An Agent Based Model for the Study on Undergraduate's Choice of Seat and Seat Distribution

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Abstract. Systems, there are many participants in high complexity, may result in unusual phenomenon in accordance with the restrictions. Among the recently proposed methods for access to such a system inside, it is an agent based model. Agent based model focused on the interaction between the agents is relevant to the study on undergraduate's choice of seat. This paper presents an agent based model for the study on undergraduate's choice of seat and seat distribution. The proposed model will be helpful to analyze both the factors influencing the seat selection and the distribution of the finished seat.

Keywords: Agent based model, Undergraduate's choice of seat, Seat distribution

1   Introduction

Since the modern human development system has a high complexity, it is not easy to identify and manage all phenomena inside the system. Hence, studies on the approach to manage the system effectively have continued over the industry and academia. Among them, the model using agent based approach analyzes the system based on the interaction and phenomena. This model is known as an agent based model[1].

An Agent based model must be validated through systematic building process for use. This paper contains the things that need to be defined and set up in order to build the agent based model through the topic about undergraduate's choice of seat[2].

This paper presents the agent based model to study how undergraduate's choice of seat and seat distribution affects the student and class. This model defines the properties of agents and makes rules on the action. It is expected to be helpful to analyze both the factors influencing the seat selection and the distribution of the finished seat.

2   Related Works

2.1   Agent-based modeling: Methods and techniques for simulating human systems.

An agent based model[1] is one of the methods for the simulation of the different systems that are designed to use a human. Through this model, fields of logistics, transport projects and urban planning have been conducted. This work focused the agent based approach how that applied and reduce the complexity when modeling large systems.

2.2   Exploring the Relation of Seating Positions to Test Scores of College TEFL Students in Korea

This work describes the relation of seating positions to test scores of students. They divided the class room into nine zones; seating positions of all students were recorded. Also, they tried to find a pattern for the relation of seating positions through grading the scores[2].

This paper suggests and design an agent based model to study how undergraduate's choice of seat. It is expected to be helpful to analyze both the factors influencing the seat selection and the distribution of the finished seat.

3   Design of Agent Based Model for Undergraduate's Choice of Seat and Seat Distribution

This model needs to be designed with an emphasis on the interaction between multiple objects; in accordance with various factors affecting seat distribution when undergraduate's choice of seat in classroom. The model should be configured to generate the interaction between agents similar to reality as possible. There are essential components which consist of agents, system space and external environment for validation[3].

Fig. 1 describes a step for designing the agent based model[4]. Most agent based models are performed simulations for validation. In this paper, we use NetLogo[5] to the implementation of the model simulation.
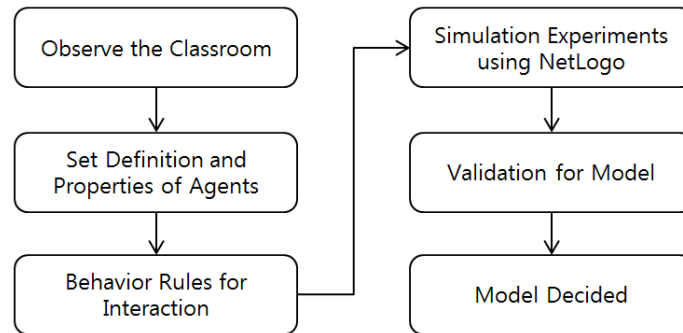
Fig. 1. Steps for designing the agent based model

3.1 Set Definition and Properties of Agents

Agents that may be present in the university classroom are students and professors, each agent may have individual properties, relation properties and results properties depending on the model [6]. A lot of unpredictable factors that may interfere with the experiment could exist, so we limit the range of predictable and quantifiable properties. Also, this paper does not contain results properties because we just focus on designing the model.

Table 1 lists various properties of agents. These properties would be reflected in the simulation process with NetLogo.

Table 1. Set definition and properties of agents

Agents	Properties	Contents of properties
Undergraduate (Students)	Individual properties (himself)	Will to study
		Interest in subjects
		Optical distance
	Individual properties (by others)	Cleanliness of seat
		Durability of seat
		Distance from windows
		Distance from mates
		Ease of going out
	Relation properties	Relationship with professors
		Relationship with mates
Professor	Individual properties (himself)	Will to teach
	Individual properties (by others)	Distance from students
	Relation properties	Relationship with students

3.2 System Space and External Environment

Agents may be present in a general university classroom; we name it a system space. There are too many types of university classrooms, so we define the shape of classroom with Fig. 2.
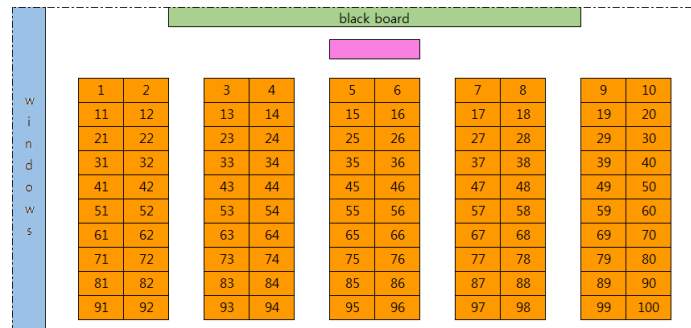
Fig. 2. Shape of classroom

On the other hand, the external environment means the outside of the classroom. Because outside of the classroom will vary depending on the university, so we select only the weather conditions as the properties of external environment.

3.3   Process and Behavior Rules of Actors

Behavior rules of agents and interaction will be conducted in accordance with the process, the process has to be divided into steps[6]. A process of model can be divided into three steps, the behavior rules and the interaction of them is as follows.

- Step 1 : Choice of seat
  Students choose a seat. Behavior rules of this step are as follows.
- Students choose a seat by their own properties. Previous experiences of choice are excluded.
- Students choose a seat which is empty; it can freely continue to replace the seat until the class begins.

- Step 2 : Intervention before class
  Professors can intervene in a seat distribution. Behavior rules of this step are as follows.
- Professors intervene in a seat distribution by their own properties.
- Some students are replaced by an indication of the professor.

- Step 3 : Change during class
  Students can change a seat. Behavior rules of this step are as follows.
- Students change a seat by their own properties.

3.4   Simulation using NetLogo for Validation

An agent based model needs a simulation for validation. The simulation should be performed in consideration of the properties, its purpose is only to be limited to the

validation. In this paper, we implement the simulation experiments for study on undergraduate's choice of seat and seat distribution using NetLogo.

NetLogo is free software for simulation experiments; it has variables, procedures and various statements. Table 2 lists variables and pseudo codes for our proposed agent based model in NetLogo.

Table 2. Variables and pseudo codes for model in NetLogo

Components	Variables	Pseudo codes
Agent (Students)	std	breed [stds std]
Agent (Professors)	pf	breed [pfs pf]
Individual properties (Students)	prop-std	to setup-prop-std procedure-prop end
Individual properties (Professors)	prop-pf	to setup-prop-pf procedure-prop end
Relation properties (Students)	corr-std	to setup-corr-std procedure-corr end
Relation properties (Professors)	corr-pf	to setup-corr-pf procedure-corr end
External environment (Weather conditions)	env-out	to setup-patches ask env-out [..] end
Behavior rules (Process)	rule-process	to go-rule-process ask rule-proc [..] end

4   Conclusion

Many modern systems are so unpredictable and complex, so people want to analyze these systems easily. An agent based model approaches the system with an emphasis on the phenomena and the interaction between agents, this could lower complexity. In this paper, we design the agent based model for the study on undergraduate's choice of seat and seat distribution. Both our proposed model and its configuration steps of definition and design we introduced will be expected to analyze other systems through an agent based model.

Future work is an implementation of experiments based on the agent based model of this paper. We will obtain the results for the study on undergraduate's choice of seat and seat distribution; also interpret the meaning based on the introduction of education.

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