Friendship Simulator – Discover Potential Emotion Between Friends

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Abstract

This Paper will present you an interesting App called Friendship Simulator. This purpose of this App is to discover user's potential emotion towards friends through Affectiva[1] which is a facial detection SDK that could be embedded in Android environment and Text-based Stimuli. And the other part of this paper will give you a view about the data collected by this App through User Study. And the data will be analyzed by linear regression model via R Studio[2].
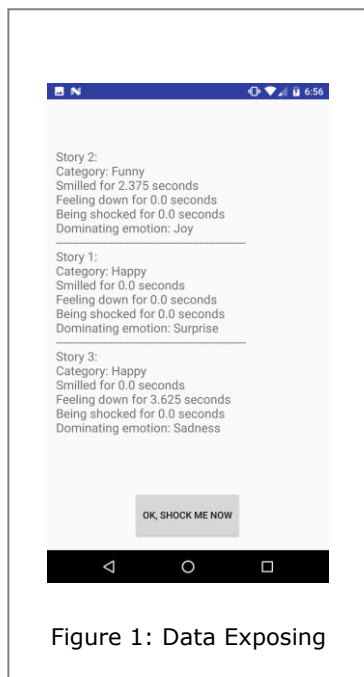
Author Keywords

Emotion; Facial Expression; Linear Regression; Text Stimuli

ACM Classification Keywords

H.5.m. Information Interfaces and Presentation (e.g. HCI): Miscellaneous

Introduction

Friendship simulator is using Text-based Stimuli and Facial Detection technology to obtain user's emotion data. And based on that data, this app will using some formula to generate a conclusion about how user is feeling about his/her friend(s). Besides, the other interesting side about this paper is that we will use the data collected by this app to carry out some prediction and correlation analysis using R Studio[2].

Text-Based Stimuli

Basically speaking, Text-Based Stimuli means showing user some story that could trigger user's emotion change. Just like what they have in the paper named **Influencing Visual Judgment through Affective Priming**[3]. The stories for this App fall into three categories: Happy, Sad, Funny. And the data processing inside the App will carry out data differently based on different kind of story. For example, if a user read a happy story, and didn't show any emotion on his/her face, this could be a deduction for the friendship credit. But if this was a sad story, then there will be no deductions. Because face with any emotion sometimes is a sort of negative emotion expression.

The way it presents the story is quite simple. It will have some story with conversation or interaction in any form between two people, and it will fake you and your friend into it to make you feeling some fictional emotion change to your friends. The length of story will be limited usually under 200 words. Because user will lose more concentration with more words.

Affectiva

Affectiva SDK[1] is powering up this App to get user's facial data during the story reading (using camera). And the raw data will fall into 3 different kinds: Joy, Sad/Anger, Surprise. And the data will be sent to back-end 8~9 times a second. Based one that, we will have a bunch a of data after the reading. But only few of them are valuable. We will set some threshold to filter the data. For example, for Joy the threshold is 45, and for sad, the threshold will lower, maybe 18 or 19. Because user tends to show no emotion when they are sad.

Related Work

Online Web-based Fortune tellers. Especially the web apps embed in WeChat[4]. In this kind of web app, you provides very little information(most likely just your name), and then you will get some life advice/predictions.

Friendship Simulator is obviously inspired by those online fortune tellers. So the main purpose of this app is just like all the related works: to entertain people. But there is a big difference here too. We are doing the entertainment with some serious method and analysis here which could make the outcome more accurate and more interesting.

Work Flow & Methods

The first step of this App working is to get some basic information about user and his/her friends which are only name and gender. After that, a self evaluation will be presented to user. This evaluation asks user to provide two kinds of feeling evaluation from user: Friendship and Crush. After the evaluation, a randomly picked story will be presented to user. And of course, it will allow user to choose what kind of story he/she would like to read: happy, sad, funny, or random. After the reading, user could choose to go to next story reading or go to the data exposing & conclusion. Inside the data exposing section, this App will expose processed human readable data to the user like Figure1. And in the conclusion part, this app will give user a friendship score and a crush score about user and his/her friend which are calculated based on the data exposed before. The whole work flow is visualized as Figure 2. For the data processing part, we took three kinds of data in like we talked before, and then we come up with two kinds of intermediate data: lasting time for each emotion and dominant emotion. Based on the intermediate data, we will carry out the final scores.

Figure 1: Data Exposing

	Real	Conclusion
User1	105	112
User2	96	98

Table 1: Friendship Score From a Couple of Lover

Figure 2: Friend Simulator Work Flow

	Real	Prediction
User1	146	150
User2	99	76

Table 1: Crush Score From a Couple of Lover
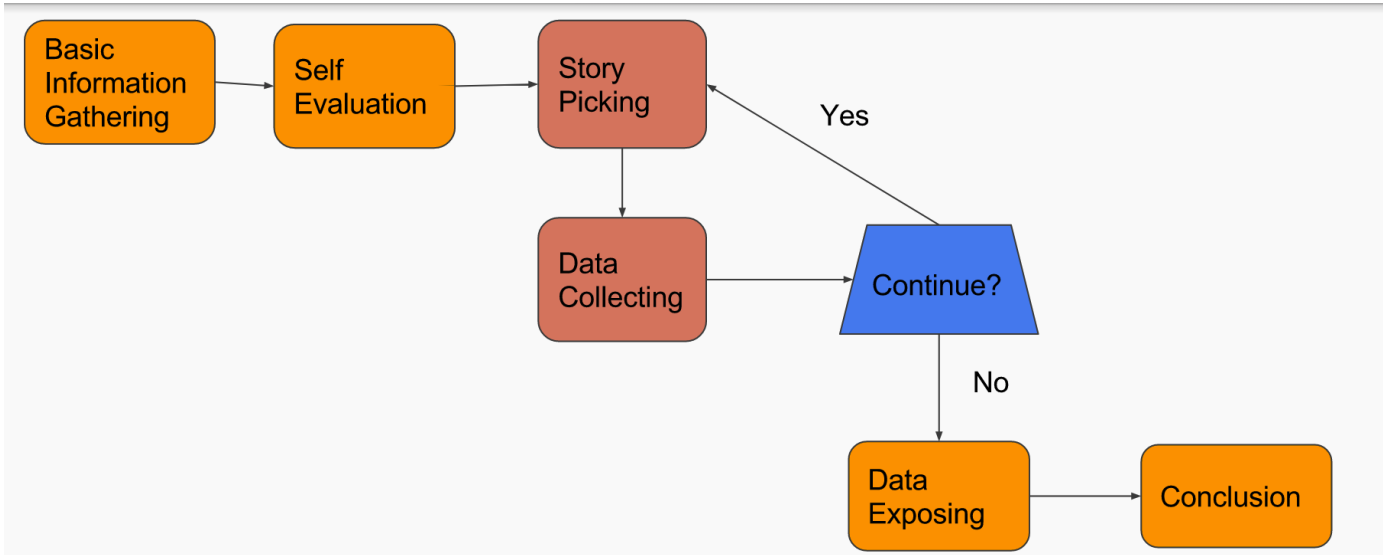
Pilot Study & Result

A pilot study was conducted several weeks before the final user study. There was only one participant in this study. The purpose of this pilot study is to make sure which mode will give us more accurate data: reading with random style or reading with one single style. The participant was asked to use the App two rounds in total. During the first round, the participant read 3 different happy story. And for the second round, the story picking will be random. Based on the comparison of conclusion and the pre-evaluation, and user feedback. The random story style will give us more accurate outcomes. One of the reason is that user will get tired to one single type of story. And after being emotionally tired, the facial reaction will keep fading away. The data for pilot study is in Figure 3.

	A	B	C
Name Box		All Happ Stories	Random Stories
2	Average Smile Time(seconds)	3.125	15.875
3	Average Surprise Time(seconds)	0.125	0.583
4	Average Sad Time(Seconds)	0	0.013
5	Friend Score	112	41
6	Lover Score	160	76
7	Pre Feeling as Friend	Best Friend	Best Friend
8	Result Feeling as Friend	We're Cool	Almost Stranger
9	Pre Feeling as Lover	Cannot without her/him	Crazy for her/him
10	Result Feeling as Lover	Cannot without her/him	Cannot without him/her
11			

Figure 3: Data Collected From Pilot Study

User Study & Result

The final user study was conducted on 3 different participants with 4 rounds: 2 rounds for a couple of lovers and 2 rounds for two normal friends.

There are two main purposes of this user study. One is to collect more data from users for statistical analysis later. And another one is to see if there there is any different effect by using this app between friends and lovers. The result is pretty shocking. Because there is a very big difference between the effect of this App utilized between friends and lovers. The study conducted on lovers gave us very accurate outcomes on both friendship and crush side. But the study conducted on friends will give us some super inaccurate data on the friendship side. The big reason here is that this App is using mainly romantic story for happy stories. That will make people feel kind of uncomfortable if they are just normal friends without any crush in between. And that will give us somewhat inaccurate outcomes for friendship. The data is shown as Table1 and Table 2.

Statistical Analysis

The linear regression analysis and prediction was applied to the data we gained from the user study. And we used R Studio[2] to do the analysis. Figure 4 is the overview about the datasets. The most important thing we want to do here is to find which kind of data plays the most key role to decide user's emotion towards friends: Sad, Happy, Surprise, or combined? Again the result from the linear regression was very surprising. The most important variant to determine the emotion between user and friends is surprise. The fitting between surprise data and accurate score have the

lowest p value among all the other combinations including all emotion combined. And as shown in Figure 5 the p-value of fitting between surprise data and crush & friendship score is the only p-value that was under significant level to reject null hypothesis which means that surprise data should be key data in this system.

Figure 4: Overview of Dataset in User Study

```
Call:
lm(formula = friendship ~ surprise)

Residuals:
        1        2        3        4        5        6        7
   1.3407  -0.3373  -3.8668   8.2306  14.5231 -11.4134  -8.4769

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)   92.477      5.698  16.230 1.62e-05 ***
surprise      16.780     10.312   1.627    0.165
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 9.976 on 5 degrees of freedom
Multiple R-squared:  0.3462,    Adjusted R-squared:  0.2155
F-statistic: 2.648 on 1 and 5 DF,  p-value: 0.1646
```

Figure 5: Test Result between Surprise Data and Friendship

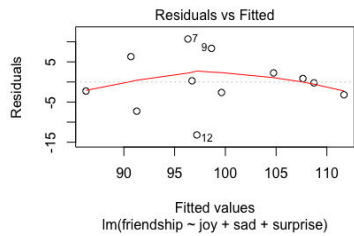|	Conf	Pred
fit	105.9	105.2
lwr	91.2	76.3
upr	119.9	134.1

Table 3: Prediction on Surprise Data

Figure 7: Fitting Plot Between Combined and Friendship Score
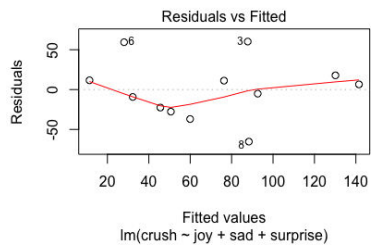

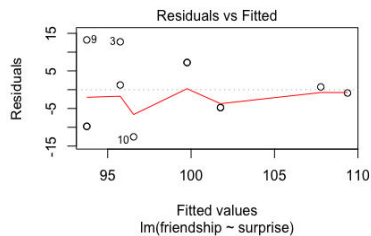Figure 8: Fitting Plot Between Combined and Crush Score

Figure 9: Fitting Plot Between Surprise and Friendship Score
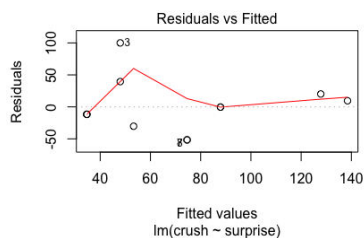

Figure 10: Fitting Plot Between Surprise

```
Call:
lm(formula = crush ~ surprise)

Residuals:
      1        2        3        4        5        6        7
14.5097   0.2793   7.3739 -39.3380  14.0261 -10.8771  14.0261

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)    8.974     12.314   0.729  0.49885
surprise     142.304     22.284   6.386  0.00139 **
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 21.56 on 5 degrees of freedom
Multiple R-squared:  0.8908,    Adjusted R-squared:  0.8689
F-statistic: 40.78 on 1 and 5 DF,  p-value: 0.001394
```

Figure6: Test Result between Surprise Data and Crush

The fitting of all emotion combined and surprise data stand alone is plotted as Figure 7 ~ 10. These two are the only two kinds of data that seems to have some relationship with the final score. A prediction based on surprise data to friendship & crush score then was conducted with linear regression model. The result is shown as Table 3.

Limitation
The limitation of this app is that it seems this app will not work very well on users that they don't have any crush on the friend they provided. Maybe the title of this App could be replaced by "Crush Simulator" instead of "Friendship Simulator".

Conclusion
The user study provides a lot of interesting findings about the data we collected. The main thing is surely the surprise data dominates in this App. And we could probably dig deeper on using the surprise data in the future.

Another very important conclusion is that this App will have very accurate outcome when the user has crush on the friend(lover), but very bad outcome when the user doesn't have any crush on the friend. This is based on the user study conducted on two different groups: lovers and normal friends.

Acknowledgements
I thank all the participants of pilot and user study and our dear professor who allow us to have our own idea to develop something cool about Affective Computing.

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