THE DEVELOPMENT OF A PROCESS BASED SPATIO-TEMPORAL INFORMATION SYSTEM

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INTRODUCTION

A class of environmental problems characterized by; complexity, temporal dependency, uncertainty, and the need for predictive capability, are not accommodated by state based geographic information systems. During 2004 a new type of spatio/temporal information system was developed to address these traditional shortfalls. This new process based system dynamically incorporates observations from large numbers of variables, closely coupling them with positional and temporal information. The resulting "instances" provide the basis for informing and analyzing events as they are unfolding and making recommendations to affect future outcomes.

This approach was applied to monitoring and predicting the metabolic cost of work as a bicyclist moved through built environments. A racing bicycle was equipped with advanced biomechanical and biometric sensors. These devices were tied to a Global Position System receiver with information recorded and processed at varying spatial and temporal granularities. Topography and other spatial data were derived from extant GIS databases. All data streams were combined and incorporated into predictive models.

Initial trials demonstrated the accuracy and precision of the energy transfer monitoring system and the ability of the approach to predict the continuing metabolic costs to cyclists during rides through geographically complex terrain. This capability was demonstrated on racing courses up to 200km in length.

This paper will describe the base theory behind this new information system, the methodology used in implementing the trial process information system, and the performance of the system within the selected application domain.

FURTHER WORK

The initial trials are being extended into three areas: The first is the development of pedestrian and cyclist energy transfer metrics for built environments, i.e., models built on field-based calibrations to predict energy use by type of individual across a specified course of travel. The second area is a specific corollary to this - an analysis of the impact of built environments on obesity and fitness in children. For the last area,

we envision the prescriptive use of system visualizations for route planning, selection and design for pedestrian pathways, bike paths, and recreation routes.