Biosurveillance Ecosystem (BSVE)

Geospatial Utilities and Models for Biosurveillance Operations

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Globalization and ecological pressures are increasing the risk of biological incidents of national significance. An important aspect of mitigating the consequences of such incidents is to predict the favorable environmental and social conditions (natural or man-made) under which they occur in order to enable a more timely and well-informed response to such threats. The ability to forecast occurrences and impacts of such biological incidents requires fundamental understanding of the geographically based environmental and behavioral factors that can possibly affect an agent's behavior including the movement of human and animals within the environment. Some of the key factors in rapid characterization of the at-risk population includes knowledge from demographic datasets or remote analysis (remote sensing, geography of the environment), simulation outputs from weather and climate models, and other environmental and social datasets, which could affect the agent's transmissibility and mode of transmission. Effective use of data from multiple sources (remote sensing, environmental, social) for early warning and forecasting of infectious disease outbreaks requires an infrastructure that enables users to discover, access, manipulate, and visualize such datasets effectively and efficiently.

The primary goal of the proposed work is to enable biosurveillance analysts and policy makers to make informed decisions earlier by delivering a web-based, open-source geovisualization toolkit that will provide rapid access to data and information from multiple sources, analytic capabilities, and integration with existing tools and models for the biosurveillance community through the Biosurveillance Ecosystem (BSVE).

Current web-based mapping solutions (Google Maps, Open Layers, etc.) enable users to consume multi-resolution, layered maps. While these tools are useful for routine navigation and consumer mapping, they are inadequate for scientific visualization and analytics, specifically when dealing with large amounts of vector and gridded data (NetCDF, HDF). We have integrated cutting-edge WebGL (https://www.khronos.org/webgl) and Canvas2D (http://www.w3.org/TR/2dcontext) based mapping and scientific visualization (contours, heatmaps, pixelmaps) features into the BSVE to enable analysts to view and manipulate geospatial data relevant to biosurveillance activities. The BSVE SDK provides an excellent avenue for integrating these technologies with the ecosystem. The aforementioned tools are developed in pure JavaScript and enable rich, dynamic geo-informatics on all modern browsers without the need for separate client applications. This enables rapid deployment of new features and geospatial datasets within the BSVE. Here is the link to GUMBO components (Visualization) GeoJS: https://github.com/OpenGeoscience/geojs, (Web-Application) Minerva: https://github.com/kitware/minerva, (Data Services) https://github.com/OpenGeoscience/dataqs, (Spatial Analytics) https://github.com/OpenDataAnalytics/gaia