

# Towards Extracting Personality Trait Data from Interaction Behaviour

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**This paper reports on progress made in the PROSKIN project, and especially on extracting personality trait data from automatically recorded interaction data. Traditionally personality data has been collected using questionnaire-based instruments because of the impracticality of using human observers. The position taken in the paper is that using a computer assisted approach for recording and processing behaviour might overcome this obstacle of using a human observer. As part of a pilot test forty participants have been using a web radio over a period of two months. Their interaction data was collected online and participants were asked to complete the IPIP-NEO personality inventory. The results suggest correlations between some personality traits such as agreeableness and neuroticism on one side and on the other side behavioural measures such as the variation in event numbers created in a session and the slope of the number of events over succeeding sessions. Although the results of this small-scale data set are promising, the actual experiment will need a larger participants group and examine more types of behavioural measures. Providing designers with remotely recorded personality data might give them a means to segment their user population and develop new user interfaces that match desires and preferences of the users in these segments.**

*Personality traits, interaction data, log file analysis, computer assisted analysis, segmentation.*

## 1. INTRODUCTION

Where traditionally applications mainly had a single user interface, new technologies such as skinning, allow users to change the 'look and feel' of their applications at run time without modification to the application code. ICQplus, WinAmp and Microsoft Media Player are some examples of applications that already provide these facilities. How individual users experience an individual interface design might however be very different. For example, Brinkman and Love [1] found that people used criteria such as the perceived ease and stimulation when selecting a Media Player interface design. This leaves designers with the question of how to design for such subjective criteria. One approach investigated in the PROSKIN project is to design for individual diversity instead of similarity [2]. For example in a situation where designers already have a customer base using their application, they might want to segment this population and develop separate interface designs for each segment. Among segmentation criteria such as age, gender, nationality and disability, user personality traits have also been suggested as a design relevant criterion [3]. This criterion might be useful because of reported correlations between personality traits and user preference for interface design properties such as colour [4] and themes [5].

Several schools of thought exist when it comes to studying Personality Psychology [6], such as psychoanalytic approach, behavioural and cognitive approach, the humanistic approach, and the dispositional approach. The latter seems the most appropriate when it comes to segmenting a user population. The underlying assumption of this approach is that individuals can be positioned on a number of personality dimensions. Currently the most dominant personality model used in this area is the Five-Factor Model, which uses personality dimensions such as extraversion, neuroticism, agreeableness, conscientiousness and openness to experiences. Longitudinal studies have indicated that a person's position on these dimensions remain stable throughout his or her adult life [7], which supports personality as a viable segmentation criterion. There are several ways to measure the personality of an individual, such as human observations, self-reported questionnaires, and peer-reported questionnaires. Human observations however have been seen as costly and time-consuming [8], and mainly for practical reasons personality instruments primarily rely on self-reported questionnaires. To obtain an acceptable level of reliability, these kinds of questionnaires, for example IPIP-NEO [9], often include 100 or more questions to establish an individual's personality across a number of occasions and behaviours [8]. Filling out such questionnaire could take up several minutes. For designers this might be unfeasible as users might be reluctant to fill out a questionnaire as it interrupts their primary task for which they need to use the application in the first place. In this research we therefore seek an alternative approach of extracting personality trait information from automatically recorded user interaction. Instead of relying on the impractical human observer to record and analyse a person's behaviour, we argue that computers can be used to perform this task automatically. Furthermore, to be of practical value, this alternative should use naturalistic interaction recordings from users pursuing their own goals, using their own application at their own place and time, instead of recordings obtained in the laboratory with a specially created

measuring instrument. The following section will therefore present the results of a pilot study of an experiment that seeks to establish these behavioural-based personality measures.

## 2. PILOT STUDY

The primary aim of the pilot test was to study the reliability and stability of both client and server software that was specially developed for the experiment. However, because of the data collected it was also possible to study correlations between user interaction data and user personality traits. The software includes a web radio, an interface design release mechanism, an online data collector, a questionnaire distribution and collection platform, online questionnaires, and a communication centre for anonymous communication between experimenter and participants. To run the client software participants must install .NET framework, version 1.1 or later, and Microsoft Windows Media Player, version 9 or later, on their PC. Once the client software is installed, participants could tune into a radio station from a list of 318 online radio channels. Both lower-level interaction events, such as mouse clicks on buttons, and high-level events, such as a stream instruction for a specific channels, were automatically recorded locally and later on automatically transmitted to the server. Participants were also asked to complete online the IPIP-NEO personality inventory [9], the Short Test Of Music Preferences (STOMP) inventory [10], and a questionnaire with general descriptive data such as age, gender, disabilities and nationality. Forty people participated in the two months that the pilot study ran. Of the 17 participants that filled out the questionnaires, 13 were male and 4 female. They had an average age of 32 years ( $SD=9.89$ ). Of these 17 participants, only 9 participants used the web radio in more than two sessions, whereby a session is defined as a continuous period that starts when the web radio is started up and ends when the web radio is terminated. The data of these 9 participants was used to study possible correlations between interaction data and personality traits.

**TABLE 1:** Pearson correlations between personality traits and behavioural measures ( $N=9$ ).

Personality trait and sub-traits	M event in session	SD events in session	Number of sessions	Total events	Correlation events and session number	Intercept <sup>a</sup>	Slope <sup>a</sup>
<i>Extraversion</i>							
gregariousness						.69*	
<i>Neuroticism</i>							
anxiety					-.87**		-.69*
anger		-.70*			-.85**		-.70*
immoderation					-.77*		
vulnerability		-.82**			-.83**		
<i>Agreeableness</i>		-.70*					
morality						-.69*	.67*
altruism		-.77*					
cooperation					.75*		
modesty					-.75*		
<i>Conscientiousness</i>							
dutifulness					.71*		
<i>Openness to experience</i>							
imagination			.70*				

Note: \* sign. at a 0.05 level, \*\* sign. at a 0.01 level, <sup>a</sup> pred. number of events in session = intercept + slope x session number.

Table 1 shows the results of the analysis of Pearson correlations between personality traits established with IPIP-NEO inventory and the following behavioural measures: 1) the mean number of events created in a session, 2) the standard deviation of the number of events in a session, 3) the number of sessions, 4) the total number of events of all sessions combined, 5) Pearson correlation coefficient between the number of events created in a session and the session number, 6) the intercept and 7) the slope of the following regression model fitted on the data of each individual participant: *predicted number of events in a session = intercept + slope x session number* whereby session number started with 1 for the first session, 2 for the second session, etc.

## 3. DISCUSSION AND FURTHER RESEARCH

Although the results seem promising, the data set of the pilot study is very small, making the analysis unstable. The sample of the actual experiment will therefore be much larger to reduce the effect that a single individual might have on the outcome of the analysis. Furthermore, the analysis will also look at other behavioural measures that have been suggested to correlate with personality traits, such as the time between to button clicks [4]. The session definition might also need revising as some users keep their PC running including the web radio for weeks without rebooting. A possible alternative would to look at period of no interaction, and use these gaps as separator for sessions. The data collected also provide the possibility to study the predicted power of *interaction* data, such as changing channels and adjusting the volume, and that of *content* data, such as the type of channels users listen to. Prediction of design preferences based on interaction data might have a wide application scope, whereas predictions based on content data might be more accurate as they related to the goal of why people actually use that specific application. While these are still open questions for future research, they suggest that research on computer assist recording and analysis of interaction data might include more than mainly product sales strategies or usability evaluation, as in case of this study measuring the user personality traits.

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