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Study on Agentization of Equipment and Physical Phenomena in the Demonstration Experiment System

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With the development of sensors, networks, data analysis and other technologies, information devices are deployed everywhere in society, and various information is exchanged, collected and analyzed. By visualizing the analyzed data and providing it as a valuable service, these information equipments contribute to improvement of social productivity. In order to smoothly introduce the information system to society in this way, it is indispensable to predict the effect after introduction, and it is important to verify by an operation experiment on the premise of the actual use scene in advance.

There are two ways to verify the information system. One is a method of introducing it to some communities and conducting demonstration experiments. The other is a method to imitate and verify the real world in the virtual space. In the method of verifying in some local communities, it is the same real environment as actual operation, and the usefulness appears as the actual result, so it is possible to accurately measure the effect. However, although it is a part of the community, a substantial cost is required to actually introduce it and conduct a demonstration experiment. Also, in the case where it is desired to show the usefulness of the system at the time of a disaster, it is difficult to reproduce the same environment as in the disaster in the real world, and there is a problem of being dangerous.

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Therefore, the method using the real world is not suitable for the demonstration experiment of the system functioning in the event of a disaster. On the other hand, with the method of simulating and verifying society in the virtual space, it is suitable for such verification because it can be freely realized in virtual space even if it is a dangerous phenomenon to reproduce in a real world, and the cost can be suppressed. However, it is difficult to provide a flexible virtual space that can respond to multiple requests as in the real environment. Therefore, model elements constituting society, and organically connect each model in the virtual space. This will provide an environment equivalent to the real world. Such a mechanism is necessary. As a method for that, I think that multi agent simulation that can approach society is effective. However, most of the integrated platforms that support multiagent simulation are mainly used for exploring the cause of social phenomena. Therefore, it is not suitable as an environment for preliminary verification of the information system. There are also multi-agent simulations aimed at the development of information systems, experiments, training, etc, but there are many cases where only the experiments under specific conditions can be performed because the environment and functions that can be reproduced are limited. In view of these points, in order to make multiagent simulation that can perform flexible configuration closer to real world, it is necessary to coordinate the simulator and the emulator with the multi agent simulator appropriately so as to compensate for missing functions.

In this research, we propose agentization. It ties each simulation, emulation to an agent that is present in the multi agent simulation. And it is possible to control the entire simulation scenario with the agent as the center. To make it an agent, we categorized the agent model into two types, "individual model" and "space model", according to target characteristics. In the individual model, the existence which can be recognized as one individual in the scenario, such as a person, a cellular phone, and autonomously operating software, is classified. All the information possessed by this individual is aggregated and managed in the agent, thereby realizing cooperation centering on the agent. On the other hand, the space model can not be defined as a real situation like a fire or an earthquake, and existence or phenomenon affecting a wide range is classified. By inte-

grating physical state and physical quantities possessed by existence and phenomena that can not be treated as such individuals to the space model agent and managing it, realization of cooperation centering on the agent in the space model as well as the individual model. By using these two kinds of agent models, we realize integrated control of agents and other simulators and emulators.

In order to conduct experiments based on the proposed method, we implement two kinds of Jonathan, Inferno and demonstrate each model. Jonathan collaborated with pedestrian agent and call application and demonstrated agentization of individual model. Inferno collaborated with field agent and fire simulator to demonstrate agentization of space model. We also showed that the physical simulator indirectly affects the evacuee agent by collaboration between evacuee agent which is an individual model and field agent which is space model. Agentize all simulators and emulators as agents of individual model or space model. By doing so, it was found that cooperation based on agents is possible, and integrated simulation can be realized.

In the agentization which is the proposed method, since the functions and information provided by the simulator and the emulator can be aggregated into an agent and operated, it realizes integrated simulation. The proposed method of this research helps preliminary verification assuming use in society and contributes to the smooth introduction of information systems into society.