LAHVA: Linked Animal-Human Health Visual Analytics

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Objective

This paper describes our integrated visual analytics framework for analyzing both human emergency room data and veterinary hospital data.

Background

Our application (LAHVA) provides a framework for analyzing both human emergency room data and veterinary hospital data. Various statistical analysis techniques have been applied in conjunction with a spatio-temporal visualization system. Such an application provides researchers with the ability to visually search the data for clusters in both a statistical model view and a spatio-temporal view. Our system uses emergency room data from the Indiana Network for Patient Care (INPC) and all general visits to Banfield the Pet Hospital, veterinary practices (approximately 70,000 visits per week).

Methods

LAHVA combines both human and animal health data for syndromic surveillance and aberration detection. Our system consists of three components: a data management component, a statistical analysis component and a visual analytics component. Our system directly accesses data from INPC and Banfield veterinary practices. We use the Regenstrief Institute's classification of emergency department data into 8 syndromes [1] and apply similar syndrome classification to the pet hospital data. Currently, statistical models are pre-computed in R [2] in order to evaluate their potential use. Future versions of the system will directly analyze the data through direct implementations of these methods.

Results

In Figure 1, we see the typical LAHVA viewing window. Emergency rooms are represented by crosses, veterinary hospitals are represented by the large V's, cats are triangles and dogs are circles. For the emergency rooms and veterinary hospitals, the glyph size and color are determined by the number of cases seen on that given time period, normalized by the total cases at the facility using six month moving average. As more cases of a particular syndrome are encountered on the specified time period, the colors change from green to red and the glyph area increases proportionally to the number of cases. The time period can be specified as daily, weekly or monthly using the controls on the bottom right near the slider. The case and factor specifications are determined by check boxes in the upper left corner and more factors are in the process of being added. Further information can be obtained by left clicking on a human or animal hospital glyph. This opens an information screen that details the patient records for the specified time period. For cats and dogs, red represents respiratory syndromes, blue would represent gastro-intestinal syndromes and green would represent eye-inflammation. For prototyping purposes, the lower left window contains pre-computed plots of the data for varying factors.

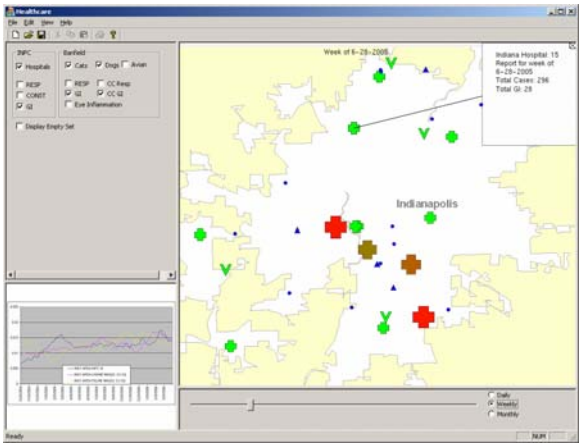

Figure 1 – LAHVA screenshot showing the statistical and spatial-temporal viewing windows as well as the factor specifications.

Conclusions

We have developed a prototype system to improve the process of public health surveillance by providing an interactive geospatial-temporal analysis interface linked with a statistical analysis system. Our system also adds multi-species health surveillance to improve systemic health surveillance by providing more health indicators for syndromes and events that effect both human and animals as well as providing faster detection of zoonotic diseases before human cases emerge.

References

[1] Grannis SJ, Wade M, Gibson J, Overhage JM, The Indiana public health emergency surveillance system: Ongoing progress, early findings and future directions, In American Medical Informatics Association, 2006.

[2] R Development Core Team, R: A Language and Environment for Statistical Computing, R Foundation for Statistical Computing, Vienna, Austria, 2007, ISBN 3-900051-07-0.

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