Augmented Interactive Starfield Displays For Health Management

Luke Rasmussen, Justin Starren, MD, PhD
Biomedical Informatics Research Center, Marshfield Clinic, Marshfield, WI

Abstract

Increased adoption of healthcare technology has resulted in vast amounts of data available to healthcare providers and administrators. To help navigate these large data sets, we propose the use of a starfield display with dynamic query filters. This allows users to quickly view high-level trends or to drill down to a single data point. The utility of such displays is demonstrated for review of both patient-specific and cross-patient data sets.

Introduction

The starfield display is a scatterplot graph of data from any multi-attribute data set which are plotted along two axes\(^1\). Combined with dynamic filtering, such displays can support the high-level visualization tasks advocated by Schneiderman: Overview, Filter, Details-on-Demand\(^1\). This study explores the use of interactive starfield displays in healthcare.

Data Displays

Two starfield implementations were developed. The first application is targeted at healthcare providers reviewing large volumes of data on a single patient (Figure 1) —in this case glucose measurements from the IDEATel telemedicine study\(^2\). A single patient with diabetes may measure blood sugar several times per day, resulting in thousands of data points per year. The standard starfield displays was augmented with vertical event timepoint indicators for telehealth encounters. Slider bars allow the provider can scale the display to focus in particular periods or filter by time-of-day to evaluate diurnal variation. Clicking on data points displays detail data about the individual measurement. Clicking on vertical bars displays the relevant telehealth note. This allows the clinician to rapidly review long periods of monitoring and to quickly drill down on changes in management that may be associated with changes in outcome.

The second implementation focuses on the summary display of data from large numbers of patients. A single display summarizes quality of care data on over 57,000 patients. Data can be filtered by disease state, indicator type, care provider, care facility. Slider bars allow filtering for age, severity, and time since last visit. Patient level detail can be obtained by clicking on any individual data point.

Conclusion

Starfield displays with dynamic filtering have been advocated in a variety of domains, and have been used to summarize health statistics at state or national levels. However, they have not been widely used in the healthcare at the scale of the individual patient or institution. To our knowledge, this is the first combination of interactive starfield displays and variable timepoint indicators, allowing drill-down on two separate data types from the same interactive display. Anecdotally, both interactive data displays presented have proved highly valuable, enabling rapid exploration of the data sets, and have revealed previously unrecognized features in the data. Formal usability studies, comparing the novel displays to conventional data presentations are planned.

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References