

Abstract

FOGLEMEN, BRENT DUNFORD. The Application of Tangible Geospatial Modeling to Facilitate Sustainable Land Management Decisions. (Under the direction of Dr. Hugh A. Devine).

United States military installation land managers are responsible for many decisions regarding the use and sustainment of military training areas. I explore TanGeoMS, a tangible geospatial modeling system, to facilitate decision-making in which the goal is prolonged existence of useable training land. This unique technology is at the leading edge of three-dimensional geospatial modeling and simulation. Preliminary results indicate that this planning and evaluation environment has the potential to significantly assist land managers in their efforts to quantify environmentally sensitive problems and to aid in the development of sustainable practices.

TanGeoMS takes advantage of a physical, three-dimensional terrain model coupled with a laser scanner, projector and a geospatial information system (GIS) to provide an interface for collaborative decision-making. Managers can examine their planned control measures in detail by modifying the physical model to represent their solution, capturing the results with a laser scanner and analyzing the results in a GIS interface. The resulting analysis is projected on the model, providing feedback on the impact of the terrain modifications and simulated processes. The feedback is used to improve existing designs, to facilitate discussion, and to develop subsequent scenarios.

Generating viable land management solutions are often dependent on a range of factors, including the intended use of the training area, its planned longevity, environmental policy, costs, and the affect a solution has to the overall impact on training. I demonstrate how TanGeoMS can assist land managers at Fort Bragg, North Carolina, to methodically experiment and observe the affects of planned rehabilitation efforts and future sustainment

operations. For my case study, I constructed a scale model of Falcon Airstrip; a training area at Fort Bragg with a high volume of military vehicle and aircraft use. The dirt air strip and dirt roads are highly susceptible to erosion, caused by rainfall runoff, by heavy vehicular traffic, and by the forceful downdraft from helicopter rotors displacing loose soil. Concentrated rainfall runoff has exacerbated a particular problem area on the north end of Falcon Airstrip. Several landscape scenarios were developed and modeled in attempt to develop a solution that minimizes concentrated runoff flow and decreases soil loss potential.

TanGeoMS is being actively used in a research oriented environment and further enhancements to the hardware and software are required before it is capable for routine applications. Advancements in scanning technology, 3-D printers, and computer processing will facilitate the implementation of TanGeoMS as a viable simulation and feedback tool. Improvements to software and system interoperability will serve to fully automate the process. A goal of this project is that this method of landscape analysis becomes part of the land management planning process, so it is a proactive exercise, rather than a reactive measure to consequential events.

The Application of Tangible Geospatial Modeling to Facilitate
Sustainable Land Management Decisions.

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