River: Using Personalisation to Support Reflection on Personal Activities

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Abstract
Tools that help us track and log activities – a class of tools broadly termed *personal informatics*, are gaining prevalence in both the marketplace (e.g. FitBit, Nike) and in the research space. These tools collect data about a person's physical activity but leave out contextual data which could be valuable for *reflection*. To address this, we look at other common practices involving the logging of activities such as day-planners and diaries. We distil previous research to articulate four design considerations to support reflection on activities, and realised these in a work-in-progress web-based personal informatics tool –River.

Author Keywords
Personal Visualisation, Personal Informatics, Information Visualisation, Feedback techniques.

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

Introduction
Understanding ourselves through personal informatics (PI) tools can lead to insights that could improve the way we live. Li et al. suggested that healthy behaviour change can be supported by guiding the individual through a series of stages: preparation, collection, integration, reflection, and action [5]. Recent

technological advances are making it easier for individuals to collect personal data; however, little research has explored reflecting on such data. To address this, we explore how to build better tools that allow people to discover insights about themselves, and to help them make the changes they want. From studies of PI enthusiasts, Li and his colleagues found that people reflect on six kinds of questions about their personal information: status, history, goals, discrepancies, context, and factors [6]. By providing data about these questions, PI tools can support two phases of reflection: discovery –where people learn about what influences their behaviour in order to reach a goal, and maintenance –where people check whether they are keeping their goals. However, because most commercial tools (e.g. Fitbit and Nike+) only track movement, the context of why a person was active at a certain time is usually lost. Furthermore, the nuances of "activity" go further than the notion of periods of high activity or inactivity. Thus many tools support maintenance, but generally lack in supporting discovery.

An age-old practice that can provide rich information concerning individuals' activities is the use of day-planners, diaries, and journals. Day-planners or personal calendars allow people to define their activities and plan them at certain times, while their diaries and journals can contain information as to whether or not these plans were met. The data that can be gathered from these tools are rich in context that can give answers to questions people ask while reflecting on their data [3]. In this work, we present a PI tool called River (see Figure 1) that combines the rich contextual and chronological data found in day-planners and diaries with the ubiquity of current activity trackers to facilitate reflection. This web-based application is designed to help individuals plan and understand their day-to-day activities.

DESIGN

People are individuals who have different situational needs and preferences in order to reach their goals. Hence, an important factor we considered while designing River is for it to be *personal* – it should have the ability to function differently for different individuals to fit their needs. We are interested in whether a single tool can be personalised to an extent where it can support both needs. Our goal is to have a single tool that supports the two phases of reflection. To realise this, we suggest the following design considerations:

- Giving individuals control over the data,
- Supporting planning and goal setting,
- Using personalised visualisations as feedback, and
- Supporting ubiquitous access as with other PI tools.

RIVER

We implemented River as a cross-platform web-based application using HTML5 and Javascript. While it is currently optimised for desktop browsers, it can be accessed and used on mobile devices such as phones and tablets that have internet connection. Ultimately, we wish to allow individuals to access it anytime and anywhere.

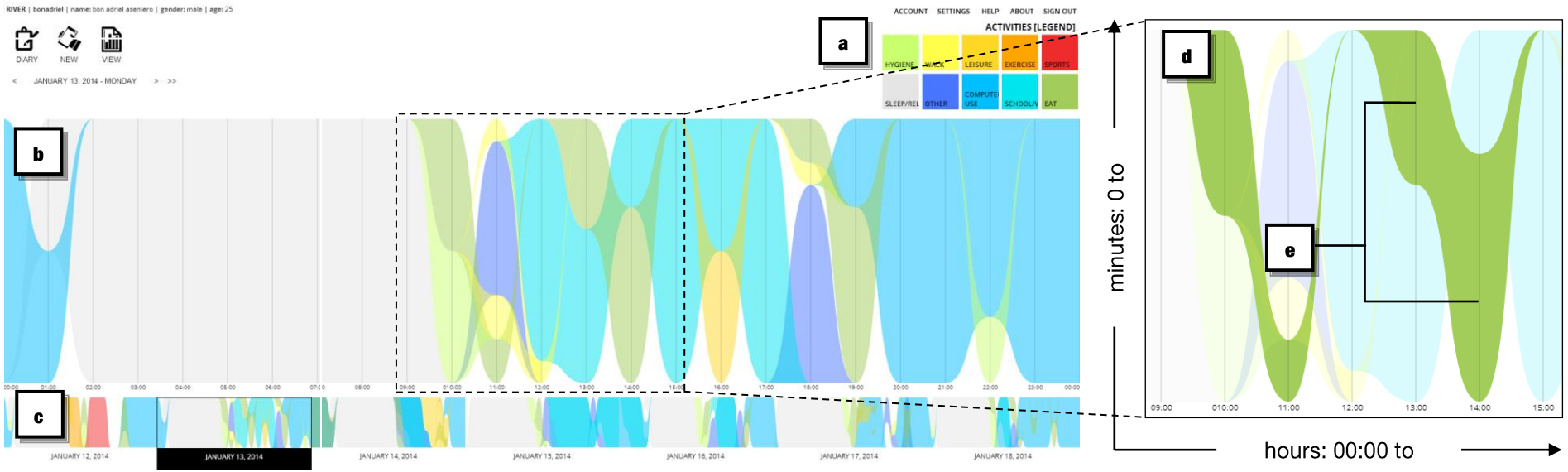

Figure 1. The main personal visualisation page of River where an individual can see his/her logged activities shown as a timeline stream. (a) The legend composed of activities the individual defined. (b) The timeline stream visualising the activities logged for a day. (c) Small multiples of timeline streams of other days within the same week showing history. (d) Interactive highlighting is used to make the timeline more readable. (e) This is read as the "green" activity (eat) happened from 13:35 until 14:40.

Defining and Collecting Activity Data

River allows individuals to define the set of activities they wish to track. Individuals are not limited to tracking activities but also other behaviours and emotions should they choose to (e.g. they can track the times when they are happy or sad while also tracking the activities they are doing at the time to see how they correlate). After registering a personal account, individuals are prompted to define their activities. These activities can be edited at any time later on by accessing their account settings. Afterwards, River allows individuals to input their data in two different ways: *On-the-go logging* –where individuals can log their activities by noting as they start and stop, and *Diary logging* –where they can opt to log their activities at a later point in time.

Timeline Streams

We call the visualisation within River, timeline streams. This is a new visualisation based on streamgraphs [1] that is designed to be engaging and personal while helping people find answers to their questions about their data. In the visualisation, each activity is represented by a colour (Figure 1a) and, as in time series shown in stacked layers [4,7], they appear as waves of curved stripes along a horizontal 2D axis. The x-axis is divided into the 24 hours of a day (from midnight to the next), while the y-axis represents the 60 minutes of an hour. As seen on Figure 1e, an activity wave is drawn from the minute it begins until it ends within each hour. This illustrates the actuality of when an activity occurred and also show the length of time allotted to it. To show discrepancies between an individual's planned and actual activities, we took

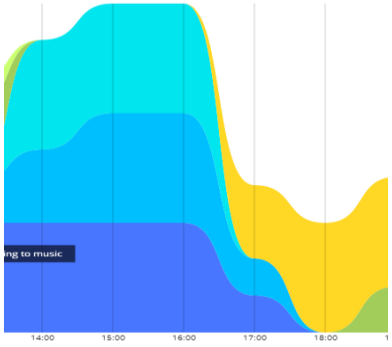

Figure 2. River supports transition from a timeline stream to a stacked graph representation of the data.

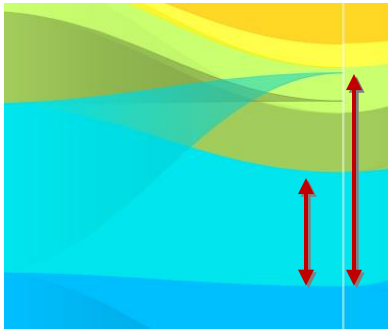

Figure 3. Individuals can see discrepancies between their planned and actual activities while in the stacked graph view. The gradient spike shows the amount planned (longer arrow) while the solid stack shows the actual amount of time allotted for the activity (short arrow).

inspiration from Amanda Cox's porcupine chart [2] where predicted values are represented as fever lines that spike out of the line showing actual values. Individuals can see the visualisation as a stacked graph, and in there, the predicted amount for an activity is shown as a gradient spike, pointing to the planned amount as seen in Figure 3.

EVALUATION

We plan to release River in the future and conduct a long-term online study. We will investigate how individuals use our tool and how it affects their perception of their personal activities. We are also interested in learning how participants will react to the visualisations we have developed. This study will help us understand the demands individuals require of our tool, and what we can do to improve user experience. We can also explore how River fits in the current ecology of PI tools such that in future, we would know how to integrate it with other tools (e.g. using it to add contextual data to Fitbit data).

CONCLUSION

While River is still a work-in-progress, we already see its potential in teaching us how to better support reflection on personal data. Currently, our contributions are as follows: first, we defined a subset of design principles to support personalisation in tools for reflection, and second, we designed and implemented a novel visualisation, timeline streams, as a way to effectively visualise personal activity data. We also implemented a modification to the established stacked graphs, combining elements from the porcupine chart to visualise the discrepancies between an individual's planned and actual activities. These visualisations can be used to visualise other data beyond the one outlined in this project. In the future, we see River as a part of personal informatics ecology whose subsequent evaluation will help us understand more about how people reflect on their personal data and how we can better support their needs.

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