An Empathic Agent that Alleviates Stress by Providing Support via Social Media

(Extended Abstract)

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ABSTRACT

This paper describes the development of an 'artificial friend', i.e., an intelligent agent that provides support via text messages in social media in order to alleviate the stress that users experience as a result of everyday problems. The agent consists of three main components: 1) a module that processes text messages based on text mining and classifies them into categories of problems, 2) a module that selects appropriate support strategies based on a validated psychological model of emotion regulation, and 3) a module that generates appropriate responses based on the output of the first two modules. The application is able to interact with users via the social network Telegram.

Keywords

social media, empathic agents, chatbots, experimentation, text mining, emotion regulation

1. INTRODUCTION

In order to help people to cope with everyday stess, *peer support* seems to be a promising means [1, 3, 5, 7]. In our current society, one of the quickest and most frequently used approaches to provide peer support is to use online social networks since this type of support only requires sending a short text message at appropriate moments. Indeed, as concluded in [6], sharing problems and showing affection are among the most common reasons why people use social media.

In spite of its strong potential, helpful peer support is not always available for users of social media, for the simple reason that some people have fewer friends than other. Moreover, even people who have many friends do not always want to share their problems online, particularly when their problems are very personal.

To deal with this problem, this paper is part of a project that explores the possibilities of *computer-generated peer support* via online social networks. More specifically, we introduce the concept of 'artificial friends' that have the ability to analyze text messages that people share via online social networks, and generate appropriate responses to these messages with the aim of helping them to deal with their 'everyday problems' (pretending to be a friend instead of a specialist).

In previous work [4], we conducted a survey via a crowdsourcing platform in order to: 1) identify the most common types of stressful situations shared by people via social media and 2) determine the strategies used by users to support stressed friends in these situations. The resulting data were used to provide a categorization of stressful situations and corresponding support strategies (see Table 1), inspired by the concept of *emotional self-regulation* introduced by Gross [2] as well as the work by Heaney et al. [3].

Taking this categorization as a point of departure, we are developing a chatbot that simulates a friend with the ability to help human users to cope with various stressful situations. The current paper presents a first prototype of such a support agent.

2. SUPPORT AGENT

Using Python, we developed a bot for the Telegram Messenger App, since it provides a public API. We used MongoDB to manage the data generated by our bot. The respective code is available on GitHub[1]. In the current section we discuss the specification concerning the complete version of the bot.

The algorithm behind our agent is based on the results obtained from the study reported previously. The assumption is that the bot receives as input certain messages from users that share stressful personal situations. For each received message, the bot first identifies the type of stressful situation that is involved (for instance, 'relationship' or 'work'). Then, given this stressful situation, the bot selects a type of support strategy that will be used to generate a comforting message. The following support strategies are used: *situation selection* (s.s.), *situation modification* (s.m.), *attentional deployment* (a.d.), *cognitive change* (c.c.), and *general emotional support* (g.e.s.). Table 1, taken from [4], shows how often each strategy was applied (in our previous study) to each type of stressful situation. In the current paper, these frequencies are used by the bot as probabilities to select a particular strategy, given a certain situation. For instance, in case an incoming message is classified as a

[1]https://github.com/leninmedeiros/Stress-Support-Bot

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Table 1: Frequency table for all types of support identified. The bot uses these data to select its support strategy.

	g.e.s.	c.c.	a.d.	s.s.	s.m.
relationship	29%	21%	18%	14%	18%
work	17%	44%	17%	0%	22%
death	53%	27%	0%	0%	20%
financial	40%	40%	0%	0%	20%
disease	11%	56%	22%	0%	11%
exams	0%	25%	0%	0%	75%
other	56%	22%	0%	11%	11%

'work' problem, the agent is most likely (with a probability of 44%) to generate a comforting message of the type 'cognitive change'.

In more detail, the workflow of the application as a whole is as follows:

1. A given user sends a message to the bot (here is important to state that, for now, we are assuming that any message sent by a given user is a description a of stressful situation – we will adjust it in the future in a way that the bot can assess automatically whether or not an incoming message classifies as a stressful situation);

2. The bot will try to identify the type of the problem reported by the user. To do so, it uses sets of key words (for the different categories shown previously). Such bags of terms (also available on GitHub) were designed based on the data obtained from the pilot study [4] as well as the most common synonyms of these words. The current version can only deal with English words;

3. After deciding the type of the stressful situation, the bot will select an appropriate support strategy, using the percentages provided in Table 1 as probabilities. ;

4. Finally, after having both the problem and the support strategy identified, the bot will send a support message back to the user. These messages are constructed based on a number of 'template sentences' that have been developed (again, based on the data collected previously). These template sentences contain some slots that can be filled in with domain-specific terms related to the stressful situation identified (e.g., 'This seems to be a difficult [XXX] situation indeed!').

When it is up and running, our bot can be found by searching for 'stress_support_bot' on Telegram. After opening a conversation window with the bot, the user must type the command '\start' to initialize the bot (see Figure 1). Figure 2 shows two fragments of simple interactions between a human user and our bot.

3. CONCLUSION

A thorough experiment to evaluate the bot's accuracy as well as its user experience is currently being conducted. Initial results point out that the bot is able to correctly classify incoming messages in the vast majority of cases (over 80%), and that users are generally positive about the appropriateness of the bot's support messages. Although extensive

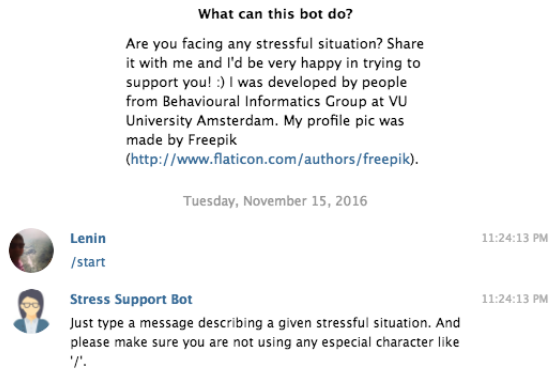

Figure 1: A given human user starting a conversation with our bot.

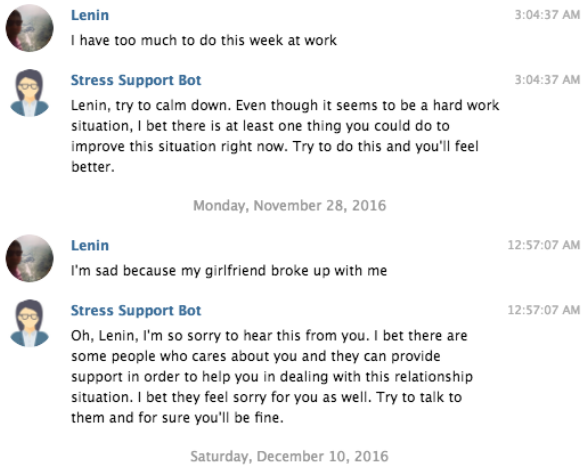

Figure 2: A given human user sharing stressful situations with our bot.

further testing is obviously required, the expectation underlying this research is that the proposed support agent can help reducing the stress people experience in 'everday situations' by generating tailored response messages, and that this is particularly helpful in cases where users do not receive comforting responses from their human peers.

In future work we intend to explore various possibilities to extend the functionality of the support agent. For example, instead of only addressing simple interactions consisting of one incoming message and one response message, it would be interesting to tackle more complex types of interaction, which could eventually result in entire human-agent conversations. Another idea for follow-up research is to place the bot within an online group of people that are mutually helping each other to cope with stress. This would extend its scope from one-to-one settings to group settings, thereby further broadening the potential impact of this promising type of technology.

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