

---

# Visualizing Gulfs and Streaks - Peripheral Support for Goal-Setting & Habit-Forming in Personal Informatics

**Wesley Willett**

INRIA  
Bât. 650 Univ. Paris-Sud  
91405 Orsay, France  
wesley.willett@inria.fr

**Lora Oehlberg**

INRIA  
Bât. 650 Univ. Paris-Sud  
91405 Orsay, France  
lora.oehlberg@inria.fr

**Abstract**

Tools for systematically logging information about one's exercise, sleep, diet, and other activities are increasingly commonplace. In spite of this, tools and strategies for using this data to impact behavior and change habits are still nascent. We present some reflections on goal-tracking and discuss a few initial strategies for supporting goal-setting and habit-formation in a life-logging tool. Our current work focuses on understanding the value of lightweight manual data input and on helping users track goals by maintaining peripheral awareness of "streaks" and "gulfs" in their data. We illustrate our thinking with examples from several initial sketches and prototypes.

**Author Keywords**

Personal informatics; goal-setting; habit-formation.

**ACM Classification Keywords**

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

**Introduction**

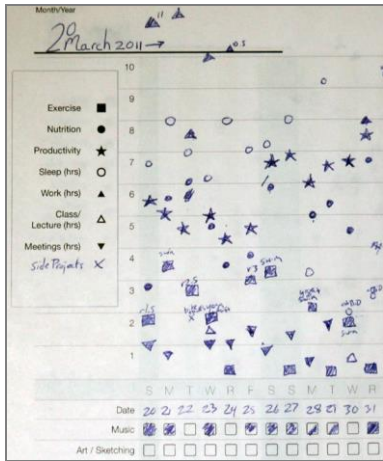
With the advent of personal tracking devices and the plethora of logging applications now available on smartphones and other mobile devices, personal informatics tools are now largely ubiquitous. Many tools focus on simply collecting and visualizing data, and a

---

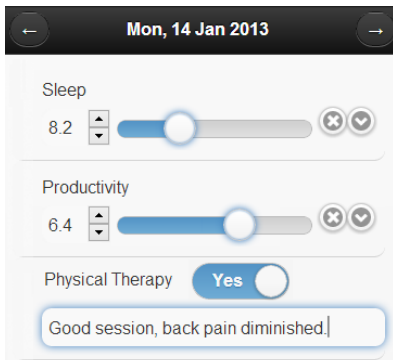
Copyright is held by the author/owner(s).

CHI'13, April 27 – May 2, 2013, Paris, France.

ACM 978-1-XXXX-XXXX-X/XX/XX.



**Figure 1.** Paper-based life-logging stationery allows lightweight, flexible tracking of complex activities, and supports reflection on recent entries.



**Figure 2.** Our initial web-based life-logging prototype supports touch-based input of complex measures with many different data types.

few have focused on leveraging this data to support habit formation and behavior change [1]. However, in our experience, these tools still do not offer the lightweight, flexible support for personal goal setting, data collection, and reflection that home-built personal informatics systems offer.

We are currently designing and building a lightweight personal informatics tool, informed by years of personal experience using paper-based data collection tools (Figure 1) and traditional visualization packages. We are interested in exploring how the processes of recording, reviewing, and reflecting on data can impact habit formation and behavior change.

In particular, our current work focuses on the transition from data collection to reflection, goal-setting, and habit-formation, and on understanding how these activities can be reinforced. To that end, we are prototyping new, lightweight approaches for (1) setting goals, (2) collecting personal data that tracks goal progress, and (3) visualizing goal-related data (loosely analogous to Li, et al.'s *preparation, collection, and reflection* stages [3]). As part of this research, we are also exploring how interactions with our tool can create peripheral awareness, and support goal maintenance and habit-formation.

### Setting Quantifiable Goals

We are interested how life-logging can support behavior change by focusing tracking activity around long-term goals that can be quantified. While goals can take many forms, we have initially focused on those that can be quantified at daily or weekly intervals (e.g. "brush teeth every night", "run 15 miles every week"). Additionally, we treat goal-setting and habit-forming as

evolving processes that involve regular checkups and maintenance designed to find a balance that is both realistic and beneficial.

### Lightweight Data Capture

A wide variety of hardware and software tools are available to monitor time use, track physical activities like exercise, sleep, and diet, and record other information of interest. Much of the work thus far has focused on tracking via automated means (FitBit<sup>1</sup>, RescueTime<sup>2</sup>, and numerous others).

However, mechanisms for lightweight manual data input are also valuable. Lightweight manual input tools (your.flowingdata.com, Lift<sup>3</sup>, etc.) make it possible to capture complex activities like "playing guitar", "wearing a retainer", or "having a conversation" that would be difficult to capture automatically. Additionally, the act of manually logging an activity may help contribute to habit-formation, since it reinforces the activity and can help establish desired activities as part of a larger routine. Manual interaction with the data entry instrument may also provide an opportunity for reflection and feedback, where tools can provide direct reinforcement as well as peripheral progress indicators.

However, the time and effort required to perform manual logging may reduce users' willingness to perform it. To address this, we have built an initial web-based life-logging prototype (Figure 2) that streamlines data entry on both desktop browsers and

<sup>1</sup> <http://www.fitbit.com>

<sup>2</sup> <https://www.rescuetime.com/>

<sup>3</sup> <http://www.lift.do>



**Figure 3.** Implicit streaks and gulfs shown in-context inside a collection tool. The thin line at the far right denotes the current date, and each box corresponds to a day during the previous week. An unbroken line of checkboxes implicitly denotes a streak ending last Thursday and the number in green indicates the streak's total length. Gulfs, including the four day gulf from Friday to Monday, are highlighted in increasingly saturated red to encourage attention.

mobile devices. The tool supports touch-based input for variety of user-defined categories and provides a variety of data types that for logging daily or weekly activities, including binary checkboxes (e.g. [yes/no] for "ran today"), quantitative scales (e.g. [0-24 hours] for "time spent at work"), and qualitative Likert-scale scoring (e.g. [1-10] for "severity of back pain"). Users can also add comments and annotations.

Finally, in our sketches, we have focused on integrating interfaces for setting goals directly into the data entry tool. This ensures that goals are framed in terms of the data that is being collected. Moreover, placing the goal-setting mechanisms alongside the tool may make it easier to for users to assess goals and refine them if goals prove unrealistic or problematic.

### Reflection - Encouraging Peripheral Awareness of Streaks and Gulfs

Current personal informatics tools present data in a variety of different ways. For example, timelines, binned histograms, and map-based displays of time-series data are all common. However, these tools often give little goal-oriented feedback or do so only for a select set of measures.

In our research, we are particularly interested in presenting users with lightweight representations of their data, framed in terms of their goals. Our hope is to provide peripheral feedback that reinforces progress and provides insight into current and pending lapses.

We focus on presenting progress in terms of "streaks" and "gulfs", inspired in part by the Jerry Seinfeld's "don't break the chain" approach [2] which advises prospective writers to write every day and document it

via streaks on a wall calendar. We hypothesize that surfacing goals in terms of streaks and gulfs allows us to exploit sunk-cost and loss-aversion to encourage continued good behavior. Figures 3-6 show several minimalist visualizations of streaks and gulfs we have explored thus far. These are designed to provide peripheral support for users' own intrinsic motivation and help encourage awareness and accountability.

#### Visualizing Streaks

"Streaks" represent the amount of time since the user's last failure to meet their current goal. Highlighting streaks allows the user to track the duration of their effort and reinforces the user's sunk cost. We are currently exploring glance-able representations designed to live either directly inside the data collection tool or in a space that is highly visible to the user (e.g. on their default home page, as the background on their PC or mobile device, or on an ambient display in their home). Figure 3 shows how streaks could be highlighted implicitly within a collection tool, while Figure 4 shows a more peripheral display that might be shown on a user's desktop.

#### Visualizing Gulfs

"Gulfs" represent the time since the last occurrence of a recorded measure or completed goal. As such, surfacing gulfs can serve as reminders for infrequent goals ("get a haircut once a month") or goals with a set minimum frequency but no maximum frequency ("call home at least once a week"). We focus on displays (Figures 3 and 5) that help users remain aware of approaching and overdue goals. These kinds of peripheral displays can help users keep tabs on goals they might otherwise lose track of and can also serve as a trigger to prompt preventative action.



**Figure 4.** Positive peripheral reminders of ongoing streaks. A goal is represented as a single tile with a numeral indicating the duration of the streak. Over time, the tile changes, becoming increasingly green to highlight the streak.



**Figure 5.** Peripheral reminders of gulfs between infrequent events or lapsed goals can be displayed to provide greater awareness of their state. In this example, a tile displays the number of days since calling a particular family member. The tile becomes increasingly saturated as a user overshoots their goal.



**Figure 6.** Allowing pairs of users to work towards a goal together and visualizing their progress in one place can provide mutual reinforcement and social accountability. Here, for example, two user's inputs are visualized alongside one another, allowing them to maintain awareness of their shared goal. Users can also help referee one another and help deal with lapses – giving his or her partner a pass in cases with extenuating circumstances. Here, the top user has exempted the bottom user from two missed days early in the week.

## Reinforcement and Habit-Formation

Peripheral displays like these are intended to reinforce progress and support habit-formation. However, tools may also apply more explicit feedback to help reinforce good actions or discourage negative ones. A context-aware tool could apply positive or negative stimuli in relevant contexts—for example, actively reminding a user about eating goals around meal times or in restaurants. Alternatively, social reinforcement mechanisms like pair or group goal-tracking can create social accountability. Finally, creating financial investment—as in the “commitment contracts” offered by services like StickK<sup>4</sup>—may provide stronger reinforcement for high-priority goals.

## Goal Maintenance - Learning from Failures and Scaffolding Adjustment and Recovery

Often setting goals is an exploratory process. We often fail to achieve goals either because they are unrealistic, or because unforeseen circumstances (an injury, travel, work obligations, etc.) intervene. One alternative may be to allow peers to act as a judge, helping the other user avoid breaking their streak in cases with extenuating circumstances but providing a degree of accountability (as in Figure 6).

In cases where users actually fail to achieve goals focusing users' attention on streaks has the potential to be highly discouraging. As such, we are interested in designing tools to catch and reconnect good activities even after a lapse. For example tools could potentially downplay the failure and instead encourage users to reflect on the causes of the break and formulate alternate goals. Providing flexibility in goal-setting

using techniques like Beeminder's "Akrasia Horizon" [4] is another interesting direction. This method recognizes that immediate desires tend to override longer-term goals, and promotes longer term planning by allowing adjustments to future, but not current goals.

## Future Research Directions for Goal Tracking

Going forward, we hope to incorporate and build upon existing work on habit formation from psychology, education, and health studies. We plan to elaborate our prototypes to explore additional questions, including:

*What is the impact of framing goals in different ways?*

Does representing goal in terms of intervals (every two weeks), gulfs (not more than two weeks), or ratios (once every two weeks) impact perceptions of progress and accountability? When is streak-maintenance a productive method of goal-setting and how does it function under various incentive schemes?

*How can we make goals more actionable?* How can we use context to make peripheral displays available or salient at appropriate times? Can goals be integrated more tightly into existing calendars and to-do lists?

## References

- [1] S. Consolvo, et al. 2008. “Activity sensing in the wild: a field trial of ubifit garden.” In *proceedings of CHI 2008*.
- [2] B. Isaac. 2007. “Jerry Seinfeld’s Productivity Secret.” LifeHacker. <http://lifelifehacker.com/281626/jerry-seinfelds-productivity-secret>. LifeHacker. 24 July 2007.
- [3] I. Li, A. Dey, and J. Forlizzi. 2010. “A stage-based model of personal informatics systems.” In *proceedings of CHI 2010*.
- [4] “The Road Dial and the Akrasia Horizon.” 2011. Beeminder blog. <http://blog.beeminder.com/dial/>. 31 August 2011.

<sup>4</sup> <http://www.stickk.com>