

Title	環境問題に対する知識の統合化とシミュレーション手法の研究
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Studies on Knowledge Integration and Simulation for Environmental Problems

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Background and Purpose of Study

Until now, the environmental problems studies have been divided into small fields, and only a few works have done to cover plural fields. There are sufficient data and information in each field, but they haven't been put together in each field or in many fields and provided to us as knowledge very well. Therefore, it is difficult for both researchers and citizens to understand the whole environmental problem. It is necessary to integrate data and information as knowledge which are essential to understand environmental problems.

The purpose of this study is to grasp comprehensively the present conditions of environmental problems and to develop a methodology and methods to help decision making of improvements. This paper analyzes the present conditions of environmental problems and social situations in Ishikawa Prefecture, suggests and prepares a system to integrate knowledge on environmental problems by making a model which is proposed by the Environmental Agency of Japan. This paper works on following questions: what important environmental problems there are in Ishikawa Prefecture, how these problems are related with each other and economy and policy, what kinds of systems we need to promote integration of knowledge on environmental problems.

A system is called 'a complex system', in which an unexpected phenomenon by watching the movement of each element is emerged in totally. A social system is 'a complex system'. To analyze 'a complex system', there is a limit to use a systematic top-down approach. It is necessary to use a bottom-up approach, with which problems are abstracted and a model combined basic elementaries is constructed. The paper considers how to supplement a top-down approach by connection with the framework model.

Contents of the Paper

This paper consists of past and current environments in the prefecture, modeling, identification of parameters, findings obtained by identification of parameters, environmental knowledge management, future works and summary.

Firstly, an investigation has been carried out to understand environmental problems, economy and policy which are elements of social system in the prefecture. As a result of the investigation, there are no serious environmental problems, but water pollution in a closed area and waste problems including recycle must be prior to other problems.

Secondly, the relations between environmental problems and humans activities have been analyzed in the prefecture by using the framework model. The framework model is a macro and integrated model consisting of eight sub-processes related to environmental problems and human activities. The model is based on the past data and current information, so that it is mainly used for analysis of the present situation and a short-term forecast. This study treats the first four processes which are related to basic production, production factors, wastes and measures. The rest of processes concerned with environmental changes, environmental interactions, environmental impacts and adjustments are treated in the chapter of knowledge management.

Thirdly, parameters have been identified by input data. Sub-models have been developed by the process of basic production to wastes. Then, the present conditions have been analyzed and short-term forecasts have been carried out about the relations between products, product factors and wastes by using identified expressions and the model.

As to the process of environmental measures, since there is no available numerical data, some text data and human knowledge have been used to analyze the relations between productions, measures, and wastes. The text data used here is the set of time series data of implemented policies. The knowledge data has been obtained by the interview to local government officers. Based on the analysis on the relations between products, wastes and policy in the 1970's and 1990's when the amount of wastes reduced, this paper considers the effectiveness of policies on environmental problems and the quality of effective policies.

Finally, in the chapter of environmental knowledge management, the knowledge creation theory for organizations is extendedly used to design an environmental knowledge management system that integrates environmental knowledge. This system is to create new knowledge from data or information, integrate new and existing knowledge, and provide useful knowledge to policy makers, researchers, and citizens. If it is completed, a shortage of knowledge on environmental problems will be solved.

Future Works and summary

This chapter considers how to run all processes in the framework model. In the paper, three processes indicating relations among environmental problems, and adjustment process indicating how to adjust human activities under the influence of environments, cannot be analyzed. Data cannot be obtained to these processes in no time. One of the challenging problems is to design a multi-agent simulator that could be an engine of the framework model. This is a bottom-up approach that constructs models on the computer

and evaluates them comparing simulation results with the real world.

Importance of This Study

This study helps us to understand the environmental problems in Ishikawa Prefecture, especially, the relations between the wastes problems and regional economy and policies. This study is one of the few investigations that treat the environmental problems in Ishikawa Prefecture. Moreover, the consideration of environmental management offers a useful guide for the future studies on the creation of our environment using explicit as well as tacit knowledge.