Assessing Navigation in eHealth Apps: a Markov Chain Analysis of the Start2Cycle app

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Purpose

Mhealth apps generate vast amounts of user data. Increasingly, researchers are discovering the opportunities of these data to assess the engagement levels of their applications. To date however, the analysis of these data is often limited to descriptive analysis. Using the right data mining techniques, application log data can offer significantly deeper insights. The purpose of this study was to map the user paths in an mHealth application and improve the engagement with the app.

Methods

This study used the log data of the 'Start2Cycle' application, developed by the Flemish public broadcaster (VRT), Ghent University and Vrije Universiteit Brussel. The goal of this application was to motivate users to start and continue cycling. A gamification approach was used, challenging the users (N=22) to cycle as much as possible in a 4 week period. The participants were randomly divided into two teams. The team who rode the most kilometers at the end of the trial, won the challenge. A transition matrix between the 9 pages of the app was composed. From this matrix, a Markov chain can be constructed, enabling an intuitive user behavior analysis tool.

Results

Figure 1 demonstrates the results. The app pages are represented by the nodes and node size is determined by the amount of visits on the page. The connections between the nodes represent the probability of a user going from one page to another. The 'coach' page was the starting point for many routes in the app. In figure 1, only paths with a probability higher than 0.21 are displayed. Exiting the app mostly happened tracking a route or visiting one of the gamification pages.

Conclusions

Using Markov chains to assess in-app navigation presents an innovative method to evaluate mHealth interventions. The insights can be used to improve navigation of the app, flow between behavior change techniques and elements in the app. For example, by seeing from which pages users log out, it can be assessed which part of an intervention receives too little attention from the participants. This method can also be applied to evaluate the usability of the app.
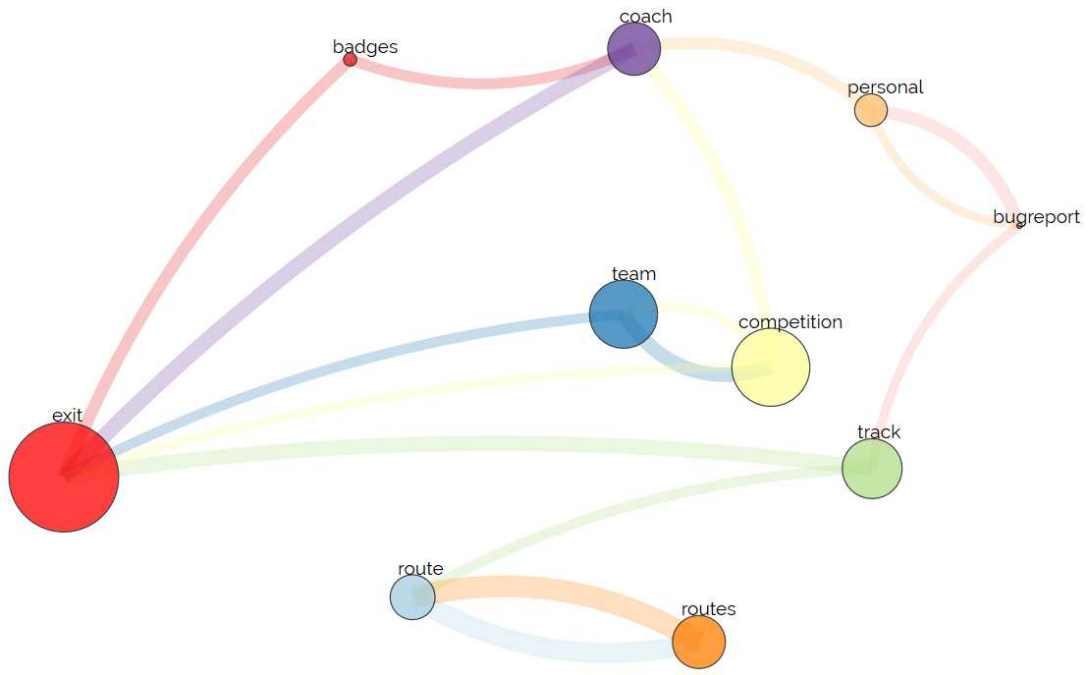
Figure 1 Markov chain analysis of app use