

Agent-Based Simulation Use in Applicant's Character Recognition

IEVA LAUBERTE, EGILS GINTERS
Sociotechnical Systems Engineering Institute
Vidzeme University Collage
Cesu street 4, Valmiera, LV-4200
LATVIA

LEONID NOVITSKY
Division of Applied Systems Software
Riga Technical University
Kalkju street 1, Riga, LV-1650
LATVIA

Abstract: - One of the tasks of the education technologies is intensification of a training process that can be achieved using different and advanced ICTE tools. Nowadays, the transition from the traditional learning in classrooms to on-line training and consulting is happen. However, often does not respect that people have different perception of information. Those differences are not only visual or auditory, but also related with the colour of learning objects and the speed of presentation. To recognize the type of the temperament of an applicant the testing is used. Most typical is the form of an interview. The authors of the article offer agent-based simulation model TemPerMod for designing the psychological map of an applicant and recognition of the temperament and perception.

Key-Words: - Agent-based simulation, Temperament, Perception, Psychological map.

1 Introduction

To economize the time and financial resources the training process must be effective enough, especially if the skills and knowledge must be frequently refreshable. It is particularly important in engineering. To improve the training different modern ICTE achievements are used int. al. virtual and augmented reality.

The Sociotechnical Systems Engineering institute works on the new e-learning technology. The technology respects the training of an applicant in conformity with individuality of his perception [1]. The training model (see Fig. 1) provides splitting the training cycle in the set of operations in conformity with the scenarios elaborated earlier. Otherwise, each of the scenarios respects the type of personality and individuality of perception of an applicant [2].

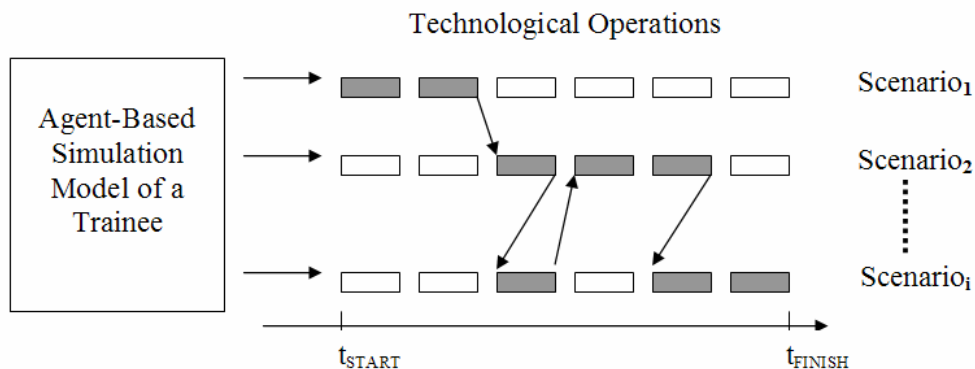


Fig.1. The protocol of the training process

The training process begins with the scenario well suited for the particular applicant, but the result achieved is regularly checked. If the result does not satisfactory then training will be continued by other scenario from the hierarchy that would be suitable enough.

There are exist different ways how to recognize the type of personality, temperament and mode of perception.

More and more social psychologists use agent-based simulation. It is an alternative approach to theory building. Agent-based simulation can better capture the complex, dynamic, and interactive processes that are important in the real world [3]. An agent-based simulation technology is not new, and it is used in social sciences for a quite long time [4]. Lately researchers go in for simulation of personality. Agents are modelled with emotions and character. There are different tests to identify a character, but nevertheless it would be great to have a visual depiction, because people are not keen on tests as well as individual emotional state may affect test outcome. And agent-based simulation can ensure this.

2 Temperament and personality as training influencing factors

Every person is unique – with own idiosyncrasy and reactions to various situations. Such differences are usually being explained as people have different types of personality and temperament. We can consider that person's behaviour and mental activity is reflection of its temperament.

The most popular classification of temperament is also the oldest one, which was introduced by Greek physician Galen's and Hippocrates [5]. The four basic temperament groups $\langle T \rangle$ are: sanguine, phlegmatic, choleric and melancholic. Those temperaments were later discussed by Kant [5].

Pavlov correlated the types of higher nervous system with psychological types of temperament. A result of this relationship appears as follows [6, 7]:

- Strong, balanced, mobile type – sanguine;
- Strong, balanced, inert type – phlegmatic;
- Strong, unbalanced, with the predominance of excitation – choleric;
- Weak type – melancholic.

Every person has a bit of every temperament type, but only one character is dominant than other, therefore it is possible to categorize in those big four groups $\langle T \rangle$, where:

$$\langle T \rangle = \{t_i\} \text{ and } i=1, \dots, 4 \quad (1)$$

Sanguine persons $\{t_1\}$ are very active and communicative. They strive for communication with others and also they know how to make good relationships. Sanguine person get adjusted to the new situation very fast and they know how to prepossess somebody, that is, they know how to earn persons trust [8]. In addition to their speaking skills they are also really good listeners. They are light hearted, fun loving, spontaneous and confident, and they like to entertain but they can be arrogant, cocky and indulgent [9]. They are optimists, but they have indirection and pronounced leader capabilities.

Sanguine person has a good sight memory, they remember other people, names and surnames very well. Unlike from phlegmatic and melancholic people, sanguine ones are easy to get interested, captivated with some idea or proposal. The only difference is that interest of sanguine person is not so consistent because of their versatility and switchover possibilities [8]. People of this type are very responsive and encouraging.

Phlegmatic person $\{t_2\}$ is calm, balanced and emotions have no essential importance in his life [8]. They are relaxed, rational, curious, observant and reliable. They do not put so high importance to relations with other people and their appreciations. They do everything more latent than others but that doesn't mean that they do it not as good as others. They have another characteristic as precision, punctuality, orderliness, care and thoroughness just because of their slowness [8].

Choleric person $\{t_3\}$ has lot of ambition, energy, and passion [9]. Choleric people are more impulsive as others. They do everything depending on their emotions and feelings. Choleric people have frequent mood changes. These people are very communicative and unlike from phlegmatic ones they like to stay social as well as to draw attention [8]. Choleric people are very egocentric in some way. They have all characteristics to act as a leader.

Melancholic persons $\{t_4\}$ are more sensitive than other. It's easy to soften their hearts and easy to invoke pitiful. Melancholic persons have rootless feeling from inside, instability, which expresses like indecision [8]. They are pessimists and often sad. They adjust to new situations relatively badly and

they are also afraid from getting attention. When different kind of people meets each other in parties – unknown people and a little bit known, usually we can find melancholic ones at the corner, aside from other people [8]. They are often perfectionists, being very particular about what they want and how they want it in some cases [9].

Sometimes melancholic and phlegmatic people are similar. It is hard to start something up for both of them. Conservatism is known for both of them. However phlegmatic people are more independent and self sufficient in their behaviour.

Other classification was done by Keirse [10, 11]. New types of temperament were introduced: artisan, rational, idealist and guardian:

- The Artisan temperament comprises the following role variants: Composer, Crafter, Performer, and Promoter. Artisans are observant and pragmatic, and their greatest strength is tactical variation. Their most developed intelligence role is either as an Operator (Promoters and Crafters) or an Entertainer (Performers and Composers). Artisans take pride in their ability to be graceful, are confident in their ability to adapt, and respect their ability to be daring. In education, they want to learn arts, crafts, and techniques that they can use in a career;
- The Guardian temperament comprises the following role variants: Inspector, Protector, Supervisor, and Provider. Guardians tend to be practical and frugal. Their most developed intelligence role is either that of the Conservator (Protectors and Providers) or the Administrator (Inspector and Supervisor). Guardians value experience, and they seek a tangible return on their investments. Believing in common sense, they are not attracted to idle speculation;
- The Idealist temperament comprises the following role variants: Healer, Counselor, Champion, and Teacher. The greatest strength of idealists is diplomatic integration. Their best developed intelligence role is either mentoring (Counselors and Teachers) or advocating (Healers and Champions). Idealists tend to study the humanities and to seek careers involving personnel work. Their lives are

guided by their devotion to their personal ethics. Idealists take pride in empathetic action. They respect themselves when they are benevolent, and they feel confident when they express their personal authenticity. As the identity-seeking temperament, they long for meaningful communication and relationships;

- The Rational temperament comprises the following role variants: Architect, Mastermind, Inventor, and Fieldmarshal. Rationals trust reason implicitly. They seek a logical argument as a basis for action. Their most developed intelligence role is either that of the Engineer (Architects and Inventors) or the Coordinator (Masterminds and Fieldmarshals). As the "knowledge-seeking" personality, rationals are strategic in orientation. They are characterized by a tough-minded personal style, reflecting their tendency to strive for power or understanding.

There are also four temperament colours $\langle C \rangle$ according to four temperaments [12] were proposed:

$$\langle C \rangle = \{c_j\} \text{ and } j=1, \dots, 4 \quad (2)$$

- Sanguine – Yellow $\{c_1\}$ (the colour of adventure and artistry);
- Phlegmatic – Blue $\{c_2\}$ (the colour of cold clear: thought, logic and perception);
- Choleric – Magenta $\{c_3\}$ (the colour of intuition and transcendent);
- Melancholic – Red $\{c_4\}$ (the colour of authority and stability).

Perhaps one more colour $\{c_5\}$ is added for Dellinger [13] (see below) and it is Grew, $j_{max}=5$.

In late 90-ties Dr. Susan Dellinger [13] introduced the term psychogeometrics and explained not only how to determine your own personality type, but how to use geometric psychology to identify the beliefs, values, and attitudes of any person you meet. She considers that each shape having specific form (circle, triangle, square, squiggle, rectangle) represents a personality, and believed that five personalities are within us, but that we have one dominant personality and one secondary personality that we use the most.

According to Dr. Susan Dellinger, 83% of the time the shapes $\langle F \rangle$ you have just chosen will accurately represent your primary and secondary personalities [13]:

$$\langle F \rangle = \{f_k\} \text{ and } k=1, \dots, 5 \quad (3)$$

- Circle $\{f_1\}$ represents harmony, unity and balance. Nururers, caregivers, stabilizers, own needs last. Paperwork strewn on desk, photos/plants on desk. Focused on well being of others and maintaining harmony. Can be too accommodating. Need to feel needed and are people pleasers. Don't like or cope well with conflict. Will back down from arguments. Take problems home. Good team players and communicators, can read non-verbal. Best listeners, empathetic and sensitive to others' needs. Caring, fun, happiest when those around them are enjoying themselves. Colleagues are "friends." Their memos may include a little smiley face or words of encouragement. Love the Team;
- Box $\{f_2\}$ represents the structure. Most organized of all the shapes. Person is tidy, logical, practical, focused and detailed. Has organized mind. Person also is loyal, dependable, perseverance and patience. Hardworking, committed and work late. It can be a loner in the workplace. Small circle of friends is typical. Prefer own workplace, not "natural" team players. Love rules, schedules, data, procedures, flow charts and spreadsheets. Need predictable environment, no "surprises." A person is resistant to change. Slow decision makers;
- Triangle $\{f_3\}$ represents ambition and high achievement. Triangle also shares some box traits: organized and focused. They are goal setters, high achievers and competitive fast thinkers, decision makers. Quick to get to the point. They have fast paced life. Can't stand wishy-washy people. They are politically correct. Know how to work the system. Want to be in control;
- Rectangle $\{f_4\}$ represents change and inner growth. State of change or transition. Temporary. Not certain about the future. Can produce a feeling of confusion and

insecurity. Person is caring, empathetic and supportive. Typical are growing, introspecting and questioning. When under stress: lack of focus, indecision, inner conflict, mood swings, forgetfulness, or inconsistency. Need support and approval;

- Squiggle $\{f_5\}$ represents high energy, animation, sense of humor and creative intelligence. Powerful like the Triangle. Creative, flamboyant, playful, spontaneous, dramatic, witty, innovative idea people, bored quickly by routine, march to a different drummer. Need constant stimulation. Idea producers, intense and volatile when excited, not good team players. However, motivate others to action. Unique, challenge status quo, rebel. Flustered, harassed and in a hurry, rarely finish a task. Messiest and least organized. Poor listeners and self-centred. Frequently break the rules, can't understand why they have to be at work on time. Direct, honest in their communication style. Don't like deadlines/follow-up.

Otherwise the activity $\langle Act \rangle$ of the person is closely related with their type of the personality, therefore we also have the scale of activities related with temperament of person:

$$\langle Act \rangle = \{act_n\} \text{ and } n=1, \dots, 5 \quad (4)$$

Activities are distributed from static to very active and chaotic.

The most important factor in training is perception $\langle P \rangle$ of the applicant. In conformity with the ideas of Bandler and Grinder (70-ties) related with Neuro-Linguistic Programming [14] at least three types exist:

$$\langle P \rangle = \{p_m\} \text{ and } m=1, \dots, 3 \quad (5)$$

- Visual $\{p_1\}$ person perceive information in image form. The diagrams, graphs, tables and pictures are well suited for the person. Very important is direct eyes contact with him during the training;
- Auditory $\{p_2\}$ person perceive information by ear. Hi does not fret for the essence of

your message rather than intonation. Most popular words for him are “listen”, “sounds good” and other;

- Kinaesthetic {p₃} is a person with predominant sense. The communication with kinaesthetic will be successful if you will be enjoyable for him only. Frequently they use the words – “nice”, “sad”, “convenient”, “cold”, “new” and other.

3 Agent-based simulation model TemPerMod for applicants testing

To determine which type of temperament person has, some tests would be taken, but they are not universal and give different results depending on person’s mood.

The term „agent-based simulation” refers to a particular type of simulation, which has two essential components – agents and environment [15, 4]:

- An agent’s behaviour is the result of rules based on local interactions;
- The environment has certain autonomy, i.e. it has a certain level of independence from what the agents do, but it can also be influenced by the agents’ behaviour.

The benefit of agent-based simulation is possibilities of estimation the all factors simultaneously reducing the chance of the applicant to manipulate with the answers. More and more social scientists focus on agent-based simulation [16, 6].

For TemPerMod designing and the testing process preparation the following background is used:

- Galen’s and Hippocrates (personality types) [5];
- Kersey’s taxonomy (temperament types) [10,11];
- Susan Dellinger (psychogeometric) [13];
- Bandler and Grinder (Neuro-Linguistic Programming) [14].

As mentioned above, people can be classified by type of personality or temperament $\langle T \rangle$. Each group has appropriate behaviour or activity $\langle Act \rangle$, corresponds to predefined colour $\langle C \rangle$ and form of

the favourite objects $\langle F \rangle$. We can suppose that activity, colour and form combine the set of attributes $\langle A \rangle$. One more factor very important for successful training is perception $\langle P \rangle$. Therefore the goal of the agent-based simulation model TemPerMod is recognizing the type of the personality $\langle T \rangle$ and the kind of perception $\langle P \rangle$:

$$\langle T, P \rangle \leftarrow A(C, F, Act) \quad (6)$$

The modelling desktop has the form of pentagon (see Fig.2).

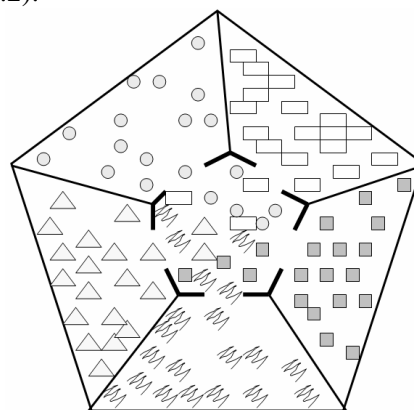


Fig.2. TemPerMod model desktop

Desktop is white. Borders of the desktop and frame dividers are drawn by thin black lines. The pentagon is divided in five frames. Each part initially has equal amount of the agents the same form and the same colour. Inside of the desktop is smaller pentagon. Each frame has the door to the inner pentagon. Agents in their frames move with different speed of motion. During the simulation cycle agents can get in the inner pentagon. Step by step the inner pentagon fills with different agents. When inner pentagon is completed then first cycle is finished. The agent colour, form or activities are not critical for filling the inner pentagon that is random process. During the simulation cycle also some audio information is announced. Some information can be depicted on the desktop also in written form. Modelling cycle continues 8-10 seconds. After 2 seconds the next cycle begins. The length of the modelling is $j \times k \times x \times n$ or 125 cycles. At the end of simulation succeeds the interview with the applicant about his impressions from the simulation game int. al. what kind of colour, form or activity of the agents are most likeable.

Agent-based model TemPerMod allows recognizing not only type of personality and

temperament, but also additional information about individual perception.

Complete testing process consists of three parts:

- Audio-visual modelling game based on agent-based model TemPerMod in NetLogo [15] environment;
- Interview with an applicant about his impressions about the game;
- Filling the psychology map using traditional concept about types of personality and temperament. It is clarified what the person thinks about himself.

4 Conclusion

This article is about agent-based simulation use and the model design for main temperament type's and the form of the best perception recognition.

The model TemPerMod is created in the NetLogo environment. Further the model and technology will be improved and validated in the real world. It must be considered which other characteristics also need to be added. This kind of simulation will be very useful to identify temperament, because it takes less time than execute a test and is more information capacious.

References:

- [1] E. Ginters et al., VR-Solutions Use in Training of Glass Melting Oven Operators, In *10. IFF Wissenschaftstage: Virtual reality and Augmented Reality for Engineering, Testing and Operating Technical Systems*, Fraunhofer Institut Fabrikbetrieb und –automatisierung, ISBN 978-3-8167-7383-2, June 27-28, 2007
- [2] Ginters E., A. Cirulis and V. Akishin, “Virtual environment use in e-learning”, In *Proceedings of 6th WSEAS International Conference on E-Activities '07*, ISBN 978-960-6766-22-8, Puerto de la Cruz, Tenerife, Spain, 14-16 December, 2007, 12-17.
- [3] Smith R.E., R.F. Conrey, Agent-based modeling: a new approach for theory building in social psychology, *Personality and Social Psychology Review*, Vol.11, No.1, 2007, pp. 87-104
- [4] Ginters E., L. Novitsky, Some aspects in Social Systems Simulation, *Proceedings of the International Conference “Modelling and Simulation of Business Systems”*, Edited by H.Pranevicius, E.Zvaskas and B.Rapp, Vilnius, May 13-14, 2003, pp.177-179.
- [5] Chamorro-Premuzic T., *Personality and Individual Differences*, ISBN 978-1-4051-3008-0, BPS Blackwell, 2007.
- [6] Barteneva D., P.L. Reis, N. Lau, Bilayer agent-based model of social behaviour: how temperament influence on team performance, *Proceedings 21st European Conference on modelling and simulation*, 2007
- [7] Barteneva D., P.L. Reis, N. Lau, Implementation of emotional behaviours in multi-agent systems using fuzzy logic and temperamental decision mechanism, *Proc. EUMAS 06: Fourth European Workshop on Multi-Agent Systems*, Lisboa, Portugal 2006
- [8] Reņģe V., *Psiholoģija. Personības psiholoģija*, Rīga, “Zvaigzne ABC”, 2000, pp. 16-29
- [9] Wikipedia, Four temperaments. http://en.wikipedia.org/wiki/Four_Temperaments Accessed on 08.08.2008
- [10] Wikipedia, Keirsej temperament sorter. http://en.wikipedia.org/wiki/Keirsej_Temperament_Sorter Accessed on 16.08.2008
- [11] Keirsej D., Please Understand Me II: Temperament, Character, Intelligence, 1st Ed., ISBN 1885705026, Prometheus Nemesis Book Co., 1998.
- [12] Religa jon R., Temperament Colors System. http://www.jedigirl.com/www/personality_types/temperament/index.html Accessed on 16.08.2008
- [13] Dellinger S., *Communicating Beyond Our Differences: Introducing the Psycho-Geometrics System*, ISBN 978-1892762009, Jade Ink; 2nd edition, 1996
- [14] Bandler, R. and J. Grinder, *Frogs into Princes: Neuro Linguistic Programming*, Moab, ISBN 0911226192, UT: Real People Press., 1979
- [15] Lauberte I., Using cellular automata in agent-based simulation for regional development, *Annual Proceedings of Vidzeme University College: ICTE in Regional Development*, Chief Editors: Eberhard Blümel, Egils Ginters, Latvia, ISBN 9984-633-01-2, 2005, pp.99-104
- [16] Miranda M.J., A. Aldea, B.R. Alcantara, Agent-Based Simulation in the selection of work teams, *Computacion y Sistemas*, Vol.7, No.3, 2004, pp.210-223