Visualizing an Urban Aquaponic Garden

Problem
Kijani Grows, a farming technology organization in Oakland, aims to reduce disparities by using aquaponic systems to educate, create jobs, and increase access to local foods.

All the data Kijani Grows collects per garden currently can only be viewed in raw form for one instance of time at a time. There is no easy way to view all the data collected per garden in parallel to check holistic garden health and to discover patterns and relationships between parts of the system. The organization would also benefit from more and better ways to educate the public about its aquaponic systems.

Our goal is to create an interactive visualization that allows users to learn about aquaponics while enabling Kijani Grows to monitor the garden, analyze its behavior, and extract trends in the system both in real time and in specified query ranges.

Motivation
As it directly benefits Kijani Grows, this is an interesting problem to solve, as it is a pioneering example of the use of technology to both monitor and analyze the obvious and hidden parts of an aquaponic garden to ultimately improve the system and create educational experiences around it.

Challenges include integrating animated components to visually depict the garden status to educate younger audiences and those unfamiliar with aquaponics, as well as developing a clean, effective, and functional way to allow the user to analyze all parts of the data.

Approach
We used a small-multiples parallel series of line graphs to visualize the individual factors collected over time. These stacked graphs facilitate analysis and comparison, especially with the data points explicitly shown on mouse hover. The slider beneath the line charts allows the user to see the data from different perspectives, enabling the user to view holistic trends and details too. To allow the user more control over the analysis of his data, we implemented the ability to view the line charts over a queried time range as well.

To make the visualization engaging and allow it to be used as an educational tool, we created an animated visualization simulating the actual status of the aquaponic garden. Updated in real time in accordance to the line graphs, the animation features details on demand that inform the user about the workings of an aquaponic system and in general can be useful as a visual monitoring tool.

Future Work
To extend our work, we would add a social component to the visualization for education purposes, for example allowing kids from multiple different schools to interact with the visualization and work with each other. Also, we could implement the ability to visualize many aquaponic gardens to allow comparison of garden statuses. Another possibility is to implement brushing and linking across the various line graphs.

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