Life and Environmental Engineering Department	ID	033640
Name	Emanuel Langat Leleito	

Advisor	大貝　彰 廣畠康裕 松島史朗

Title	DEVELOPMENT AND APPLICATION OF GIS-BASED TOOLS FOR SUPPORTING REGIONAL SCALE COMMUNITY PLANNING (GIS を活用した広域圏の地域づくり支援ツールの研究開発)

(514 words)

Urban Planning has in the past few years experienced a major paradigm shift from the traditional top-down planning processes to citizen centered democratic planning. At the same time, there is an increasing awareness that many of the social, economic and environmental issues present today can only be dealt with effectively at a regional scale where communities can work together on shared issues that transcend local boundaries. The current situation of planning for social, economical and environmental sustainability in rural Japan is a good example that combines the need for a regional scale planning approach and embodies citizen participatory practices. The particular objective of this study is to develop GIS-based planning support tools useful in aiding current regional scale discussions and planning for community sustainability focusing on recent spatial strategies being considered by the local and central governments in Japan.

The thesis is divided into 8 chapters with an extra section placed in the Appendix. All the main sections correspond to four separately published peer reviewed articles. Chapter 1 provides an introduction to the broader overall research background and objectives, the research methodology, and an outline of the research while Chapter 2 is a more detailed explanation of some of the terms and tools used in this study. In Chapter 3, a regular grid-cell based database structure is proposed, developed and evaluated as a compromise solution for establishing a more flexible database and a more efficient structure for visualization and analyzing a wide variety of spatial data. Next, in recognition of the fact that travel analysis is a core function in simulation models used for supporting socio-economic and environmental planning, an innovative approach for simulating and visualizing optimal paths in multi-modal travel is developed in Chapter 4. The method is based on the cell grid data structure and uses a modified form of the Accumulated Cost Surface (ACS) algorithm while borrowing ideas from the super-network theory to successfully compute travel time considering user defined travel modes. Chapter 5 to 7 showcases the application of the developed travel time computation model in creating a regional planning support tool with capability for travel cost based accessibility analyses, road improvement, cross-border cooperation impact analysis, and automated optimal facility location using Genetic Algorithm (GA) procedures. The tool is applied to various planning projects in the study area with the aim of providing useful information to the planning stakeholders in current discussions on the rural sustainability issue.

Chapter 8 provides a general conclusion and discussion on the GIS-based planning support tool development. It also looks at probable future developments into a Web-GIS based system which could enable stakeholders to get easy access to the planning support tools from remote locations. In this regard, an extra section in the appendix introduces an experiment with a proposed new method that employs WebGIS and videoconference systems to enable gathering and sharing of information from concurrently hosted distributed participatory planning workshops. The method has implications for supporting public involvement in the planning process on scales wider than the conventional community units and enabling communities to continuously work together on the shared regional scale issues.