Diedre Brown
INFO 697-02/Fall 2020 Programming for Interactive Visualizations
Project Proposal
11 November 2020

Daylight Time

Why daylight? As a localized piece of information, what insights can be gained by quantifying daylight?

For many species, daylight is an essential source of illumination, heating, affective comfort, and metabolic activities, including the photosynthesis. And for human beings, as a diurnal species, designing with and for daylight has been elemental since time immemorial. While the amount of daylight is often quantified in broad terms of duration at a specific location and or intensity, it is rarely considered *locally* at the level of the individual. Though an individual may be cognizant of the effect that longer/shorter daylight hours has on their lives, rarely do they consider this at the level of an hour within a day and what activities they engage in. For example, as COVID-19 has forced people to *live-work-play* in their homes, the amount of daylight received in one area of a home, may dictate one's activity in that space versus another room (e.g. a kitchen versus a bedroom). However, the amount of daylight in these areas may be anachronistic to the activity. For instance, if one's work and sleep space[1] is a bright south facing bedroom, the space may be conducive to productivity, but difficult to fall asleep in during summer months. Therefore, relating the quantity and intensity of daylight to one's daily activities in a space may open up an exploratory avenue of insight into one's behavior patterns.

The Mechanics of Quantifying Daylight – Data Collection

While professional daylight sensors exist, end-user development (EUD) with microcontrollers, such as Adafruit and Arduino boards, affords anyone with the desire to work with these boards and sensors the ability to take their own daylight readings for a nominal cost. If the device is then connected to the internet, using a webhook, like IFTTT, data collection becomes a matter of enabling the webhook to send the data to a cloud-based spreadsheet like Google Sheets. This is the procedure that I followed from 14-29 September 2020 using an Adafruit Feather Huzzah ESP8266 microcontroller with a photoresistor light sensor module.[2]

The Adafruit Feather was connected to my WiFi, and sent readings every three seconds to my Adafruit.io cloud account for data collection. Though Adafruit.io's free account provides users with 30 days of data storage and the ability to download this data as a CSV file, it was necessary to use a webhook integration, IFTTT, to perform data manipulation and analysis. The Adafruit.io cloud also offers users the ability to create sharable data dashboards for the incoming data feed. While useful, these dashboards only provide limited data visualizations such as line graphs, bar charts, and on/off switches (Figure 1). The time-series chart I created with this dashboard (Figure 2) is what prompted me to consider the meaning of a time-series visualization.

Time Series Visualization

Like daylight, time is a constant certainty for all life on earth. And as Johanna Drucker highlights in *Graphesis*, "Timelines, calendars, tables used for accounting purposes are among the oldest formats that come down to us in the conventions on which we draw for information visualization in the current moment. Every calendar system has behind it the lurking shape of ancient observations" (p.66-67). Yet, if a solar day, a clock or sundial, and a calendar are all measures of time, why does a time-series graph of the same period of time seem to betray both the "solar and experiential" contextual information of that time? A time-series line graph utilizes the mathematical concept of a line, the shortest distance between two points. However, as Albert Einstein's 1905 "special theory of relativity" and other breakthroughs from 20th century physics onwards have illustrated, time is not a certainty but a relative concept. Therefore, one could argue that though the shortest distance between two moments in time, the mark of a line is only an average consideration of the passage from one period to the next. Furthermore, as a means of visual expression, if one is to internalize and personalize time-series data, is an average enough of an explanation of their experience?

In *Visualization Analysis and Design*, Tamara Munzner not only provides us with ways to further enhance linear time-series data charts by encoding different information with various marks and channels, but her concepts of encoding information through expressiveness and effectiveness principles also provided validity to the mapping by hand of data (Lupi & Posavec, 2016), which Giorgia Lupi and Stefanie Posavec's *Dear Data* project outlines.

Project Intent

This project aims to tell the story one's daily activities in relation to daylight. With myself as a case subject, I intend to use the daylight data obtained from my Adafruit Feather and my recorded activities for the period of 14-29 September 2020. By incorporating the visualization principles outlined, my intent is to create something in D3 that could be used by others and EUD designers, as a way to step away from traditional data dashboards. While the dashboards are useful and effective for quick and instantaneous readings, this offers the possibility to consider the individualized self within the data. I intend to use interactive elements such as tooltips and a selection bar to allow the user to access specific information, such as time and daylight reading, and to filter the visualization by activity experienced.

---

[1] For those of us in typical limited space New York City apartments.

[2] During this period, readings were recorded every three seconds to a Google sheet. This resulted in a total 59 spreadsheets containing 106,260 readings. This approximates to 7,590 daylight readings per day.

Bibliography

Drucker, J. (2014). *Graphesis: Visual Forms of Knowledge Production*. Harvard University Press.

Lupi, G., & Posavec, S. (2016). *Dear Data*. Princeton Architectural Press.

Munzner, T. (2014). *Visualization Analysis and Design* (1st ed.). A K Peters/CRC Press. https://doi.org/10.1201/b17511

Appendix - Figures

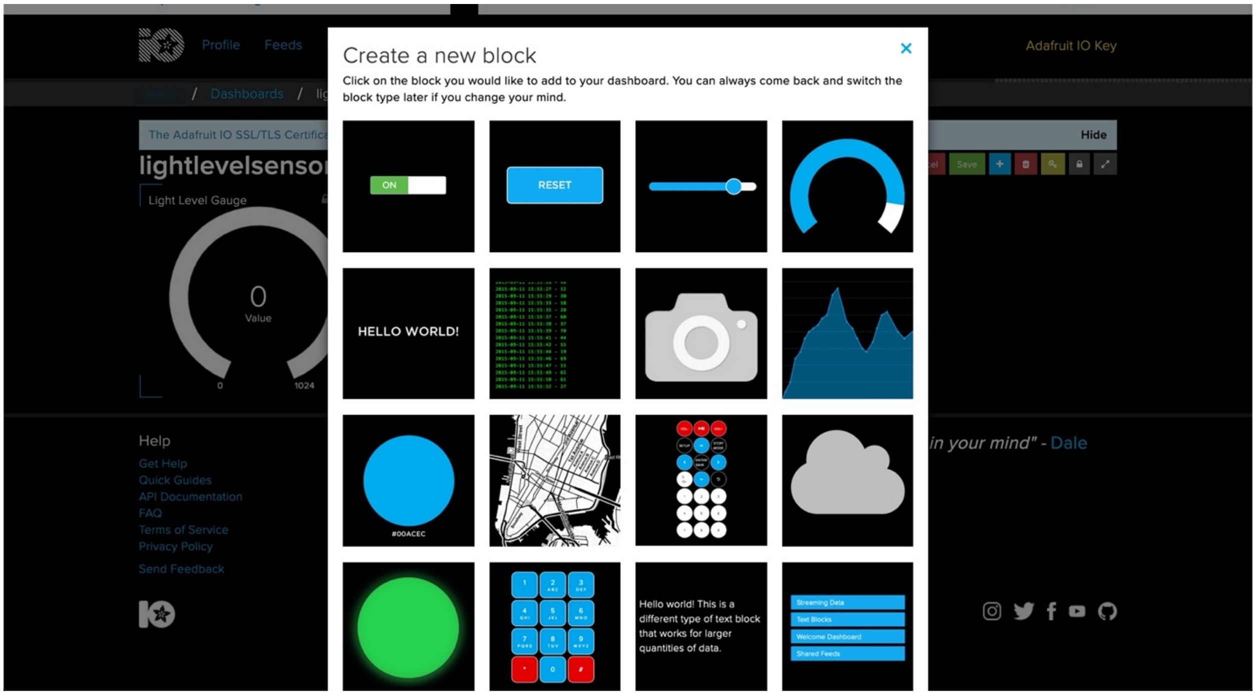

Figure 1. Adafruit.io Dashboard blocks for data visualization.

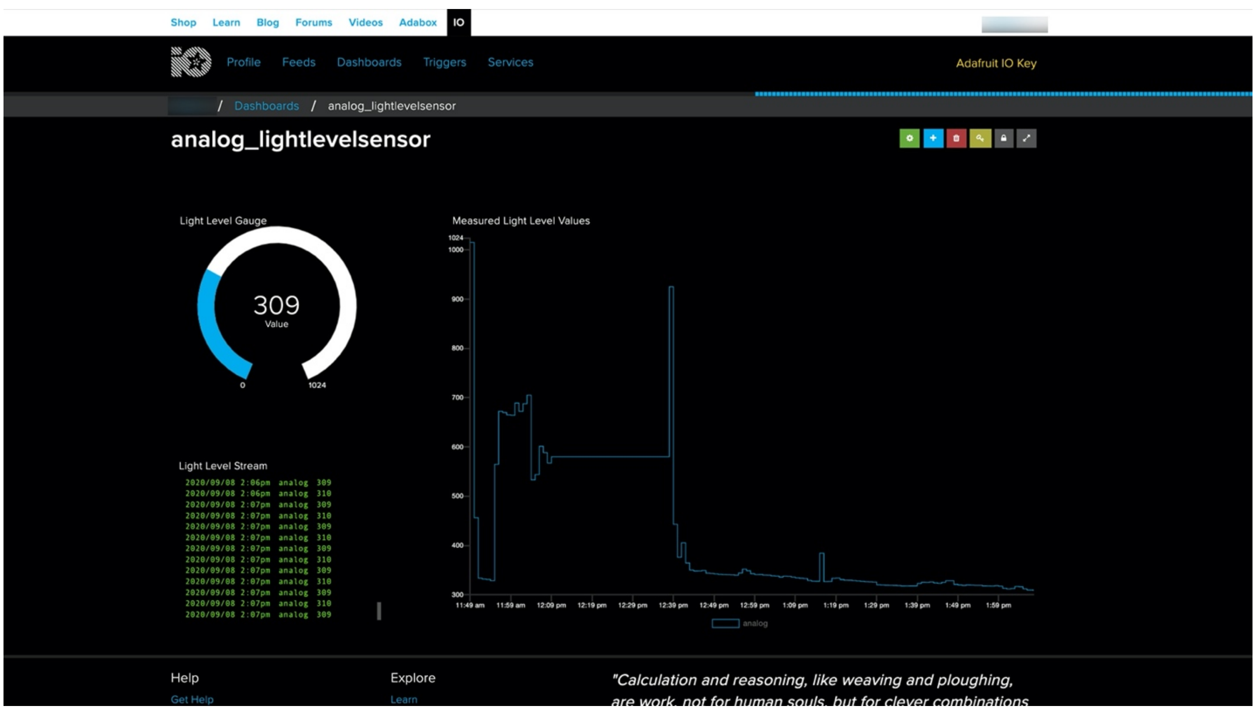

Figure 2. Dashboard used for device set up.