Creating an Application to Administer Custom Social Network Surveys

Dylan Peters, Allison Geary

DUKE COMPUTER SCIENCE

Research

Abstract

Traditionally, researchers focusing on social networks administer surveys to subjects using long paper forms. Subjects list each alter in the network and answer questions about each alter and the connections between them in a large spreadsheet-like table. However, with the ubiquity of touch-screen tablets, as well as subjects' familiarity with this technology, there is potential for improved data collection techniques. The Complex Data Collective (Codaco) has created a JavaScript-based tool called Network Canvas that allows users to visualize and directly modify the distances and connections between alters in their ego-centric networks. This tool is in active development, but researchers with current projects can benefit from modified versions of the application that allows them to generate and administer their own custom surveys.

Objectives

Our team's goal is to customize the Network Canvas tool from Codaco such that researchers with no coding ability can use it to create and administer network surveys with questions and logic particular to the researcher's area of interest. In particular, we want the program to adhere to the following guidelines to ensure maximum flexibility.

- Researchers shall be able to create and administer customized surveys with no coding required.
- Surveys shall be capable of being displayed in the native language of the subject.
- The application shall be capable of collecting data without an internet connection and uploading data to a central data server at a later point when internet is available.

In addition to flexibility, another critical consideration for the application is security. There are two main security criteria to which the final application must adhere:

- At any time while taking the survey or after completing the survey, the subject should be able to withdraw data sharing consent and delete their data.
- The generated data should be readable only by the researchers leading the project. The survey/tablet administrator should not be able to view the subject's data at any point. Other participants should not be able to view the subject's data.
- Data sent through the network shall be securely encrypted.

Methods

In order to achieve our objective of adapting the Network Canvas into a researcher-friendly tool, we will consult with social network researcher Marta Mulawa and computer science professor Robert Duvall. These two experts will offer insight into the requirements for making a flexible, usable program.

The program was originally written using the Apache Cordova framework, which allows developers to embed a web app into a native application, thus creating an application for multiple platforms at one time. Our team will focus specifically on Android tablets, as these are the most useful for research in developing countries.

Results

Our team was able to successfully adapt the Network Canvas application to adhere to the flexibility and security standards we set forth at the beginning of the semester.

In order to make the program flexible, we created a method for researchers to generate new custom network surveys. The researcher writes the survey using a template that saves it as a csv file with the appropriate format, and the csv file is copied onto the tablet or downloaded from a file-hosting service. The program then parses the csv file to create a survey object that is displayable to the subjects. To write surveys that are displayable in foreign languages, the researcher simply translates the text of the csv file, and the foreign language strings are automatically copied in UTF-8 to the tablet.

To facilitate offline data collection, the program saves data locally on the tablet and allows the administrator to upload the data in bulk when the tablet is connected to the internet. Even if the tablet never receives an internet connection, it is possible to download the data from the tablet directly onto a computer for later uploading to a central server.

The second main feature of the app we strove to accomplish was making it more secure. The following features make the application more secure than it was at the beginning of the semester:

When the application is opened, it opens to a new home screen. Previously, the application automatically opened to the last place it was before quitting. Opening to a home screen prevents users from seeing data from the previous user.

In order to perform any "sensitive operations," the user must input the device's passcode. This prevents participants from accidentally or maliciously deleting or viewing other participants' data.

To prevent users with access to the tablet from viewing participants' data, the data stored on the tablet is encrypted using symmetric encryption with a randomly generated key that is stored in secure storage on the device. The files are decrypted and cached in order to upload to a server, and the cache is cleared after upload. The communications with the server are protected by SSL encryption.

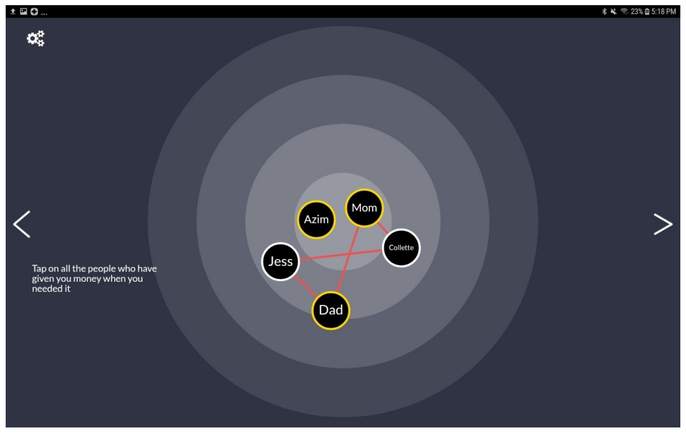

Figure 1: This screenshot of the app shows a survey question prompting the subject to identify which network members have a specific trait. Researchers can customize these questions to fit their own research.

Conclusion

Because we were able to adapt the application to intake a csv file of questions and create a new survey, the app will be viable for future studies involving social networks. In fact, it will be used to collect data for a global health study in Tanzania this summer and could be used for future studies without significant adaptation or knowledge of code. Similarly, our improved security measures, including encryption and password protection, will allow the application to better adhere to Institutional Review Board (IRB) norms and to carefully protect the subjects' data, which is often very personal. These changes will allow the application to gain IRB approval for various projects and to ensure that the subjects feel that their information is secure.

Figure 2: This screenshot of the app shows a survey question prompting the subject to sort network members into a range of different options. Like in Figure 1, researchers can customize these questions to fit their own research.

References and Acknowledgements

We would like to thank Basant Singh, Josh Melville, and the Complex Data Collective team for providing the app framework for us to build on. We would also like to thank Professor Duvall and Dr. Mulawa for giving us guidance with the project this semester.

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