Poster: Estimating Llama Caravan Travel Speeds

Nicholas Tripcevich, Ph.D., University of California, Berkeley

Available at: https://works.bepress.com/tripcevich/23/
Introduction

The distances between archeological features, and understanding social and physical links across space, are fundamental to our understanding of the past. Spatial relationships may be determined through ancient artefacts, traditions, and beliefs. Moving phenomena, such as trade caravans, present special difficulties to archeologists because the archeological "data" that remain are often ephemeral. Evidence of exchange relationships endured through time often appear in the form of exotic goods and stylistic interaction over great distances. Examining the "mobile" aspects of a particular area is particularly difficult when few people who are engaged in long-distance exchange, demand that archeologists bring together evidence from both ecological zones, and from the specific interactions to which these zones are connected. Generated cost-distance models provide a means to examine movement and are not restricted to studies of sociocultural and ecological space.

This study uses ethnographic field data to derive an asymmetrical Cauchy (Gaussian) equation that describes the movement of a llama caravan along an ancient trail system as a function of topographic, geometric, and material constraints. The model is then applied to the actual caravan route in order to evaluate the realism of the model.

Llama caravans in the Andes

Background

Camelids were domesticated in South America at least 5000 years ago. In the mountainous interior of Peru and Bolivia, llama caravans were a vital form of transport between people residing in different ecological zones. Camelids were domesticated in South America at least 5000 years ago. In the mountainous interior of Peru and Bolivia, llama caravans were a vital form of transport between people residing in different ecological zones. The evidence of exchange relationships endured through time often appear in the form of exotic goods and stylistic interaction over great distances. Examining the "mobile" aspects of a particular area is particularly difficult when few people who are engaged in long-distance exchange, demand that archeologists bring together evidence from both ecological zones, and from the specific interactions to which these zones are connected. Generated cost-distance models provide a means to examine movement and are not restricted to studies of sociocultural and ecological space.

Archaeological Significance

A general transport model is one that is addressing questions about the role of capacity of house-holds in long-distance exchange, transport between ecological zones, interaction between local centers and colonies, and mobility perceived by the prehistoric states. In addition, geospatial studies provide one of the main data sources for archeological studies, and provenance determinations are increasingly important. The models are a particular concern of the rich evidence of regional exchange and imperial contacts in the northern highland valleys. A network of many activities. It is spatially high-altitude far from the coast or major river systems and transport was largely overland. Evidence of exchange relationships endured through time often appear in the form of exotic goods and stylistic interaction over great distances. Examining the "mobile" aspects of a particular area is particularly difficult when few people who are engaged in long-distance exchange, demand that archeologists bring together evidence from both ecological zones, and from the specific interactions to which these zones are connected. Generated cost-distance models provide a means to examine movement and are not restricted to studies of sociocultural and ecological space.

Fieldwork in 2007

Observations of travel route :

- Travel times calculated with GPS (both differential and non-differential readings)
- Quality of trail conditions
- Note: Llamas move at a rate of 2 to 3 km/hr

Data Analysis

GPS time series created using the taylor53 radial basis function for a non-differential data. The Cauchy equation is also computed for a non-differential data. The resulting function was tested against the caravan route itself to evaluate the accuracy of the model. Preliminary results indicate that the asymmetry of the cost-distance function provided greater realism in areas with higher topographic relief. Travel speeds in the more areas of the caravan route, which were well above taylor53 radial basis function, can be interpreted as being a function of the changing topographic features, such as the changing faceting patterns of the surface, and the effects of trail quality were also possible. Data that includes trail data from human and llama will contribute to possible behavioral-ecology studies in the future.

Conclusions

Improvements in geospatial technology, such as GPS data loggers and accessible cost-distance functions in GIS software, have simplified the task of developing asymmetrical models for various regions. Further work with the asymmetric cost-distance model calibrated to llama caravans can be applied to archaeological phenomena that were once determined using llama caravans. For example, the speed of diffusion of chronology from the Chacoan sphere in southern Peru to consumption areas throughout the region can be modeled as a function of topography, using the cost-distance model.

Estimating Llama Caravan Travel Speeds

Ethno-archaeological fieldwork with a Peruvian salt caravan

Nicholas Tripecevich, PhD
UC Berkeley (Archaeological Research Facility)

Field Setting

In July 2007, David Cruz and his son Dasu Ancco reported a traditional journey with 28 llamas, their two younger male relations. They arrived for a weeklong transport caravan and took safe harbor from the caravan route itself to evaluate the accuracy of the model. Preliminary results indicate that the asymmetry of the cost-distance function provided greater realism in areas with higher topographic relief. Travel speeds in the more areas of the caravan route, which were well above taylor53 radial basis function, can be interpreted as being a function of the changing topographic features, such as the changing faceting patterns of the surface, and the effects of trail quality were also possible. Data that includes trail data from human and llama will contribute to possible behavioral-ecology studies in the future.

Spatial Data Gathering Methods

Each morning prior to departure, a GPS data logger is secured to the back of the flock of llamas. The group on the last night was larger, and the group walked together. The resulting function was tested against the caravan route itself to evaluate the accuracy of the model. Preliminary results indicate that the asymmetry of the cost-distance function provided greater realism in areas with higher topographic relief. Travel speeds in the more areas of the caravan route, which were well above taylor53 radial basis function, can be interpreted as being a function of the changing topographic features, such as the changing faceting patterns of the surface, and the effects of trail quality were also possible. Data that includes trail data from human and llama will contribute to possible behavioral-ecology studies in the future.

Results

The entire journey resulted in over 100,000 GPS positions along trails ranked in quality between 1 and 5. The effects of the differences in trail quality were notable, as a single llama caravan function will be presented here.

Using the Cauchy function in the form:

The data consisted of a unique ID number, latitude and longitude gathered at 3 sec interval. A test run from a stationary position was analyzed for the entire journey resulted in over 100,000 GPS positions along trails ranked in quality between 1 and 5. The effects of the differences in trail quality were notable, as a single llama caravan function will be presented here.

Participants

- Tadeo Ancco, Raul Ancco
- Many thanks to our friends/informants from Pampamarca.
- Investigators: E. Mendosa, C. Semancik, and N. Tripecevich
- Example of trail with 2 sec interval positions.