An agent-based model of knowledge transferal

An Agent-Based Model of Knowledge Transferal

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Abstract. We set out a model of inter-team knowledge evolution through inter-group interaction. We introduce facilitation into the model and show how different models of facilitation create different results in group members' knowledge.

Keywords: agent-based model, knowledge transfer, decision making, social networks

1 Introduction

Agent-based modelling and complexity science have been cited as possible solutions for investigating team interactions. At its heart lies the interaction between human agents within and comprising a complex system of interactions.

Agent-based models have been thought of as dividing into two camps: as a method for studying the dynamics of social systems (the 'microworld approach'), or as a type of boundary object [1]. The use of agent-based models within operational research has been limited, with debate existing as to the use of agent-based models rather than actually building agent-based models. While the microworld and boundary object perspectives are not necessarily mutually exclusive, this paper takes the former approach: modelling the actors within the social system. We leave for further research the use of agent-based models themselves as boundary objects [2]. In doing so, we start the process of using agent-based models within the operational research community.

2 Motivation

A recent stream of research has studied the interactions between individuals within workshop settings [3], groups [4], and dialogue [5]. We combine this with agent-based approaches of firm interaction [6] and the dissemination of culture [7] to create a model of inter-personal interaction within workshop settings.

We wish to investigate how interactions between participants and facilitator(s) determine the dissemination of knowledge between participants and how this affects the final outcome of a group-level decision (for example voting on an outcome or determining how to proceed from a menu of choices).

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We expect that the behaviour of a facilitator will have an effect on these outcomes, and wish to investigate when and how facilitator engagement has a positive or negative effect on outcomes. For example, we may wish to investigate situations where too much facilitation has a negative effect on the group decision making process.

3 Agent-Based Model

We model the interaction between N participants and $M \in \{0,1\}$ facilitators.

Each participant starts the simulation with a preference or propensity for an idea that varies along a scale. In our example, we can think of this preference for black or white: each participant has a shade of gray (somewhere between black and white on this preference scale). We can think of this as their a priori preference for an outcome, for example their preference for option 'A' or option 'B', coded as black or white in the model. Each individual has a threshold where they change their expressed view. For simplicity's sake, we set this at $\theta = 0.5$ for each participant. While participants have an inherent view that expresses some doubt as to whether black or white is their preference, they express themselves as either black or white.

In the model, interaction between participants updates the preference of the participants within the dialogue. Various rules are considered for these updates including:

- Each participant in a dialogue updates their preference according to the average preference level of the other participants in the dialogue
- A majority rule is enacted where if a participant is in a minority, they update their preference towards the majority

Facilitators (when in the model) can also indirectly influence participants:

- By restricting or encouraging discourse (movement of participants in the model) and thereby restricting individual participants from entering into the dialogue where preferences are updated;
- By dividing participants into groups

In our agent-based model, we represent each participant as occupying a position in a space. Participants interact depending on the rules set down by the facilitator.

Other parameters that can be explored are:

- Participants' 'vocalization' where they express their opinion to the group: this is in effect their circle of influence. For some individuals this may be only when neighbors to others; for some participants, they may be able to cast their opinion wider than their direct locale
- Participants' 'persuasiveness' where they are able to change the opinion of others by a larger or smaller amount
- The number of participants;

- The multidimensionality of propensities where participants rather than having a unidimensional value (black to white) have multidimensional preferences, either as a scale or as Boolean values

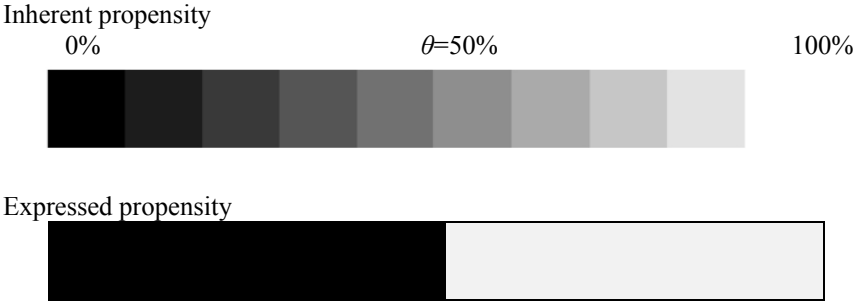

Fig. 1. Expressed and inherent propensities.

The Agent-Based Model shown below represents *N* participants within the workshop, each with their inherent propensity displayed by means of their colour.

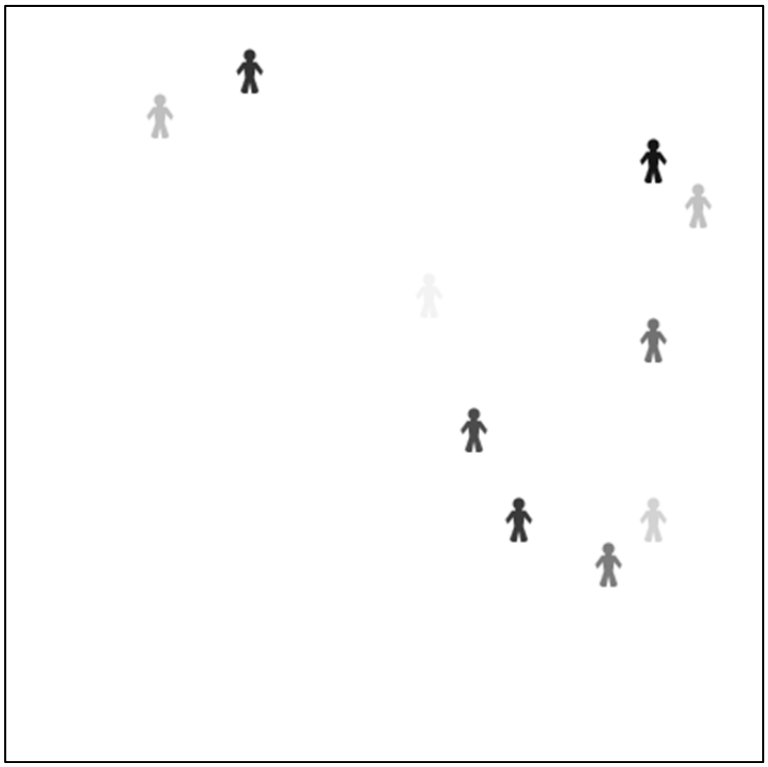

Fig. 2. Running agent-based model showing agents' propensities.

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