

SUPPORTING VISUAL EXPLORATION OF ANIMATED TIME SERIES WITH MODIFIABLE TEMPORAL UNIT

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Abstract: Seeing change in geodata is important for various purposes such as viewing the status of on-going developments and predicting the future. Animation is selected as a potential method to visualize change in time series. But different phenomena may change in different time intervals. Hence users require methods and tools to control temporal units used to visually explore. In addition, users might be overwhelmed by the number of changes displayed in an animation of long time series. Users may also need to be able to select or change different time units when working with animation. But the animation environments often do not enable such changes. Supporting tools to modify the temporal unit are therefore needed for improving any animation environment. In this way, users can modify the temporal units according to their needs.

There are several kinds of interaction with time: constructing and controlling the animation, temporal panning, temporal query, temporal zooming, and temporal data transformation. As in spatial zooming, temporal zooming is also includes zooming in and out. Temporal querying and temporal zooming can be used to modify the temporal unit. Implementation of temporal zooming out and temporal queries are the focus of this study. Some of the methods proposed and applied as the modifiable temporal unit tools are time sampling, time aggregation, time brushing, and time selection based on the threshold. To support the users in their choice of the new time unit, a general overview of the data, or the relation between the attribute and time should be given before conducting time selection/modification. A time series graph is employed to do it.

Proposed methods are implemented in ILWIS, open source GIS software originally built by Faculty of Geo-Information Science (ITC), University of Twente, the Netherlands. ILWIS is chosen because extending open source software will be useful, especially for users from developing countries. Prior to the implementation of the methods, a review of existing tools in ILWIS is carried out. Existing tools and methods that might be used for time unit selection are improved, and tools that did not exist are developed.

The prototype produced can be used to select different temporal units to monitor changes and to reduce the amount of information displayed. They may also be used to find a proper temporal unit for monitoring events. The combination of the time series graph and time selection tools allows the user to answer visual exploration questions related to attribute (what), location (where) and time (when, how long, how often). As a case study, NDVI data, considered useful for monitoring vegetation conditions have been used to implement the functionalities of the tools. The case study shows how geographic phenomena can be identified by the tools.

Keywords: animation, time series, time unit selection, modifiable temporal unit, ILWIS