Augmented Interactive Starfield Displays for Health Management
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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 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.

Starfield Displays
The starfield display is a scatterplot graph of data from any multi-attribute data set which are plotted along two axes. Combined with dynamic filtering, such displays can support the high-level visualization tasks advocated by Schneidman:

- Overview, Filter, Details-on-Demand

This study explores the use of interactive starfield displays in healthcare.

Glucose measurements from the IDEATel telemedicine study were used to demonstrate large sets of data collected for a single patient. As shown in Figures 1-3 (see the “Home Glucose Monitoring Data” panel), the utility of the starfield control with dynamic query filters allows the clinician to:

- Rapidly review long periods of monitoring
- Scale to focus on time periods
- Filter time of day to discover diurnal variations
- View details of a measurement or telehealth visit note

Figures 4-6 (see the “System-Wide Quality Care Measures” panel) demonstrate the use of the starfield control to summarize the quality care measures for 57,000 patients in the Marshfield Clinic system.

Vector Field Displays
A vector field display is an extension of the Starfield Display in which points are replaced by segments. These segments can display an additional variable or, in this case, convey change in a primary variable. Figure 7 provides an example of a vector field for comparison of quality of care data across multiple years. The vector field allows rapid discovery of trends across multiple subjects based on the vector direction. Especially during the initiation of quality projects, it is critical to identify not only general trends, but also individual patients who are not responding to the intervention.

Conclusion and Future Work
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, the displays have already revealed previously unrecognized patterns in the data sets.
- Based on initial responses to the prototype, Marshfield Clinic is developing a full production version for clinician use.
- Formal usability studies are ongoing.

Acknowledgements
This work was funded by National Library of Medicine Grant R01 LM007965-04 and Centers for Medicare and Medicaid Services Cooperative Agreement 95-C-50560.

References