Mobile Apps for Stimulating Healthy Life: Walky Doggy Reference Example

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***Abstract*—Lack of physical activity leads to such diseases as diabetes, stroke, osteoarthritis and other noncommunicable diseases. Therefore, it is very important to stimulate physical activity. One of the simplest types of physical activity is walking on regular basis. It was shown that regular walking allows to reduce the risk of different diseases and disabilities, has positive effect on immune system, emotional status and quality of life. One of the possible approaches to motivate people to go walking is dog walking. The fact that the dog needs to be walked everyday at the same time periods makes dog walking a good and effective sort of physical activity. However, acquiring a dog brings some restrictions in the dog owner's life and requires the owner to take care and responsibility of the dog. These restrictions can be overcome with a mobile applications that emulate dog's need for a walk provoking user to go walking. Moreover, such kind of application can be very useful for other use cases. For example, in a case when a kid asks his or her parents to acquire a dog and parents want to be sure that their kid will take care and responsibility for that.**

I. Introduction

In the XXI century, noncommunicable diseases (NMDs) became the most dangerous enemy of the mankind. In 2008 63% or 36 million of global deaths were caused by the NMDs [1]. And this number is rapidly growing projecting to rise to 52 million deaths in 2030 [2]. Noncommunicable diseases, also known as chronic or lifestyle-related diseases, comprise cardiovascular diseases, chronic respiratory diseases, chronic pulmonary diseases, cancer and diabetes.

One of the four factors that significantly raise the risk of NMDs is prevalence of physical inactivity [3]. The lack of physical activity together with unhealthy diet leads to the overweight and obesity that, therefore, lead to such diseases as stroke, diabetes, cancer, osteoarthritis and liver disease. Thus, different approaches for motivation and stimulation of physical activity among people are needed now.

The XXI century also became an age of the portable personal electronics. Nowadays, almost everyone has at least one cellphone, smartphone or tablet. Such massive distribution of these devices allows to use them in promotion and motivation of the healthy lifestyle for everyone [4], [5]. Nowadays, there is a lot of fitness and healthy lifestyle mobile applications presented on the market. These applications range from simple exercise guides to complex activity trackers that allow to automatically measure and track different types of user's activities [6] and virtual trainers [7].

In this paper we describe another approach for motivating people for regular walking with the use of mobile application. The main idea of this approach is to accompany user with the virtual dog that associate itself with the real dog for the user and requires dog walking, but devoid of any other need in care. We also present Walky Doggy application that uses this approach and aims to stimulate user walking on a regular basis.

The rest of the paper is organized as follows. In Section II we discuss the impact of the regular walking on health and give detailed description of our approach. Section III contains description of the Walky Doggy application. In Section IV we compare Walky Doggy application with existing solutions for tracking physical activity. In Section V we discuss future development steps and possible features of the Walky Doggy application. In Conclusion we summarize the idea of using smartphone application as the replacement of the real dog to stimulate physical activity.

II. Motivation

There is a need for stimulating physical activity, especially among old people [8]. A lot of studies were held to research an impact of the regular basis walking on aged people. Melzer et al. [9] in their study showed that regular walking improves postural stability and balance control among people under 70 ages. Walking on a regular basis activates glucose metabolism, which can be very beneficial for people with diabetes [10]. The study by Nieman et al. [11] showed that regular 30-minutes walk causes positive immune changes. It was also found that brisk 20-minutes walk 3 times per week reduces the risk of the cardiovascular diseases [12]. The Look AHEAD (Action for Health in Diabetes) Trial showed that increasing level of physical activity reduces the risk of mobility-related disabilities and leads to weight loss for aged people [13]. Finally, regular walking has positive effects on cognitive function, emotional status and even quality of life [14].

However, one of the Look AHEAD Trial findings showed that aged people are very amenable to lifestyle intervention [15]. It means that if particular adult was not physically active before, then there is a significant possibility that he or she will not change it in future. This will lead to gaining weight and increasing risk of mobility-related disabilities and other diseases for the person. Therefore, a considerable motivation is needed for such people to increase their physical activity.

One of the possible motivations is a dog. In [16] authors

claim that acquiring a dog could be a good stimulation for non-dog owners to initiate regular walking in a form of dog walking. However, acquiring a dog can be a difficult burden for the aged people, as dogs require much care, such as feeding and veterinary medicine. Aged people would not take such a big responsibility that requires a lot of effort from them. Moreover, having a dog complicates the mobility possibilities for its owner, as the dog cannot be leaved alone for the time of the trip. Lastly, sometimes people just cannot acquire the dog because of the allergy.

All of these restrictions can be overcome if dog is replaced with a smartphone application. Such an application can emulate the need of a dog for a walk by just notifying the owner about it and controlling a time spent for a walk. This type of applications allows to initiate regular user's walking everyday it the same periods of time.

In addition, such virtual dog application can be helpful for parents, whose kids want to have a dog. In this case parents are not always sure if their kid will be enough responsible for acquired pet. Even if the kid asserts parents that he or she will take care of the dog, it does not mean that it will be so, as it is a kid. In such situations parents can propose to the kid smartphone application as a kind of trial before acquiring real dog. This application will require from the kid to systematically go for a walk in spite of the bad weather, fact that the kid does not want to do it or anything else. Such emulation will show parents if their kid is ready to take care and responsibility of the real dog or not. Furthermore, in such use case the application will rear kid's sense of the responsibility.

Moreover, such smartphone application will bring a very useful tool for the parents that allows to track and control physical activity of the kid. Furthermore, the application can contain social and motivational components that will stimulate kids to be more physically active. These components will be discussed in Section V.

III. Description of Walky Doggy Application

Walky Doggy is an activities stimulating fitness application for devices on Android platform, which forces the user to take walk exercise by emulating behavior of a dog that needs to go outside for a walk. The main aim of the application is to motivate user to go for a walk every day at the same time. Walky Doggy provides a virtual dog with the only need—need for a walk—that notifies user about it.

The main screen of the Walky Doggy application contains information about closest walk time (Fig. 1). It also allows to start the walk immediately in a case user does not want to wait for walking time or will not have a time to walk later and have some free time right now. Such action will count this early walking in place of the closest walk and will reschedule next walking time.

User can adjust walking times on the settings screen (Fig. 2) that can be opened from the main screen of the application. To be more similar with a real dog behavior application requires to set up time for at least two walks per day. User can also set up the time required for each walk. In addition, user can personalize the app by setting own picture

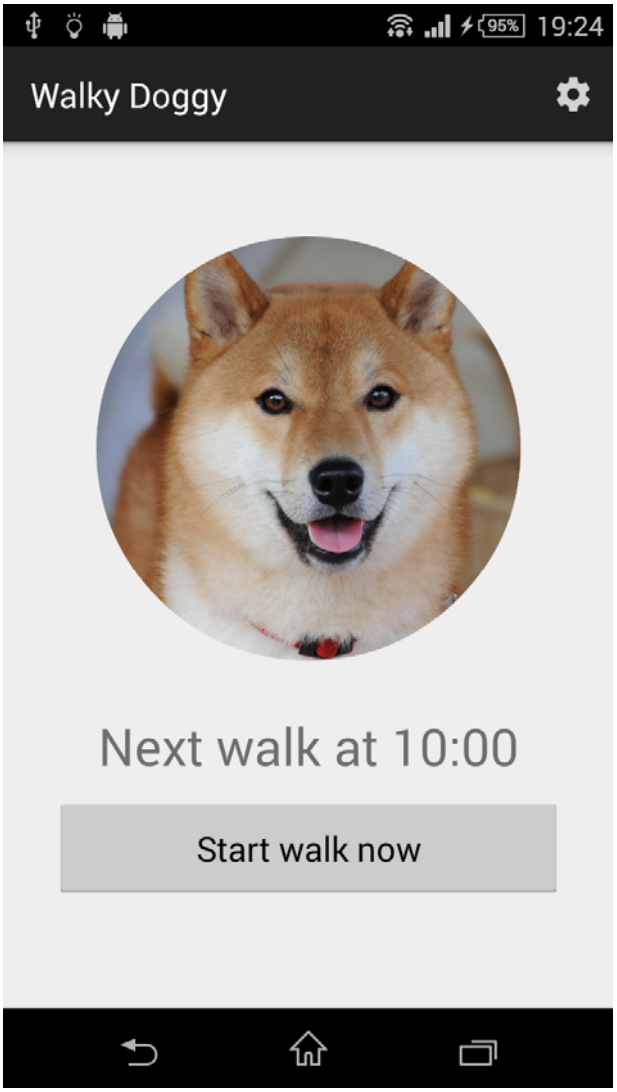

Fig. 1. The main screen of the Walky Doggy application

of dog and barking sound that will be played to notify about the need for a walk. Such customization features allow user to associate application with the real dog.

When time comes for a new walk application notifies the user about it with the dog's barking and a message in the status bar of the smartphone. If user ignores this notification, application starts to attract user's attention more actively by increasing the volume and intonation of barking. Such kind of actions emulates real dog behavior. When the user accepts the notification, the applications goes foreground and offers to start a walk (Fig. 3). If user agrees for that, application shows walking screen (Fig. 4), where current walk progress is shown.

Walky Doggy application requires to walk for at least 30 minutes. Therefore, the progress of the walk is shown as the time left for walking. In addition, Walky Doggy application contains step counter that shows the number of steps of the current walk on the walking screen. Such a feature allows user to estimate his or her physical activity during the walk.

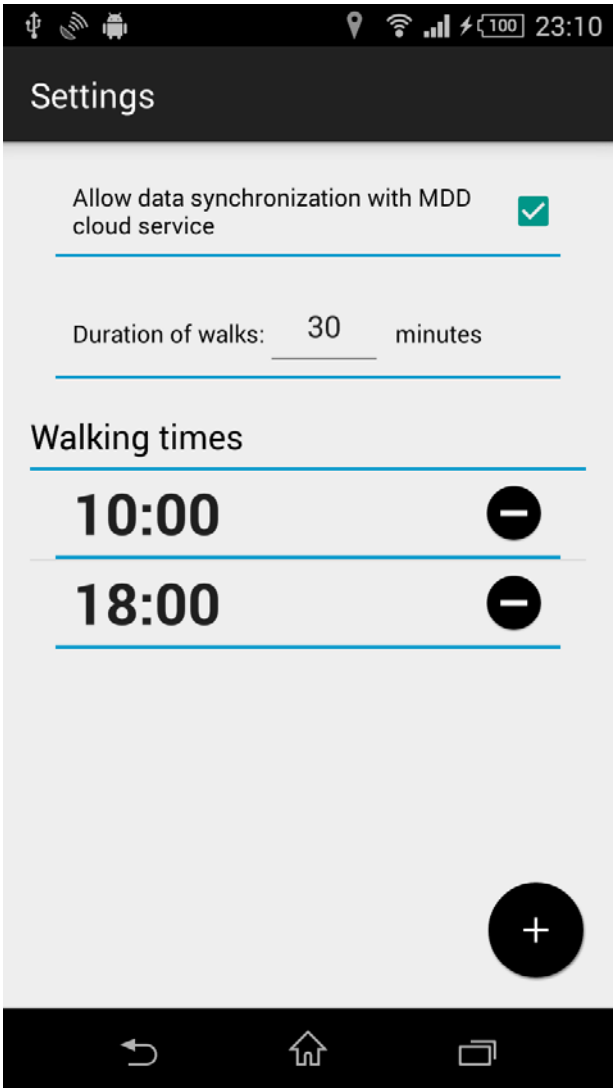

Fig. 2. The settings screen of the Walky Doggy application

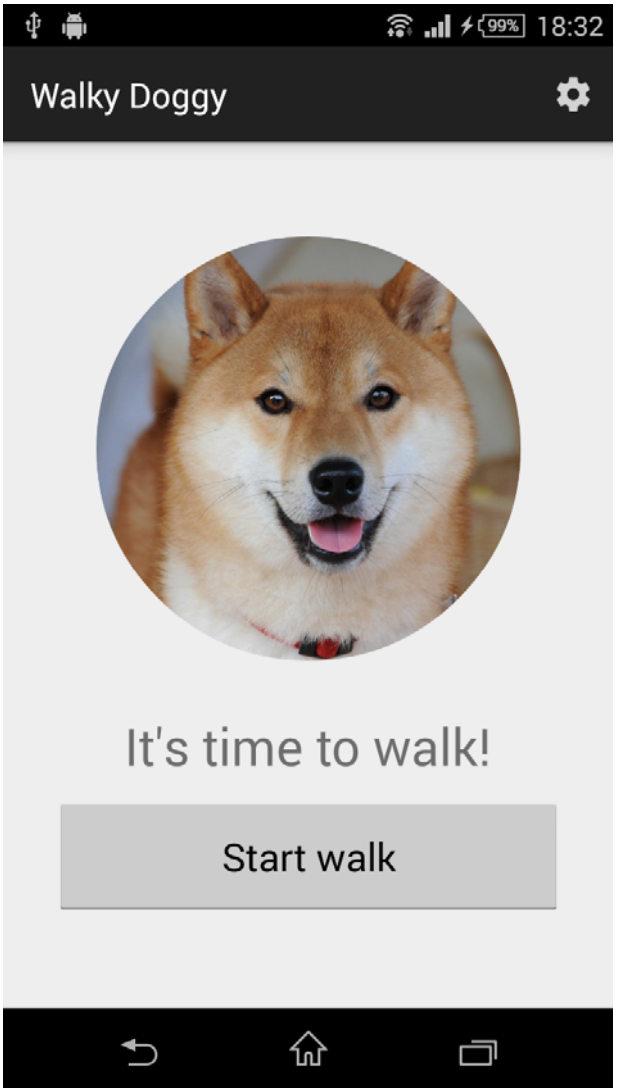

Fig. 3. Walky Doggy is asking user to take a walk

IV. Comparison with Existing Solutions

Nowadays, there are a lot of different mobile applications for tracking user's activity presented on the market. Such applications allows to track different types of activity, such as walking, running and cycling. In this section we will describe one of the most popular mobile activity trackers (Google Fit, Microsoft Health, Moves and Endomondo) and compare them with Walky Doggy applications.

Google Fit[1] is a service provided by Google to track and store information about user's activity. The service consists of applications for Android and Android Wear platforms and also a web application. The service allows to track information about walking, running and cycling, such as time spent for activity, counted steps and distance. Google Fit also allows user to track his or her weight. The motivation to physical activity is achieved through setting personal activity goals, automatic estimation of reached goals and comparison of previous results with new ones.

Microsoft Health[2] is cloud-based service by Microsoft that collects, stores and analyzes information from different activity-tracking devices, mobile applications and services. The service provides insights based on different types of user's activity, such as the time needed to recover before next exercise session. As Google Fit, Microsoft Health allows to set up personal activity goals and track the progress of achieving them.

Moves[3] is an application for Android and iOS platforms that tracks information about users running, walking and cycling. The information includes steps, duration, distances and calories burned. Moves shows user's daily activity in a form of storyline with all the information about different types of physical activities and a map that shows places where user has been in-between activities.

[1]https://fit.google.com

[2]https://www.microsoft.com/microsoft-health

[3]http://www.moves-app.com

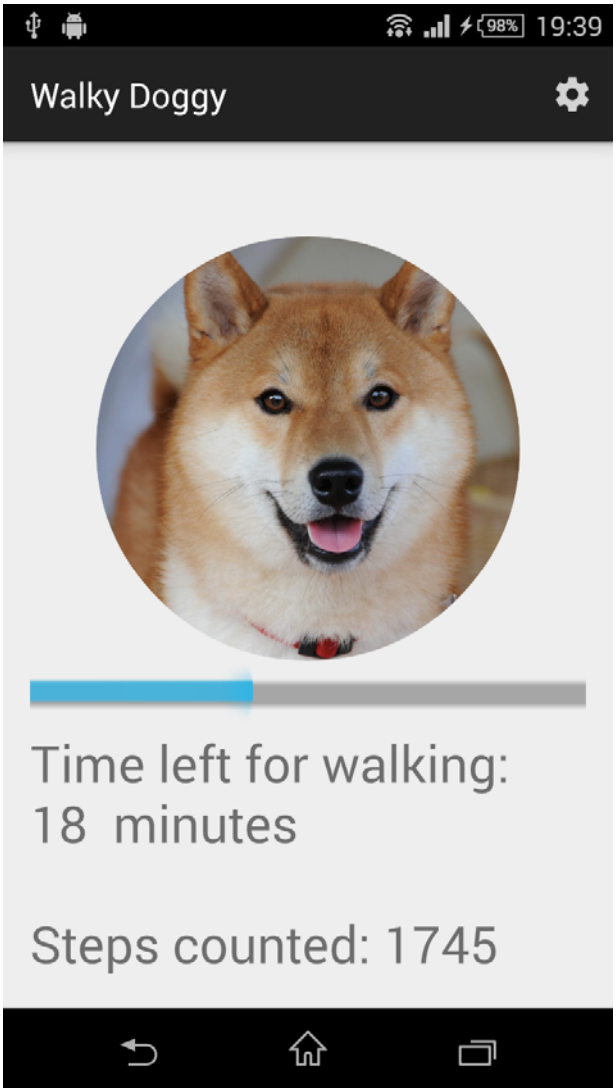

Fig. 4. Walking progress screen

Experience Endomondo[4] is a mobile application for Android, iOS, Blackberry and Windows Phone platforms that allows to track different types of distance activities, such as walking, running, cycling and swimming. The application motivates user for physical activity through setting up personal goals and different types of social activity. This social activity includes challenges and peptalks with user's friends, sharing routes and results with friends in application's community or on social networks.

The motivational part of all of such mobile activity trackers consists of either setting up personal activity goals or social component, which allows to share user's result with friend and compete with them, or both of them. Such types of motivation are effective for the young and middle-age people, but they are not very effective for old people. Walky Doggy presents different approach for motivating people for physical activity that is based on user's sense of responsibility. Such approach is more influential for old people to stimulate them for daily physical activity. It also allows to cultivate the habit of daily walking that is very healthy, especially for old people. Moreover, Walky Doggy can be used for rearing the sense of responsibility among kids that cannot be achieved with the use of usual activity trackers.

[4]www.endomondo.com

V. Integration with Personal M-Health Ecosystem

A. Medical Cloud Service Synchronization

One of the strategic goals for the Walky Doggy project is in integration of the meter of physical activity of the user with the existing medical MDD cloud service[5]. This cloud service provides medical data aggregation, storage, tracking and visualization functions. The service collects different user's medical and health data from different sources, processes it for automated pre-diagnostics (highlighting critical changes of health for the doctor) and provides well organized representation of the data and pre-diagnostics results for all collected parameters on one timeline with separate representations optimized for doctors and for users themselves.

MDD cloud service already allows to collect data from several mobile tracking applications. These applications include:

- Blood Pressure Diary[6]—is an application for Android platform that allows to collect, track and visualize user's blood pressure and heart rate measurements. The application allows to present data with the graph and show statistical summary of the data. These features are very helpful for doctors that observe patients with cardiovascular diseases. The application also can analyze user's measurements and provide information whether the results of the measurements are normal or not. The application contains other useful features such as multiuser support and notifications, which user can use either as reminders for taking medicaments or measuring blood pressure. User can input measurements manually, but application supports two more handy ways of doing this. The first one is receiving the data directly from Bluetooth- and NFC-based blood pressure monitors by A&D. The second one is by recognizing the measurement data from the screen of the usual blood pressure monitors [17].
- Weight Diary[7]—is an application for Android platform that allows to track and visualize user's weight measurements. The application can automatically classify weight measurement based on the WHO/ISH BMI classification. The application is very useful for people that monitor weight, e.g., groups of patients with restrictions of movement, diabetics, etc.
- Healthy Sleep Diary[8]—is an application for Android platform that allows to track user's sleeping time. The application allows to set up personal daily or weekly norms of the sleeping times. Healthy Sleep Diary helps user to monitor sleeping and motivates to follow regime, go to bed early by manual sleep time

[5]http://fructmd.com
[6]https://play.google.com/store/apps/details?id=org.fruct.yar.bloodpressurediary
[7]https://play.google.com/store/apps/details?id=org.fruct.yar.weightdiary
[8]https://play.google.com/store/apps/details?id=org.fruct.yar.healthysleepdiary

monitoring. This is important for people with various types of diseases, plus it provides very relevant context information for analysis of other health parameters.

- CardiaCare[9]–is a tool for continues monitoring and analysis of patients ECG, heart activity and arrhythmia detection [18]. The data is collected and proceeded in the real time from wearable ECG monitors (a few types of ECG monitors are supported). Thanks to joint use with Walky Doggy it will be possible to get long-term monitoring of the heart health when user is not moving and while it is walking, which is crucial for diagnostics of a set of diseases. Currently the application is available via Nokia Store and Opera Store for S60 devices and in April 2015 it will be also released for Android.

Thereby, MDD cloud service contains different types of user's data and measurements and allows to see the correlation between it. The service also allows its users to share their data with their doctor. This allows doctors to see the whole big picture of their patients and therefore provide more accurate diagnosis and treatments. In future we are also aimed to develop and implement algorithms for automated discovery of possible problems with user's health or even diseases.

Moreover, MDD cloud service can collect not only medical data, but also the data about user's environment. These can be the data from home sensors, such as humidity, ambient temperature, oxygen content, etc., and even information about the weather. The last one is gathered from weather information providers using the information about user's location from one's smartphone.

Adding the Walky Doggy application into ecosystem of the MDD cloud service is a very important task for both application and cloud service. The data synchronization feature in Walky Doggy application will provide new type of data for the MDD service. This data will be very useful, as it will allow to see the correlation between the level of the user's physical activity and his or her health status. For example, it will allow user to see how his or her weight is decreasing and blood pressure normalizes because of the increasing time spent for physical exercises. It could also serve as another motivation for physical activity.

In the case Walky Doggy application being used to teach kids for taking responsibility of the dog, MDD cloud service synchronization feature can also bring profits to the parents. For example, it will allow them to track physical activity of their kid remotely without disturbing him or her. Another useful profit can be obtained by correlation between kid's physical activity and the weather. In this case parents can see if bad weather was the reason of the kid was not walking when he or she should.

B. Step Counter Features

Another way of improvements for the Walky Doggy application that we are focusing on in our future work is features connected with step counting. It includes visualization of counted during the walk steps and providing different statistical information. Based on the counted steps information it is possible to calculate the number of calories burned during the walk.

Another feature that we are aimed to implement in Walky Doggy application is setting the walking target in steps. This feature will provide users with more freedom, as it will allow them to walk not only the specified time, but also the precise number of steps they want to reach during the walk. All of these step counting features will allow to promote Walky Doggy application not only as motivational or kid's responsibility checking tool, but also as a full featured activity tracker.

The improved step counter features together with MDD cloud service synchronization feature will highly increase the profits of the Walky Doggy application, as it will increase the number of different types of data aggregated and analyzed on the MDD cloud. This, in turn, will increase the accuracy of both MDD cloud automated analysis and doctors' diagnosis, prescriptions and treatment.

C. Social Features

Nowadays the social aspect became very important, especially in mobile applications. Therefore, we are aimed to implement social features in Walky Doggy application. These features will include both achievements and sharing walking results with friends. The main aim of these features is to motivate and stimulate users for more physical activity. Moreover, it will be possible for existing users to share their results with their friends and relatives. Such social activity will attract more people to care about their health and to be more physically active.

Social features will be especially very useful for the application use case with kids. For example, improved step counting features will allow Walky Doggy to calculate the average walking speed. This, in turn, will allow to provide competitions among friends, who will try to beat the best results.

VI. Conclusion

The main mission of this paper is to initiate discussion on importance of developing solutions that will positively change people hobbies and lifestyle. In the paper we described an approach to stimulate physical activity by forcing people to take regular walks. This approach comprises usage of the mobile application that emulates real dog. Such application, on the one hand, allows to initiate regular everyday walking imitating dog walking. On the other hand, usage of the application saves from restrictions and responsibility that brings acquiring a dog.

Another use case of the proposed application is for teaching children be responsible and as a real tool for parents to evaluate whether their child is ready to have a dog. The application provides cozy and highly personalized interface, which makes it nice in practical use and children love it.

Currently there are no other apps in Google Play that address the same use case scenarios. Moreover, we see long-term advantage of Walky Doggy application in integration with MDD cloud platform, as this way all collected data about

[9]http://symbian.apps.opera.com/ru_ru/cardiacare.html

physical activity of the user could be efficiently used for health monitoring and early diagnostic of diseases.

In the end we would like to encourage everyone to start using this app and what is even more important—start thinking and developing other applications and services that could affect user lifestyle by making it more healthy.

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