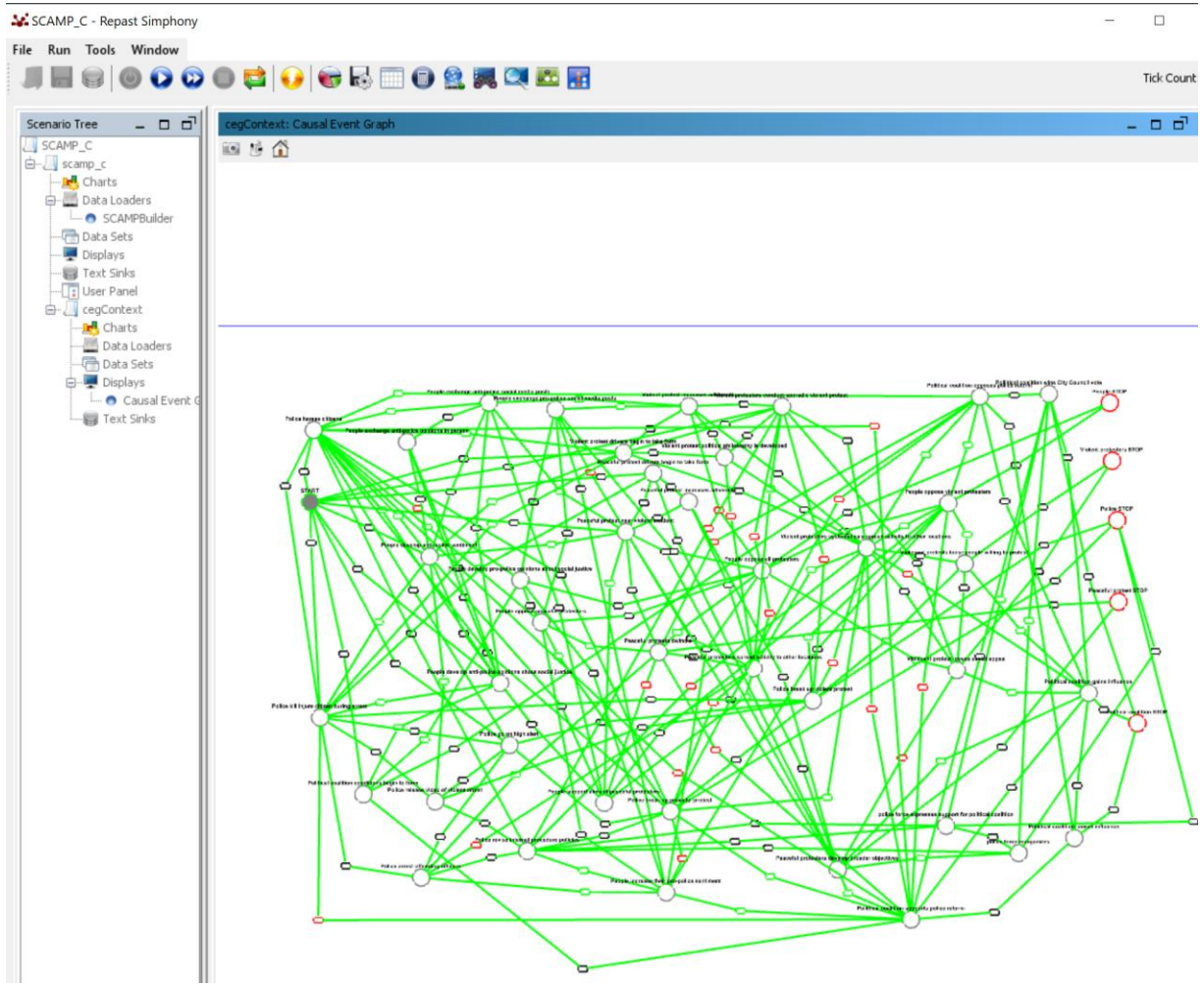
Built in Cmap.

Free application that does not require programming skills.

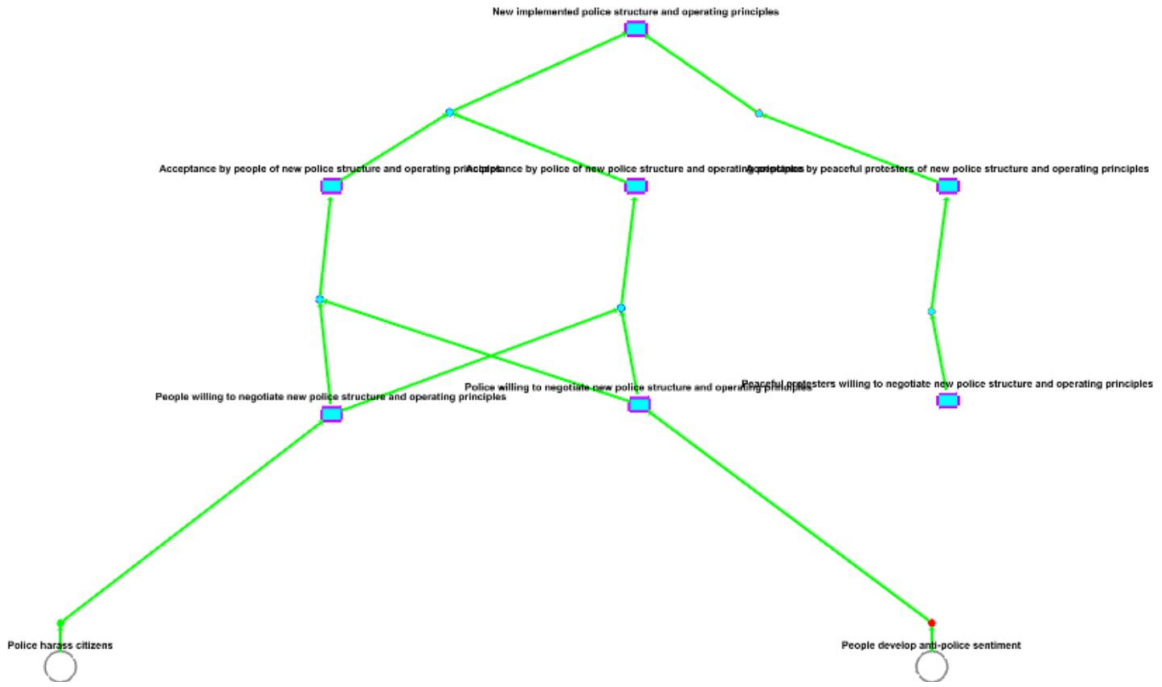


This is what the networks look like when SCAMP reads the Cmap file.

Event map



Goal map



SCAMP runs generate many files describing the evolution of the modeled.

adjacencymatrix.csv	1/8/2021 3:29 PM	CSV File	4 KB
affs.csv	1/8/2021 3:33 PM	CSV File	290 KB
agentGroup.csv	1/8/2021 3:33 PM	CSV File	334 KB
agentHistory.csv	1/8/2021 3:33 PM	CSV File	159 KB
agentMeetings.csv	1/8/2021 3:33 PM	CSV File	20,841 KB
agentTrack.csv	1/8/2021 3:29 PM	CSV File	1 KB
basePrefs.csv	1/8/2021 3:29 PM	CSV File	90 KB
consoleLog.txt	1/8/2021 3:33 PM	Text Document	3 KB
entropyLog.csv	1/8/2021 3:33 PM	CSV File	51 KB
eventLog.csv	1/8/2021 3:29 PM	CSV File	1 KB
features.csv	1/8/2021 3:33 PM	CSV File	1,094 KB
fullPrefs.csv	1/8/2021 3:33 PM	CSV File	323 KB
graphLog.txt	1/8/2021 3:29 PM	Text Document	2 KB
groupChanges.csv	1/8/2021 3:29 PM	CSV File	1 KB
groupInfluencers.csv	1/8/2021 3:33 PM	CSV File	2 KB
groupNetwork.csv	1/8/2021 3:33 PM	CSV File	12 KB
implicitNetwork.csv	1/8/2021 3:33 PM	CSV File	106,322 KB
influences.csv	1/8/2021 3:33 PM	CSV File	9,663 KB
model.xml	1/8/2021 3:29 PM	XML Document	75 KB
parameters.json	1/8/2021 3:29 PM	JSON File	2 KB
realizedNetwork.csv	1/8/2021 3:33 PM	CSV File	107,319 KB
satLog.csv	1/8/2021 3:33 PM	CSV File	5 KB

Example of top-level goal satisfaction for "coalition" over the course of a run

Time	Political_coalition
96	0.088
97	0.154
98	0.154
99	0.240
113	0.343
139	0.348
163	0.455

← Is this satisfaction level acceptable?

Is the event structure hypothesis correct?

Is the goal hierarchy hypothesis correct?

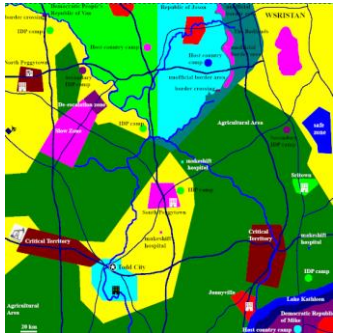
Did we choose the right mix of agents?

Tweaking and rerunning the model might answer these questions.

Four other SCAMP functionalities

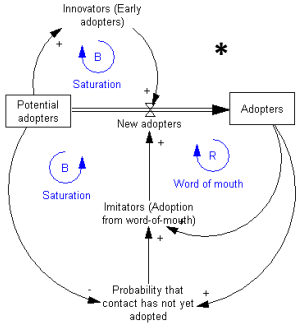
1

Agents can move over geography.



2

Interface with system dynamics models.



3

Represents a causal logic

- estimate probability
- support cycles and feedback
- model passage of time
- represent agency

4

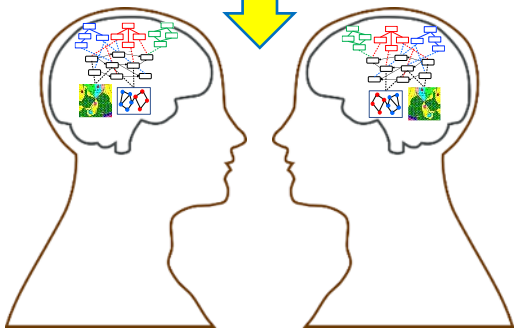
Real-time data feeds

- Features on events and geo location can be linked to real-time data sources

* https://en.wikipedia.org/wiki/System_dynamics

Technical backup – SCAMP is a Stigmergent network.

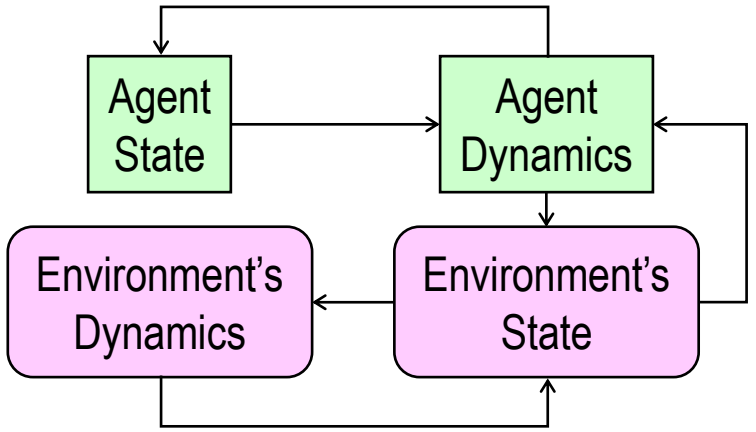
Conventional ABM	Stigmergic ABM
Complex agents	Simple agents (digital ants)
Complex agent interactions	Agents interact through complex environment
Change model = write computer code	Change model = draw graphs G: (N, E)
Model logic lives *inside* agents	Agents live *inside* the model

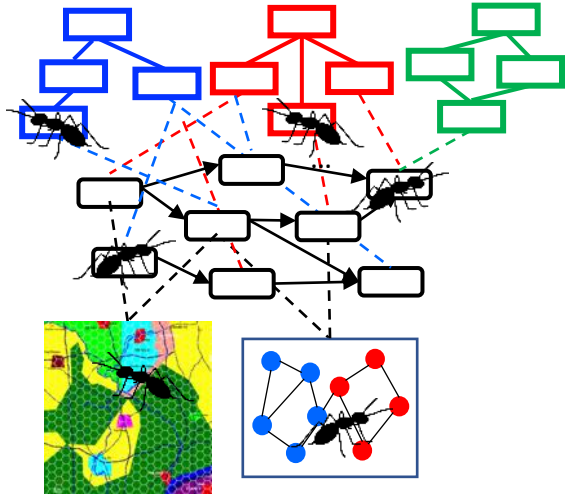


Stigmergy (Grassé, 1959)

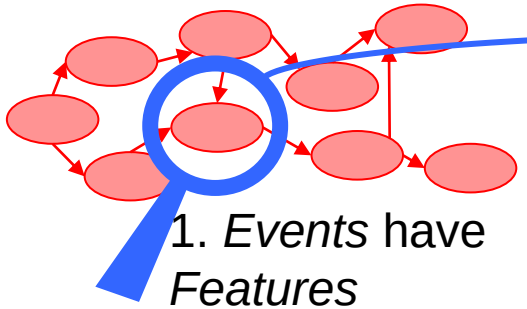
← στίγμα = “sign” + ἔργον = “action”

→ Actions mediated by signs in the environment





Technical backup – Well-being variables can be input from external observations.



1. *Events* have *Features*

.1	-.3	.4	.8	-.7	.7	.5

Impact on Well-being
- Economic
- Physical
- Psychological

Urgency
- Urgency
- one per group
- from goal network

Presence
- one per group
- past participation level

2. *Actors* have *Preferences*

.4	.8	.7	.0	-.4	.8	.2

3. Actor choices of events:

Made by roulette selection over cosine distances

Produce behavioral variables

e.g., participation levels, group satisfaction) that can inform external processes