

A. SIAABMSim Simulation Environment

A.1. Overview

The Software-intensive Acquisition Agent Based Model Simulation (SIAABMSim) developed for this research is a **Repast 3.1**¹ Java application developed in the **eclipse**² software development environment (SDE). SIAABMSim implements the model presented in Chapter 5.

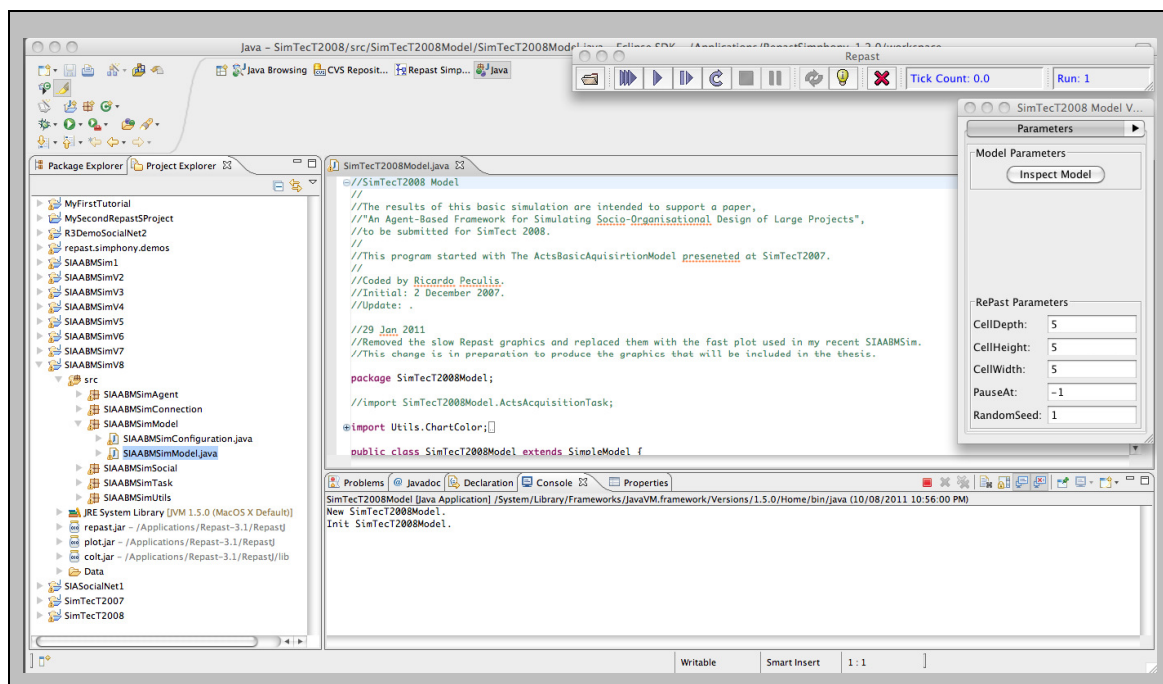


Figure A-1 – SIAABMSim SDE

SIAABMSim accepts configuration files that specify scenarios defining the task and the social system and parameters that influence many aspects of the simulation. Agents can be *actors* and *artefacts*. Actors are cognitive agents that represent people and artefacts are non-cognitive agents that are the products created and modified by actors. Configuration files

¹ Recursive Porous Agent Simulation Toolkit (Repast) is a Java based toolkit for agent-based modelling and simulation available from http://repast.sourceforge.net/repast_3.

² **eclipse** is a software development environment available from <http://www.eclipse.org/>.

specify artefacts, dependencies between artefacts, actors and how they interact with other actors and with artefacts.

A.2. Displays

The screenshot below shows the three main views of the simulation. The larger window is the *Environment Window* and the two graphic windows are the *Behaviour Window* and the *Performance Window*.

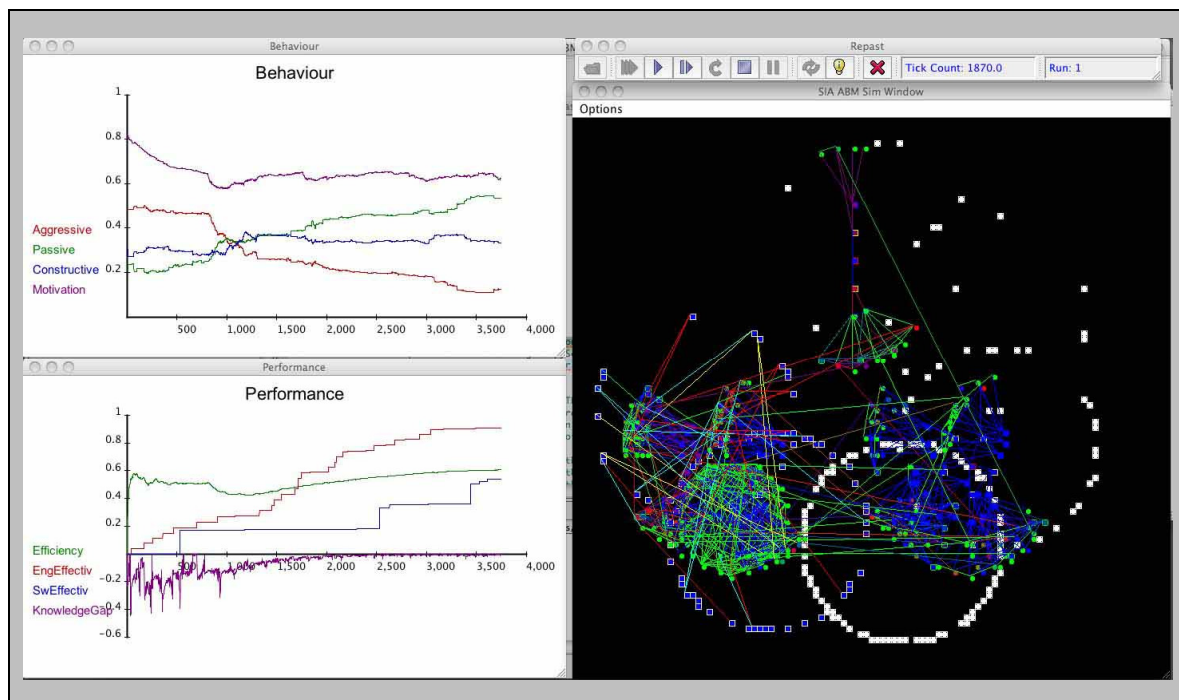


Figure A-2 – SIAABMSim Main Screen

Environment Window

The Environment Window shows actors, artefacts, tasks, interactions and dependencies. The display has five views that can be selected to display Artefacts, Dependencies, Actors, Interactions and Tasks. The display below has the Dependencies view switched off.

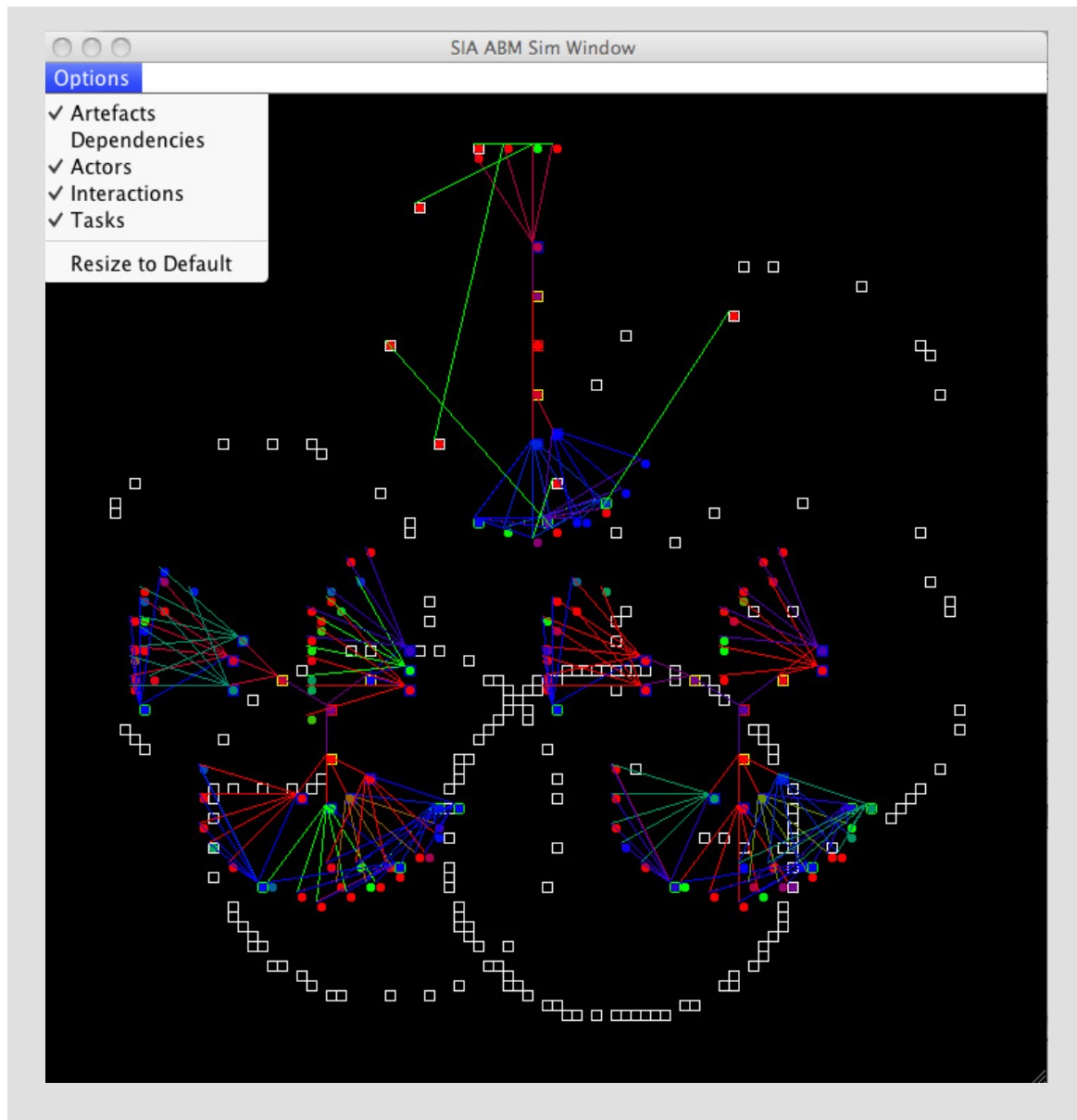


Figure A-3 – Environment Window

Products and Artefacts

Artefacts are represented by white squares colour filled. The fill colour indicates the effectiveness of the artefact as the task progresses, as shown below. If effectiveness is zero (black), the artefact has been planned but the development has not started.

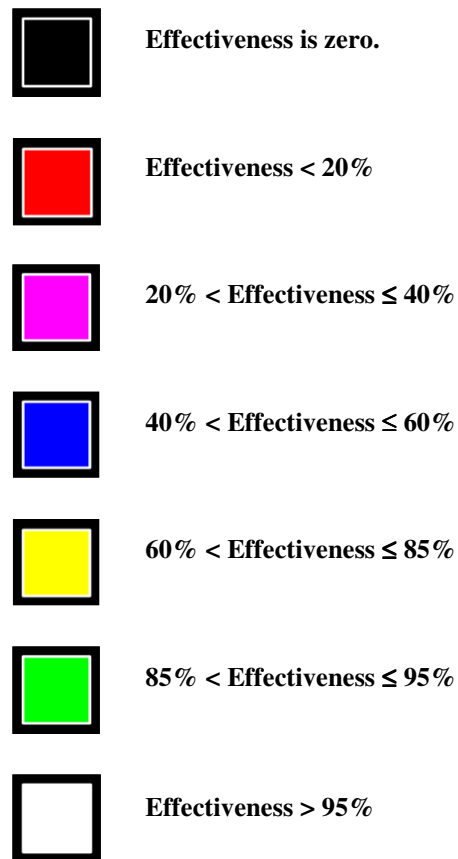


Figure A-4 – Artefact Effectiveness Colour Code

Artefacts that belong to the same product are grouped in circles. Parallel development can occur in accordance with the development life cycle model but for convenience a nominal output order is assumed and placed in a circle in a clockwise manner. Starting from the top the products are: Statement of Need; Capability Development; System Specification; System Architecture; Software Specification and Design; and the Software Product, should satisfy the Need, as shown in the screenshot below. The overlap of circles has no practical meaning.

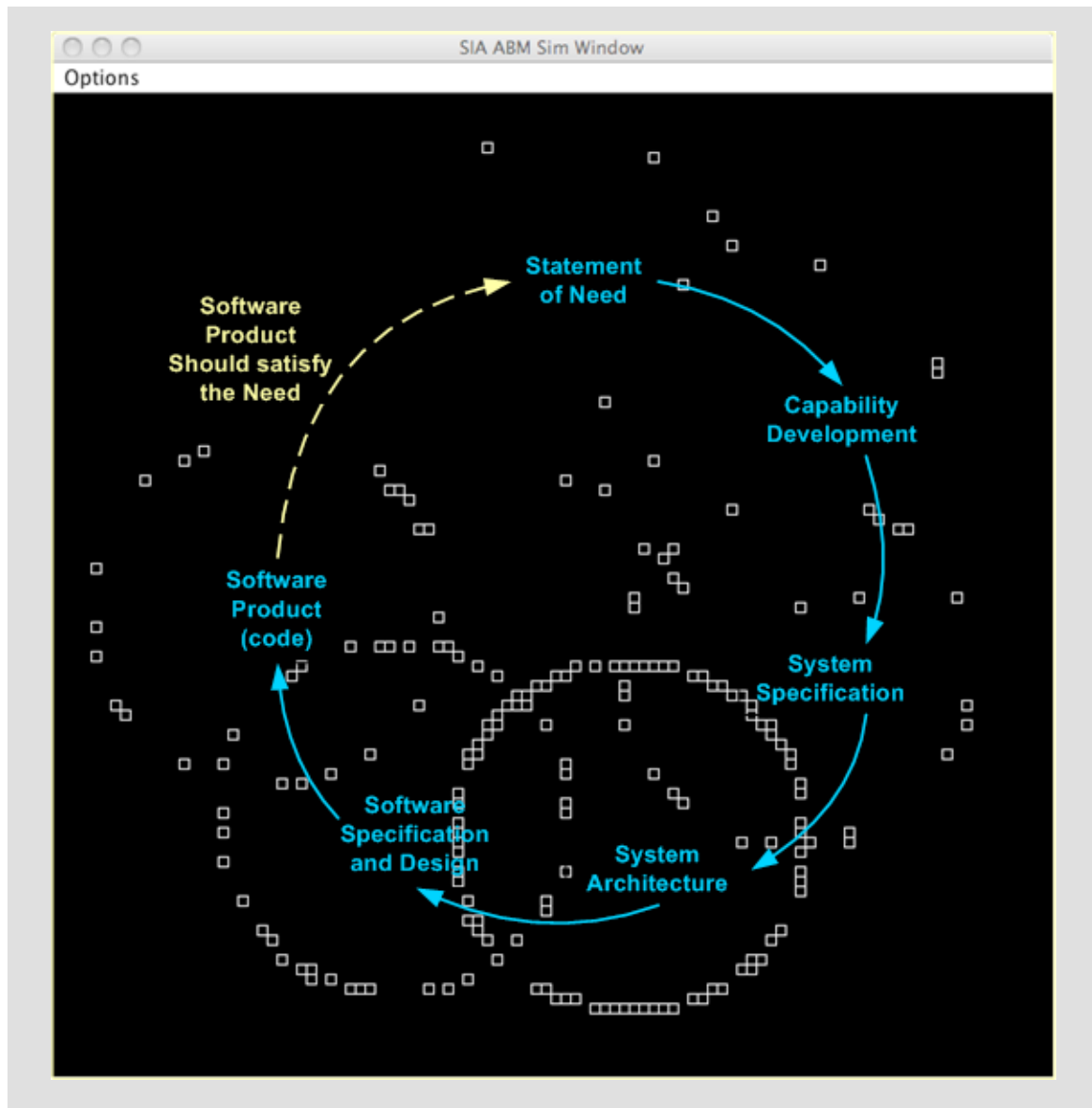


Figure A-5 – Environment Window – Artefacts View

Dependencies are shown as white lines connecting artefacts. Dependencies correspond to connections between artefacts through coefficients of Transformation Matrices, i.e. the output artefact depends on a transformation of an input artefact. As dependencies do not change dynamically the Dependencies layer is usually switched off.

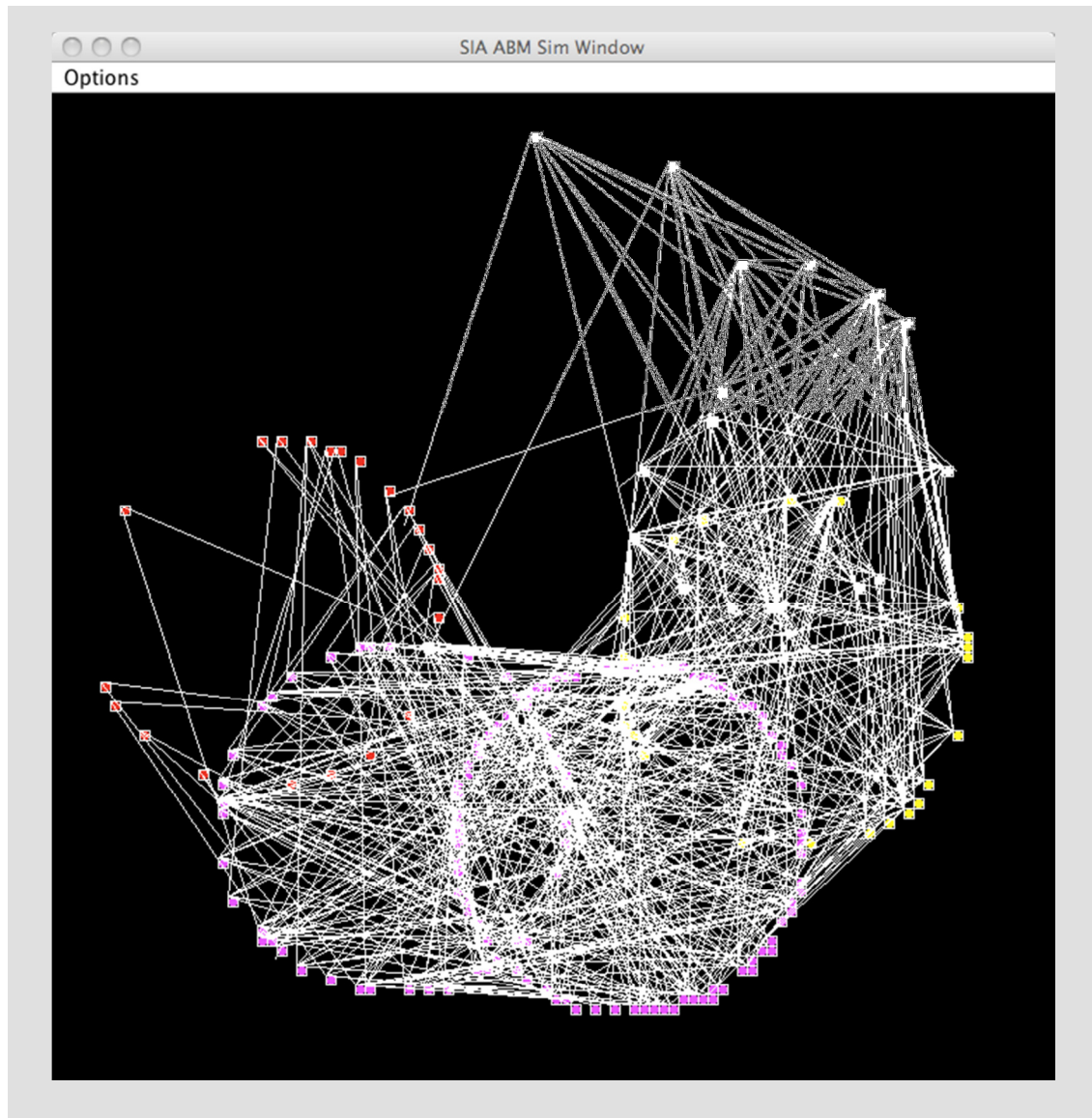


Figure A-6 – Environment Window – Artefacts and Dependencies Views

Actors, Interactions, Teams and Organisations

Actors are shown as a symbol that reflects the actor's role and the actor's behavioural style. Team Members (TM) are represented by a coloured circle and the fill colour indicates the actor's behavioural style. Aggressive style is red; constructive is blue; and passive is green. As behaviour changes the colour hue assumes values between red, blue and green. The symbol for each of the actor's roles is shown below.

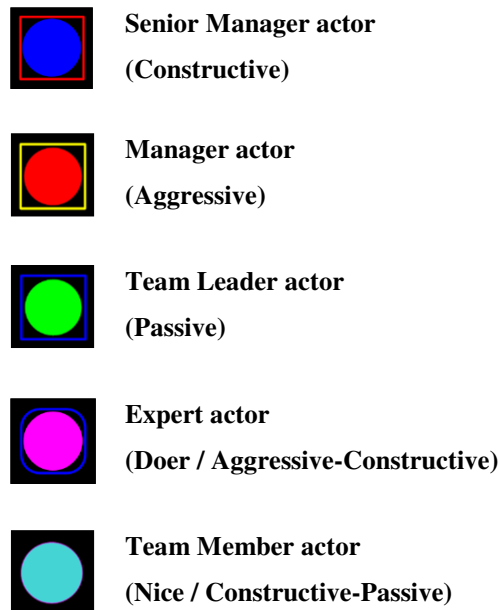


Figure A-7 – Actor Role Symbols

Interaction is represented by a coloured line connecting the two actors. The behaviour of the actor that originates the interaction determines the colour of the line. Formal interactions create the structure of teams, departments and organisations. Informal interactions may connect actors from different teams and organisations.

Organisations have one Senior Manager and one or many Managers. Departments have one Manager and one or many Team Leaders. Teams have one Team Leader and one or many Team Members. A configuration file defines the structure of the organisation. The screenshot that follows shows three organisations. The organisation at the top of the window has the Senior Manager, two Managers, three Team Leaders, three Experts and twelve Team Members. The way that the actors and interactions are placed on the display represents the

structure of the organisation. Organisations are placed close to the artefacts that are their responsibility.

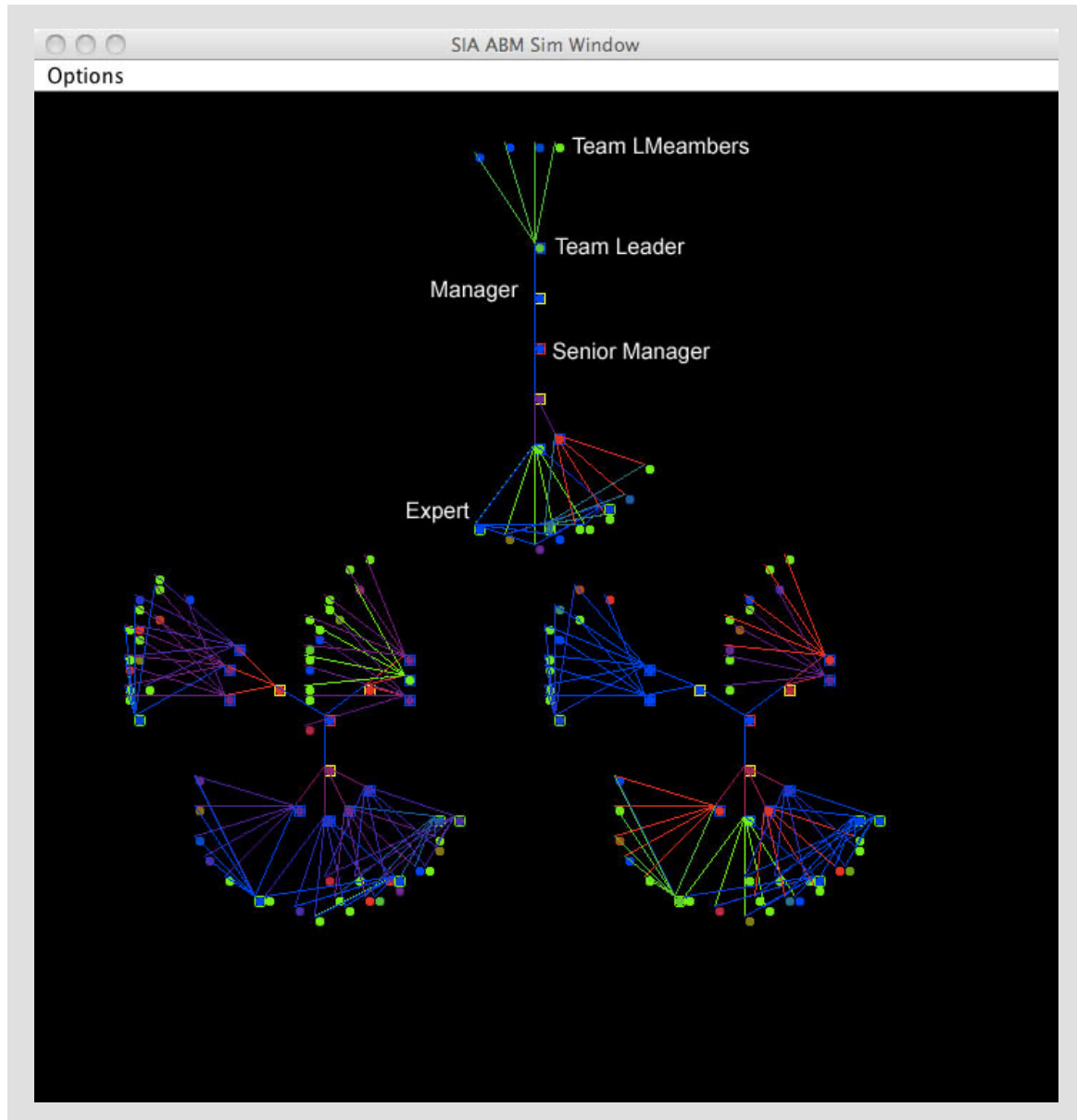


Figure A-8 – Environment Window – Actors and Interactions Views

The colour of actors and interactions changes as the simulation progresses reflecting the dynamic behaviour of the organisations.

Behaviour Window

The Behaviour Window shows the collective dynamic behaviour of the actors over time. The graphic shows the average of motivation and the three components (aggressive, constructive and passive) of behavioural style of the actors.

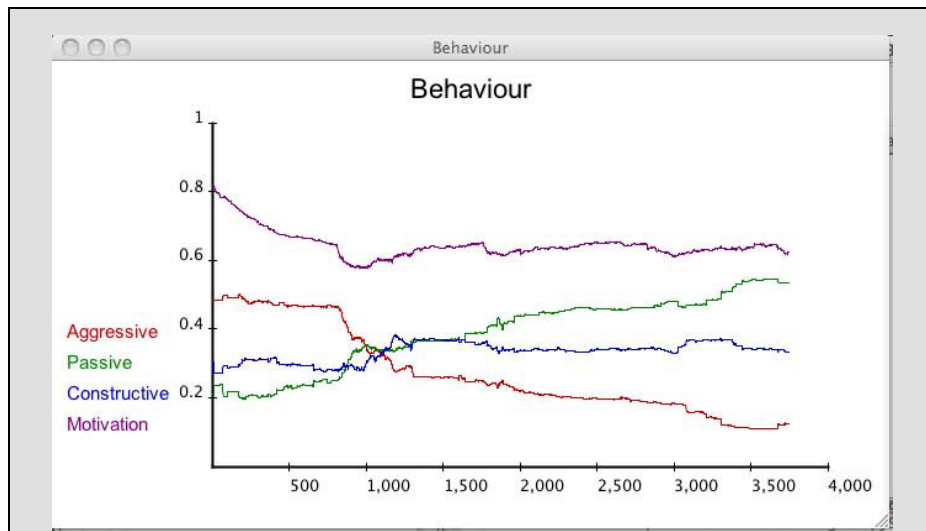


Figure A-9 – Behaviour Window

Performance Window

The Performance Window shows the progress of the task and the knowledge gap between what the tasks require and what is available in the population of actors.

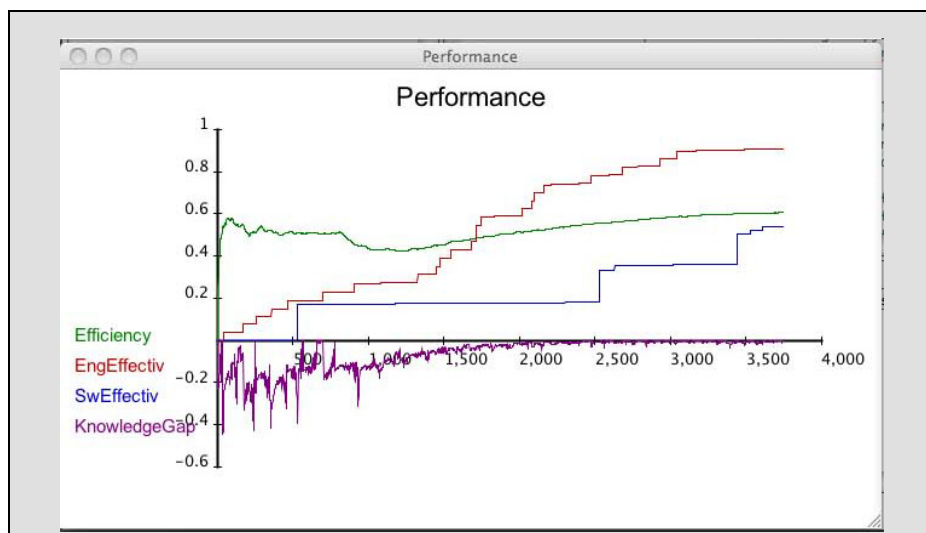


Figure A-10 – Performance Window

The attributes displayed in the Performance Window are normalised. Ideal effectiveness is represented by the numeric value 1.0, meaning that all the artefacts achieved what was intended and needed. Software Effectiveness (SwEffectiv) shown in blue is the effectiveness of the final product delivered to the customer. If the effectiveness of the software product does not achieve the ideal value, i.e. it is less than 1.0, the solution will not satisfy the need. Engineering Effectiveness (EngEffectiv), shown in red, is the effectiveness of all engineering artefacts that are needed to develop the software. If Engineering Effectiveness does not achieve the ideal value the software product will not achieve maximum effectiveness.

The Knowledge Gap showing negative in magenta indicates that the knowledge available in the population of actors is not sufficient to execute the task. When the actors collaborate and learn, the knowledge gap decreases as shown on the graphic. The high frequency noise-like variation in the knowledge gap is caused because every task has its own knowledge requirement and every actor has their own knowledge capacity. The high variation of knowledge required and knowledge available cause a high variation in the knowledge gap.

Efficiency is the ratio of effort spent on productive tasks and the total effort spent. Efficiency is lower when the actors are spending time collaborating and learning or reviews are in progress.

A.3. Simulation Parameters

Three files shown on the screenshot below control the simulation: Organisations File defines actors, teams and organisations; Probabilities File determines the probability of an actor's actions; and SimSettings File contains parameters that influence the whole simulation, including the development life cycle model, rates and limits.

The Actors File can be used to define actors in the population individually. The actors created from a distribution defined in the Organisations File can be exported, modified and imported by the simulation. 'KeepPopulation' and 'MultiRunID' are used when the simulation is executed automatically multiple times and in that case the results are recorded in a Simulation Results File identified by the 'MultiRunID'. While in Multi-Run the simulation can use the same population of actors for all runs or generate a new population for each run.

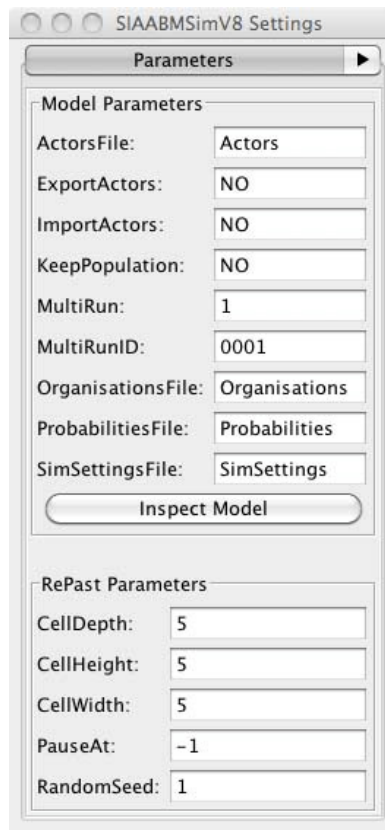


Figure A-11 – Simulation Parameters

population of actors for all runs or generate a new population for each run.

RePast Parameters are provided as the default. CellDepth, CellHeight and CellWidth are not used by SIAABMSim. PauseAt can be used to pause the simulation at a specified time count and a negative value is used when pause is not needed. RandomSeed is used for the pseudo-random number generator in RePast.

Organisations File

The Organisations File defines the population of actors and how the actors are organised in teams, departments and organisations. Below is a sample of the Organisations File defining three organisations.

ORG	ORG1	0.2	Nil	Application					
CEO	1	0.5	0.4	1.0	0.0	1.0	0.0	1.0	0.0
Manager	4	0.5	0.4	1.0	0.0	1.0	0.0	1.0	0.0
Expert	8	0.33	0.0	1.0	0.0	1.0	0.0	1.0	0.0
TeamLeader	8	0.5	0.4	0.9	0.05	0.8	0.05	0.8	0.05
TeamMember	36	0.5	0.4	0.8	0.05	0.7	0.05	0.8	0.05
ORG	ORG2	0.2	Capabilities	SysEng	SysArchitect				
CEO	1	0.5	0.4	1.0	0.0	1.0	0.0	1.0	0.0
Manager	18	0.5	0.4	1.0	0.0	1.0	0.0	1.0	0.0
Expert	48	0.33	0.0	1.0	0.0	1.0	0.0	1.0	0.0
TeamLeader	48	0.5	0.4	0.9	0.05	0.8	0.05	0.8	0.05
TeamMember	240	0.5	0.4	0.8	0.05	0.7	0.05	0.8	0.05
ORG	ORG3	0.2	SoftEng	SoftDev					
CEO	1	0.5	0.4	1.0	0.0	1.0	0.0	1.0	0.0
Manager	24	0.5	0.4	1.0	0.0	1.0	0.0	1.0	0.0
Expert	66	0.33	0.0	1.0	0.0	1.0	0.0	1.0	0.0
TeamLeader	66	0.5	0.4	0.9	0.05	0.8	0.05	1.0	0.05
TeamMember	324	0.5	0.4	0.8	0.05	0.7	0.05	0.8	0.05

Figure A-12 – Organisations File

The file can specify one or many organisations. Each organisation starts with a label ORG followed by the name of the organisation (ORG1). The numeric value that follows is the probability of interactions between actors of different teams and departments. If the number is zero there will be no interactions outside the team. If the value is 1.0 the actors will interact with all the actors in the organisation, while a value of 0.20 shows a 20% chance of interactions outside the team to occur.

The words that follow the probability of interactions indicate the type of work that the organisation will do. The accepted words are Nil, Application, Capabilities, SysEng, SysArchitect, SwEng and SwDev. Nil represents the need and is the first input to the acquisition. The other words represent the ‘Statement of Need’ (Application), ‘Capability Development’ (Capabilities), ‘System Specification’ (SysEng), ‘System Architecture’ (SysArchitect), ‘Software Specification and Design’ (SwEng) and the ‘Software Product’ (SwDev). If there is only one organisation all the six products should be allocated to the organisation. When there are six organisations one single product should be allocated to each organisation.

The five lines following the organisation's attributes specify the population of actors in accordance with the format shown below.

ROLE	N	B	BSTD	K	KSTD	E	ESTD	M	MSTD
CEO	1	0.1	0.2	0.9	0.1	0.9	0.1	0.9	0.1
Manager	2	0.1	0.2	0.9	0.1	0.9	0.1	0.9	0.1
Expert	3	0.33	0.1	0.9	0.1	0.9	0.1	0.9	0.1
TeamLeader	3	0.33	0.5	0.8	0.2	0.7	0.2	0.9	0.1
TeamMember	12	0.33	0.5	0.7	0.3	0.6	0.3	0.8	0.2

Attribute	Description
ROLE	Role to which the population applies.
N	Number of actors in the population
B	Average <i>behavioural style</i> of the actors in the population: 0.0 = Aggressive; 0.33 = Constructive; 0.66 = Passive
BSTD	Standard Deviation of the <i>behavioural style</i> of the actors in the population.
K	Average <i>knowledge</i> of the actors in the population. 0.0 = no knowledge; 1.0 = perfect knowledge
KSTD	Standard Deviation of the <i>knowledge</i> of the actors in the population.
E	Average <i>experience</i> of the actors in the population. 0.0 = no experience; 1.0 = ideal experience
ESTD	Standard Deviation of the <i>experience</i> of the actors in the population.
M	Average <i>motivation</i> of the actors in the population. 0.0 = not motivated; 1.0 = totally motivated
MSTD	Standard Deviation of the <i>motivation</i> of the actors in the population.

Figure A-13 – Organisations File Format

Probabilities File

The Probabilities File defines the probability of events to occur in accordance with the actor's behavioural style. Events are actions performed by the actor or changes in its behaviour. The data is organised in a table where rows are the events and the columns the behavioural style.

Below is a sample of the Probabilities File used to test the first and second hypotheses.

Header	Aggressive	Doer	Constructive	Nice	Passive	Neutral
Start	0.05	0.10	0.20	0.10	0.05	0.01
Respond	0.50	0.80	0.90	0.80	0.70	0.50
AskHelp	0.05	0.20	0.50	0.30	0.10	0.05
OfferHelp	0.02	0.05	0.80	0.10	0.05	0.01
AcceptHelp	0.30	0.40	0.80	0.50	0.20	0.10
Help	0.05	0.10	0.50	0.30	0.10	0.05
Praise	0.01	0.05	0.30	0.20	0.05	0.0
Reprimand	0.50	0.30	0.05	0.01	0.0	0.0
Learning	0.10	0.20	0.30	0.10	0.05	0.01
Forgetting	0.05	0.10	0.15	0.20	0.25	0.30
Motivated	0.10	0.15	0.20	0.15	0.10	0.15
Demotivated	0.20	0.25	0.40	0.25	0.10	0.15
Working	0.90	0.98	0.95	0.90	0.80	0.85
Overtime	0.70	0.50	0.30	0.10	0.05	0.10
Aggressive	0.50	0.40	0.30	0.20	0.1	0.0
Constructive	0.10	0.20	0.80	0.30	0.10	0.0
Passive	0.03	0.05	0.10	0.15	0.25	0.20
BAggressive	0.0	0.0	0.0	0.0	0.0	0.0
BConstructive	0.0	0.0	0.0	0.0	0.0	0.0
BPassive	0.0	0.0	0.0	0.0	0.0	0.0
MngAggressive	0.0	0.0	0.0	0.0	0.0	0.0
MngConstructive	0.0	0.0	0.0	0.0	0.0	0.0
MngPassive	0.0	0.0	0.0	0.0	0.0	0.0
TLAggressive	0.50	0.40	0.30	0.20	0.1	0.0
TLConstructive	0.20	0.20	0.5	0.30	0.10	0.0
TLPassive	0.03	0.05	0.10	0.15	0.25	0.20
QualityMotiv	0.2	0.3	0.7	0.6	0.55	0.5
CostSchedMotiv	0.8	0.7	0.3	0.4	0.35	0.5
ExplicitReward	0.7	0.6	0.3	0.4	0.55	0.5
ImplicitReward	0.3	0.4	0.7	0.6	0.35	0.5

Figure A-14 – Probabilities File

Table A-1 describes the events in the Probabilities File.

Table A-1 – Events in the Probabilities File

Event	Description
Start	Starts interaction with other actor
Respond	Responds interaction started by other actor
AskHelp	Asks help
OfferHelp	Offers help
AcceptHelp	Accepts help
Help	Helps actor when asked
Praise	Praises actor when conditions arise
Reprimand	Reprimands an actor when conditions arise
Learning	Spends productive time learning
Forgetting	Decreases knowledge and experience
Motivated	Increases motivation
Demotivated	Decreases motivation
Working	Works on productive task
Overtime	Works overtime on productive task, learning or helping other actors
Aggressive	Increases aggressive behaviour when conditions arise
Constructive	Increases constructive behaviour when conditions arise
Passive	Increases passive behaviour when conditions arise
MngAggressive	Manager actor increases aggressive behaviour when conditions arise
MngConstructive	Manager actor increases constructive behaviour when conditions arise
MngPassive	Manager actor increases passive behaviour when conditions arise
TLAggressive	Team Leader actor increases aggressive behaviour when conditions arise
TLConstructive	Team Leader actor increases constructive behaviour when conditions arise
TLPassive	Team Leader actor increases passive behaviour when conditions arise
BonusReward	Likes bonus as a form of reward
RecognitionReward	Likes recognition as a form of reward

SimSettings File

The simulation settings described in Table A-2 are used to set conditions and tune the simulation.

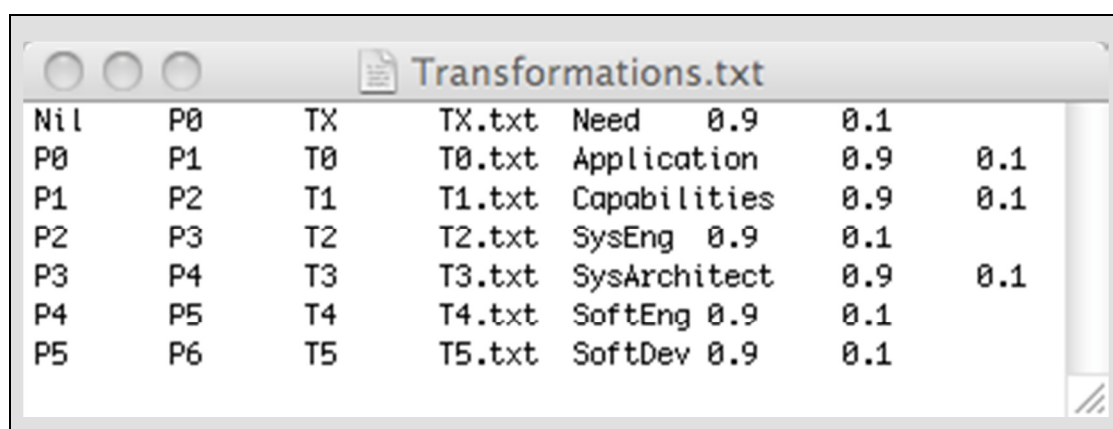
Table A-2 – SimSettings File Description

Parameter	Value	Description
GraphicDisplay	Y	Turns the displays on or off.
Development	E	Development life cycle: S = Sequential; E = Evolutionary The development life cycle comprises of a sequence of development phases each performed in one or many increments. Sequential Development mimics the waterfall life cycle where the end of a development increment enables the next increment of this and the next phase. Evolutionary Development forces a complete development cycle to be complete to enable the start of another increment. This option mimics the evolutionary life cycle where a partial but complete product has to be delivered to enable the next evolutionary cycle can start.
IterativeFactor	0.3	Proportion of what is learned by doing the task that is feedback to previous transformations. It can be seen as ‘feedback learning factor’
nTaskIncrements	4	Number of development increments
TargetEffectiveness	1.0	Target effectiveness
TargetEffort	-1	Target effort: -1 = no limit
TargetDuration	-1	Target duration: -1 = no limit
ExplicitReward	0.0	Percentage of explicit reward
ImplicitReward	0.0	Percentage of implicit reward
PraiseThreshold	1.1	Threshold for managers praise their subordinates
ReprimandThreshold	1.35	Threshold for managers reprimand their subordinates
DelayPraise	1000	Number of units of time before managers start praising
DelayReprimand	1000	Number of units of time before managers start reprimanding
MinKEM	0.4	Minimum value for Knowledge, Experience and Motivation
EffortFactor	1.0	Multiplier factor for task allocated effort
ReworkEffortFactor	1.0	Multiplier factor for rework allocated effort
ReviewFactor	1.0	Proportion of required Review effort that is assigned to the task
ReworkFactor	1.0	Proportion of required Work effort that is assigned to the task
TaskProgressRate	1.0	Coefficient used to calibrate the progress of tasks
LearningRate	0.3	Coefficient used to calibrate the process of learning
ForgettingRate	0.02	Coefficient used to calibrate the process of forgetting
ExperienceRate	0.3	Coefficient used to calibrate the process of acquiring experience
BehaviourRate	0.01	Coefficient used to calibrate the process of changing behaviour
ConstructiveRate	0.05	Coefficient used to calibrate the process of becoming constructive
PassiveRate	0.15	Coefficient used to calibrate the process of becoming passive
AggressiveRate	0.10	Coefficient used to calibrate the process of becoming aggressive
MotivationRate	0.05	Coefficient used to calibrate the process of motivation
RemoteInteractions	0.1	Probability of an interaction outside the team to occur
InteractionFactor	0.8	Probability of and interaction to occur
LearningFactor	0.4	Coefficient used to calibrate the process of learning by individual effort
CollaborationFactor	0.8	Coefficient used to calibrate the process of learning by collaboration

IterativeLearningFactor	1.0	Coefficient used to calibrate the process of learning by evolutionary development
FlipBehaviour	0.0	Probability for an actor randomly change behaviour
CopySenior Behaviour	0.0	Probability of Senior Managers and Managers to follow the behaviour of their customers or bosses

Transformations File

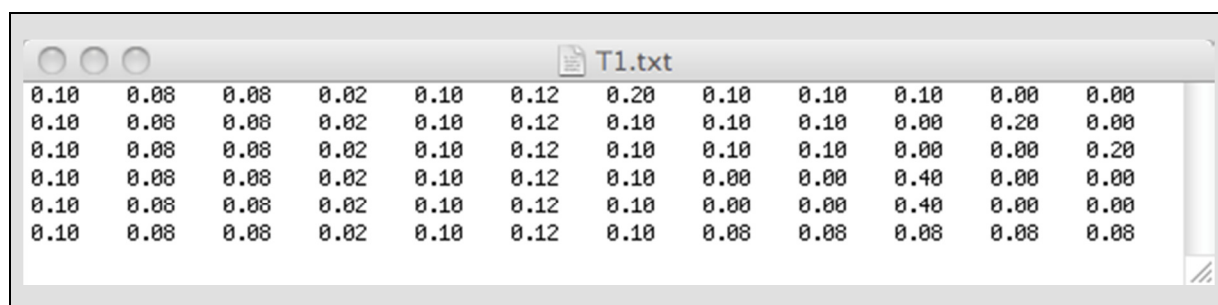
The Transformations File, shown below, specifies the name of the tasks and the transformation matrices files. The two numbers on each row are respectively the mean value of knowledge required to perform the task and the standard deviation.



Nil	P0	TX	TX.txt	Need	0.9	0.1
P0	P1	T0	T0.txt	Application	0.9	0.1
P1	P2	T1	T1.txt	Capabilities	0.9	0.1
P2	P3	T2	T2.txt	SysEng	0.9	0.1
P3	P4	T3	T3.txt	SysArchitect	0.9	0.1
P4	P5	T4	T4.txt	SoftEng	0.9	0.1
P5	P6	T5	T5.txt	SoftDev	0.9	0.1

Figure A-15 – Transformations File

Below is the transformation matrix T1. The other transformation matrices are too big and would be unreadable to be shown in pictorial form (see Section **Error! Reference source not found.** for details).



0.10	0.08	0.08	0.02	0.10	0.12	0.20	0.10	0.10	0.10	0.00	0.00
0.10	0.08	0.08	0.02	0.10	0.12	0.10	0.10	0.10	0.00	0.20	0.00
0.10	0.08	0.08	0.02	0.10	0.12	0.10	0.10	0.10	0.00	0.00	0.20
0.10	0.08	0.08	0.02	0.10	0.12	0.10	0.00	0.00	0.40	0.00	0.00
0.10	0.08	0.08	0.02	0.10	0.12	0.10	0.00	0.00	0.40	0.00	0.00
0.10	0.08	0.08	0.02	0.10	0.12	0.10	0.08	0.08	0.08	0.08	0.08

Figure A-16 – Transformation File

A.4. Simulation Features

SIAABMSim includes a number of features provided by Repast, among them Multi-Run and Dynamic Class Inspection and Attribute Change.

Multi-Run

Repast provides a mechanism to run multiple simulations in batch known as Multi-Run. Each individual run will take a different random seed. When SIAABMSim is executed in multi-run the output displays are disabled and the results of the simulation are recorded in a text file for subsequent analysis. The parameters recorded include the final duration, effort, effectiveness and efficiency of the acquisition. The MultiRunID in the Simulation Parameters Window is appended to the file name to identify the Simulation Results.

Dynamic Attribute Change

Repast provides a mechanism to inspect classes and modify public attributes when the simulation is in progress, whether 'running' or 'paused'. SIAABMSim uses this feature to allow change to an actor's attributes during the simulations by clicking on the actor in the Environment window. The screenshot below shows a Manager actor being changed to become 'aggressive' during the course of the simulation. Attributes of the organisations and departments can also be changed.

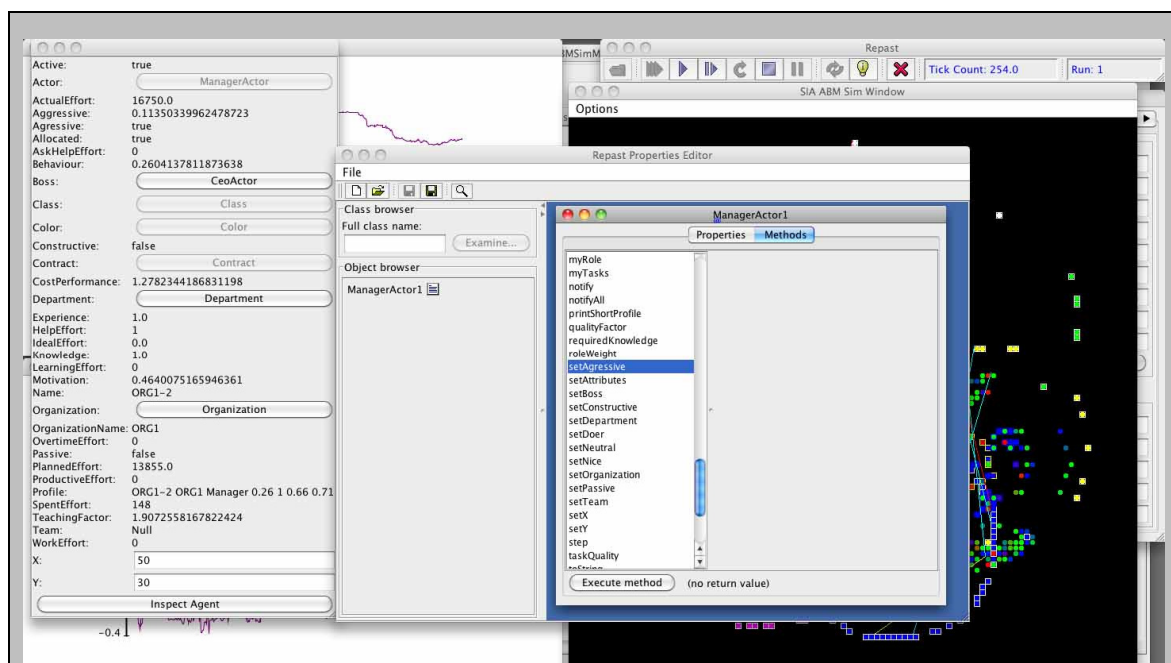


Figure A-17 – Changing Attributes of an Actor during the Simulation

A.5. Configuration Files for Testing Scenarios

SimSettings File

SimSettings-Ideal	SimSettings-Real
GraphicDisplay Y	GraphicDisplay Y
Development S	Development S
IterativeFactor 0.0	IterativeFactor 0.5
nTaskIncrements 5	nTaskIncrements 5
TargetEffectiveness 1.0	TargetEffectiveness 1.0
TargetEffort -1.0	TargetEffort -1.0
TargetDuration -1.0	TargetDuration -1.0
ExplicitReward 0.0	ExplicitReward 0.1
ImplicitReward 0.0	ImplicitReward 0.1
PraiseThreshold 1.0	PraiseThreshold 0.9
ReprimandThreshold 1.0	ReprimandThreshold 1.1
DelayPraise -1	DelayPraise 100
DelayReprimand -1	DelayReprimand 100
MinKEM 0.4	MinKEM 0.4
EffortFactor 1.0	EffortFactor 1.0
ReworkEffortFactor 1.0	ReworkEffortFactor 1.0
ReviewFactor 1.0	ReviewFactor 1.0
ReworkFactor 1.0	ReworkFactor 1.0
TaskProgressRate 1.0	TaskProgressRate 1.0
LearningRate 0.0	LearningRate 0.02
ForgettingRate 0.0	ForgettingRate 0.005
ExperienceRate 0.0	ExperienceRate 0.3
BehaviourRate 0.0	BehaviourRate 0.01
ConstructiveRate 0.0	ConstructiveRate 0.05
PassiveRate 0.0	PassiveRate 0.15
AggressiveRate 0.0	AggressiveRate 0.10
MotivationRate 0.0	MotivationRate 0.05
RemoteInteractions 0.0	RemoteInteractions 0.001
InteractionFactor 0.0	InteractionFactor 0.8
LearningFactor 0.0	LearningFactor 0.5
CollaborationFactor 0.0	CollaborationFactor 0.8
IterativeLearningFactor 0.0	IterativeLearningFactor 1.0
FlipBehaviour 0.0	FlipBehaviour 0.001
CopySeniorBehaviour 0.0	CopySeniorBehaviour 0.05

Figure A-18 – SimSettings-Ideal and SimSettings-Real

Probabilities File

Probabilities-Ideal						
Header	Aggressive	Doer	Constructive	Nice	Passive	Neutral
Start	0.0	0.0	0.0	0.0	0.0	0.0
Respond	0.0	0.0	0.0	0.0	0.0	0.0
AskHelp	0.0	0.0	0.0	0.0	0.0	0.0
OfferHelp	0.0	0.0	0.0	0.0	0.0	0.0
AcceptHelp	0.0	0.0	0.0	0.0	0.0	0.0
Help	0.0	0.0	0.0	0.0	0.0	0.0
Praise	0.0	0.0	0.0	0.0	0.0	0.0
Reprimand	0.0	0.0	0.0	0.0	0.0	0.0
Learning	0.0	0.0	0.0	0.0	0.0	0.0
Forgetting	0.0	0.0	0.0	0.0	0.0	0.0
Motivated	0.0	0.0	0.0	0.0	0.0	0.0
Demotivated	0.0	0.0	0.0	0.0	0.0	0.0
Working	1.0	1.0	1.0	1.0	1.0	1.0
Overtime	0.0	0.0	0.0	0.0	0.0	0.0
Aggressive	0.0	0.0	0.0	0.0	0.0	0.0
Constructive	0.0	0.0	0.0	0.0	0.0	0.0
Passive	0.0	0.0	0.0	0.0	0.0	0.0
BAggressive	0.0	0.0	0.0	0.0	0.0	0.0
BConstructive	0.0	0.0	0.0	0.0	0.0	0.0
BPassive	0.0	0.0	0.0	0.0	0.0	0.0
MngAggressive	0.0	0.0	0.0	0.0	0.0	0.0
MngConstructive	0.0	0.0	0.0	0.0	0.0	0.0
MngPassive	0.0	0.0	0.0	0.0	0.0	0.0
TlAggressive	0.0	0.0	0.0	0.0	0.0	0.0
TlConstructive	0.0	0.0	0.0	0.0	0.0	0.0
TlPassive	0.0	0.0	0.0	0.0	0.0	0.0
QualityMotiv	0.0	0.0	0.0	0.0	0.0	0.0
CostSchedMotiv	0.0	0.0	0.0	0.0	0.0	0.0
ExplicitReward	0.0	0.0	0.0	0.0	0.0	0.0
ImplicitReward	0.0	0.0	0.0	0.0	0.0	0.0
Probabilities-Real						
Header	Aggressive	Doer	Constructive	Nice	Passive	Neutral
Start	0.05	0.10	0.20	0.10	0.05	0.01
Respond	0.50	0.80	0.90	0.80	0.70	0.50
AskHelp	0.05	0.20	0.50	0.30	0.10	0.05
OfferHelp	0.02	0.05	0.80	0.10	0.05	0.01
AcceptHelp	0.30	0.40	0.80	0.50	0.20	0.10
Help	0.05	0.10	0.50	0.30	0.10	0.05
Praise	0.01	0.05	0.30	0.20	0.05	0.0
Reprimand	0.50	0.30	0.05	0.01	0.0	0.0
Learning	0.10	0.20	0.30	0.10	0.05	0.01
Forgetting	0.05	0.10	0.15	0.20	0.25	0.30
Motivated	0.10	0.15	0.20	0.15	0.10	0.15
Demotivated	0.20	0.25	0.40	0.25	0.10	0.15
Working	0.90	0.98	0.95	0.90	0.80	0.85
Overtime	0.70	0.50	0.30	0.10	0.05	0.10
Aggressive	0.50	0.40	0.30	0.20	0.1	0.0
Constructive	0.10	0.20	0.80	0.30	0.10	0.0
Passive	0.03	0.05	0.10	0.15	0.25	0.20
BAggressive	0.50	0.40	0.30	0.20	0.1	0.0
BConstructive	0.20	0.20	0.5	0.30	0.10	0.0
BPassive	0.0	0.0	0.0	0.0	0.0	0.0
MngAggressive	0.50	0.40	0.30	0.20	0.1	0.0
MngConstructive	0.20	0.20	0.5	0.30	0.10	0.0
MngPassive	0.0	0.0	0.0	0.0	0.0	0.0
TlAggressive	0.50	0.40	0.30	0.20	0.1	0.0
TlConstructive	0.20	0.20	0.5	0.30	0.10	0.0
TlPassive	0.03	0.05	0.10	0.15	0.25	0.20
QualityMotiv	0.2	0.3	0.7	0.6	0.55	0.5
CostSchedMotiv	0.8	0.7	0.3	0.4	0.35	0.5
ExplicitReward	0.7	0.6	0.3	0.4	0.55	0.5
ImplicitReward	0.3	0.4	0.7	0.6	0.35	0.5

Figure A-19 – Probabilities-Ideal and Probabilities-Real

Organisations Ideal

Organisations-1Org-Ideal-300										
ORG	ORG1	0.1	Application	Capabilities		SysEng	SysArchitect	SoftEng	SoftDev	
CEO		1	0.33	0.0	1.0	0.0	1.0	0.0	1.0	0.0
Manager		20	0.33	0.0	1.0	0.0	1.0	0.0	1.0	0.0
Expert		0	0.33	0.0	1.0	0.0	1.0	0.0	1.0	0.0
TeamLeader		60	0.33	0.0	1.0	0.0	1.0	0.0	1.0	0.0
TeamMember		300	0.33	0.0	1.0	0.0	1.0	0.0	1.0	0.0

Organisations-3Orgs-Ideal-600										
ORG	ORG1	0.2	Nil	Application		SysEng	SysArchitect	SoftEng	SoftDev	
CEO		1	0.33	0.0	1.0	0.0	1.0	0.0	1.0	0.0
Manager		4	0.33	0.0	1.0	0.0	1.0	0.0	1.0	0.0
Expert		0	0.33	0.0	1.0	0.0	1.0	0.0	1.0	0.0
TeamLeader		8	0.33	0.0	1.0	0.0	1.0	0.0	1.0	0.0
TeamMember		36	0.33	0.0	1.0	0.0	1.0	0.0	1.0	0.0
ORG	ORG2	0.2	Capabilities	SysEng		SysArchitect	SoftEng	SoftDev		
CEO		1	0.33	0.0	1.0	0.0	1.0	0.0	1.0	0.0
Manager		18	0.33	0.0	1.0	0.0	1.0	0.0	1.0	0.0
Expert		0	0.33	0.0	1.0	0.0	1.0	0.0	1.0	0.0
TeamLeader		48	0.33	0.0	1.0	0.0	1.0	0.0	1.0	0.0
TeamMember		240	0.33	0.0	1.0	0.0	1.0	0.0	1.0	0.0
ORG	ORG3	0.2	SoftEng	SoftDev		SysEng	SysArchitect	SoftEng	SoftDev	
CEO		1	0.33	0.0	1.0	0.0	1.0	0.0	1.0	0.0
Manager		24	0.33	0.0	1.0	0.0	1.0	0.0	1.0	0.0
Expert		0	0.33	0.0	1.0	0.0	1.0	0.0	1.0	0.0
TeamLeader		66	0.33	0.0	1.0	0.0	1.0	0.0	1.0	0.0
TeamMember		324	0.33	0.0	1.0	0.0	1.0	0.0	1.0	0.0

Figure A-20 – Organisations-Ideal