Research area in Strategic Objective *"Creation of fundamental technologies to analyze human and society for Society 5.0"*

Co-Creation of the transformation platform technology for human and society by integration of the humanities and sciences

Research supervisor: Satoshi Kurihara (Professor, Faculty of Science and Technology, Keio University)

Overview

Although social simulations are reflected in policies, such as the prediction of the number of COVID-19 infected cases, there are still many challenges in reflecting complex social situations like the economic impact associated with the inhibition of infection, to social simulation. This is because information such as behavioral characteristics, concerns, and preferences of individuals, communities, and societies contained in various data and interrelationships of data has not been fully utilized. Process innovation is likely to carry out more complex policy scenarios and strategic programs effectively and with high social receptivity if various multi-scale (individual, community, society) data people's activity data can be analyzed and included in social simulations.

This research area aims to co-create technologies by integrating humanities, social sciences, and natural sciences as a platform for society transformation, such as behavior modification: technology for analyzing people and society from data of various scales and types, and technology for deriving policy scenarios by simulation based on this analytical technology.

Specifically, it will be worked on the following research with the theme of social issues such as disaster prevention / mitigation / risk management, infectious disease control / remote after corona society, social / economic disparity, sound utilization of Web / social media, etc.

1) Multi-scale (individual, community, society) activity data and derivation of behavioral characteristics and preferences of people and society, identification of factors that bring about behavioral judgment, modeling, and quantification of them, etc. based on humanities knowledge
2) Derivation of scenarios that contribute to policy making and decisions by simulating modeled and quantified people and multi-agents that introduce the characteristics of society
3) Search for effects of derived policy scenarios and methods for improving social acceptance, and feedback on 1) and 2)

This research area is managed as part of the artificial intelligence, big data, IoT, and the cyber security integration project (AIP Project) developed by the Ministry of Education, Culture, Sports, Science and Technology.

Research Supervisor's Policy on Call for Application, Selection, and Management of the Research Area

1. Background

Although social simulations are reflected in policies, such as the prediction of the number of COVID-19 infected cases, there are still many challenges in reflecting complex social situations like the economic impact associated with the inhibition of infection, to social simulation. This is because information such as behavioral characteristics, concerns, and preferences of individuals, communities, and societies contained in various data and interrelationships of data has not been fully utilized. Process innovation is likely to carry out more complex policy scenarios and strategic programs effectively and with high social receptivity if various multi-scale (individual, community, society) data people's activity data can be analyzed and included in social simulations.

It is essential to realize a system that integrates cyberspace (virtual space) and physical space (real space) to make this innovation a reality. It is possible to provide services tailored to various individual needs by utilizing a data-driven approach: collecting data in the physical space, analyzing them in the cyber space, and feeding them back into the physical space. Solving social issues and creating new values depending on individual, community, and area sizes are expected.

2. Research and development objectives and examples of research projects

Based on the above background, this research area aims to integrate humanities, social sciences, and natural science to create an analysis platform that understands people and society from various data of people and society and simulates society; and to promote workable decision-making, consensus formation, and behavior modification linked to social transformation.

Assumed social issues include, for example, disaster prevention / mitigation / risk management, infectious disease countermeasures / remote after COVID-19 society, social / economic disparity, sound utilization of Web / social media, social advancement of women, declining birthrate and aging population, education, etc. Specifically, the research will undertake the following (1) to (3) but will not be limited to them. Thus, freer, and more challenging proposals are required.

(1) Collection, analysis, and modelling of data from individuals, communities, and society

Research will be conducted on the derivation of behavioral characteristics and preferences of people and society, their modeling and formulation, and the identification of factors that bring about behavioral judgment by utilizing data from various strata.

[Specific examples]

・Derivation of behavioral characteristics, preferences, behavioral factors, etc. of individuals and communities and derivation of social structure like community and attributes, etc., from data such as SNS, web, transferal, environment, etc.

・Modeling and quantification of knowledge of humanities and social science on behavioral characteristics, preferences, behavioral factors, etc. of people and communities, like cognitive bias and reference dependence

・ Behavior analysis by attribute, community, and area through field surveys, etc.

(2) The creation of multiscale social simulation technology for social transformation.

Research will be conducted to derive policy scenarios by comprehending the current situation, seeking the ideal future, and conducting simulations by adopting the modeled and formulated characteristics of people and society.

[Specific examples]

・Construction of multi-scale simulation technology (multi-layer, multi-modal, integration, etc.), data assimilation, inverse estimation technology, complex system/swarm intelligence technology, and integration with statistics/machine learning.

・Creation of real-time simulation technology using SNS and open data, and technology for visualizing bias in data used.

・Construction of a social model (social digital twin) that includes the legal system and diverse values.

(3) Establishing methods for social process innovation

Research will be conducted by regarding the derived policy scenarios as effective and possessing high social receptivity to establish a methodology for linking them to social transformation, including the promotion of behavior modification. Research guidelines will also be established for how the research (1) and (2) should be to enhance the effects of social modification.

[Specific examples]

・Construction of analysis technology and impact assessment method for policy scenarios derived by simulation.

・Establishing methods to apply policies to the real world based on social receptivity.

・Search for modeling methods to introduce methodology simulations that promote behavior

modification.

(Other keywords)

(1) Sensitivity engineering, information presentation psychology, cognitive bias, relationship modelling, reinforcement learning, ethnography, etc.

(2) Risk analysis, induction/deduction integrated AI, complex network science, world model, behavior selection model, etc.

(3) Scientific communication, timely and flexible macroeconomic analysis, social psychology, causal reasoning, noncooperative game theory, mechanism design, etc.

3. Assumed research progression

This research area aims to establish a new fundamental technology by strengthening the integration of humanities, social science, and natural science with social simulation technology as a glue. To this end, research themes were selected from the humanities, social sciences, and natural sciences fields without bias. Although "PRESTO" is an individual-type research program, utilization of data by selected researchers will be actively conducted by promoting intra-area collaboration and interaction with industries. Under this policy, researchers are expected to conduct more in-depth discussions on academic expansion, the path to problem solving, and how their research will develop and contribute to society by collaborating with other fields and maximizing the results.

4. Research period and research costs

The research period is three years and six months or less; budgets have an upper limit of a total of 40 million yen (not including indirect costs).

5. Points to note when applying

This research area expects the creation of prominent results that advance researchers to leaders of the next generation through research with a truly significant impact, even if it is difficult to achieve. Therefore, a budding and challenging proposal without fear of failure that may contribute to the goals of this research area and how their proposal can approach social issues was presented with the willingness of an applicant to be positively evaluated. This research area, assumes research in collaboration with other fields after the selection of a research project, from the viewpoint of the integration of humanities and sciences. Therefore, not only the application of their own specialized field, but also research applications that include collaboration with different fields is expected (however, collaborating partners are not covered by support). Please describe in detail the benefits your research obtains through collaboration with different fields, the benefits collaborating partner researchers receive.

This research area addresses research projects as a research area of “AIP network laboratory” that constitutes part of the artificial intelligence, big data, IoT, and the cyber security integration project (AIP Project) developed by the Ministry of Education, Culture, Sports, Science and Technology in collaboration with related research institutes including RIKEN Center for Advanced Intelligence Project, and will contribute to the integrated management of the AIP project.