Chapter 2
The Architecture and Early Findings of a Working SMS-Based System for Individuals with Mild to Moderate Depression

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ABSTRACT
Depression is one of the leading mental health disorders in the world. With an exponential rate of growth, the disease will soon surpass the ability of health care professionals to monitor and treat individuals. The use of mobile technologies offers new insights into disease progression, real-time emotional reaction data collection, and care in vivo. This chapter describes the architecture of a software system that continuously monitors an individual’s emotional state through SMS and responds to the individual with supportive text messages. Along with early findings from the working system, the development of the emotional state queries and responses is described.

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INTRODUCTION

By moving health monitoring out of the hospital and doctor’s office and into an individual’s living environment through mobile technology, it can be a key factor in reducing the costs of healthcare and the costs of entering a health facility. Technology can also be used as an adjunct to the care extended by health professionals. Through the development of learning-based systems that can collect real-time data through an individual’s mobile phone, a user’s behavior can be modeled and associated with the progression of their disease. From the development of reliable models, new information about the progression of diseases can be discovered. With more accurate knowledge the development of systems using mobile technology, specifically mobile phones, could ultimately assist in improving treatments for diseases, and offer an extension care through short instances 24/7.

This chapter will present a software architecture for a text messaging (SMS, i.e. short messaging service) system, called COMPANION, that queries the emotional state of individuals suffering from mild to moderate depression and then responds to the individual with a clinically-developed emotional support text message. At the end of this chapter the reader should be able to:

- Describe the overall purpose of the COMPANION system.
- Discuss the architecture of the COMPANION SMS software system.
- Identify other areas within healthcare where COMPANION might be effective.

BACKGROUND

The World Health Organization predicts that by 2020, depression will be the leading cause of disability worldwide (Lopez & Murray, 1998). It is already one of the most common mental health disorders in the world. There are levels of depression that range from mild to moderate, to major depressive disorder. Each level can signal different stages of the diseases progression or different degrees of symptoms. For instance, individuals suffering from major depression will experience a depressed mood, marked diminished interest or pleasure in activities, an inability to function in normal daily activities, and have a combination of symptoms that may include disturbances of sleep, changes to appetite, fatigue, and diminished ability to concentrate to name a few (Beard, Wilson, Morra, & Keelan, 2009). Treatments for this level of depression can be a single mode (medication) or a combination (medication with talk therapy). If not treated, individuals suffering from major depression can ultimately end up hospitalized and any hospitalization, whether due to a physical problem, mental disorder, or co-morbid conditions are extremely expensive (AHRQ, 2006; Kaiser Family Foundation, 2010). Actually, if an individual does not have a mood disorder but is being hospitalized, it has been found that individuals often experience depression while in the hospital (Philbrick, Rundell, Netzel, & Levenson, 2012). Now, with two diseases, the individual is likely to stay longer in the hospital and have costs for their care (Philbrick et al., 2012). Individuals suffering with mild to moderate levels of depression often experience two to four symptoms such as a depressed mood, feelings of sadness, loss of appetite, or difficulty sleeping, for two weeks or less. A diagnosis of minor depression is not an officially recognized diagnosis by the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) (Williams, Hitchcock-Noel, Cordes, & al., 2002).

Depression, as noted above, can be effectively treated through antidepressant medications and/or psychotherapy (talk-therapy) (National Institute of Mental Health). But, with 121 million people (National Institute of Mental Health, 2012) diagnosed with depression and the number increasing,