

SeekOut: an Exercise and Exploration App

Abstract

SeekOut is an app designed to promote aerobic exercise and exploration of local areas. It presents users with panoramas of locations, challenging them to seek out the depicted locales. When users reach their destinations, the app records their progress. The approximate distance to each new destination is user controlled, supporting a range of activities and fitness levels.

Introduction

Heart disease is the leading cause of death in the US and globally [1, 2, 3]. Regular aerobic exercise improves cardiovascular health [3] and provides a variety of other benefits [4]. Studies have looked into games as an effective way to motivate people to exercise [5, 6]. Thus I sought to create a game for mobile devices that would encourage exercise.

SeekOut is an Android app that generates random destinations for the user to try and find. Users can specify roughly how far away the destination should be, view a panorama of their destination, confirm when they reach it, and keep a record of their progress. The app promotes healthy behavior by encouraging regular aerobic exercise and exploration of local areas.

Related Works

While a variety of exercise apps exist and there are a number of apps that encourage exploration through use of destination generation and GPS tracking, SeekOut is relatively unique in its approach. By presenting the destination as a panorama image, rather than a dot on the map, SeekOut creates a challenge for the user in identifying where the user is supposed to go. This challenge may increase interest and motivation in reaching the destination. The challenge also encourages users to become explore nearby locations, learning about their local area and promoting a sense of discovery (for unfamiliar places) or mastery (for familiar ones).

Work in the field of exercise motivation has identified certain recommendations for effective use of technology and games in encouraging exercise [5, 6]. SeekOut incorporates some of these recommendations, including providing achievable goals, providing positive feedback, and being fun to play.

Certain elements of SeekOut and the games that inspired them are:

- Gamification of exercise/exploration (Dance Dance Revolution, Pokemon Go)
- Location-hunting challenges (Legend of Zelda: Breath of the Wild memories, geocaching)

- Google Street View as a game ([GeoGuessr](#))

Design Approach

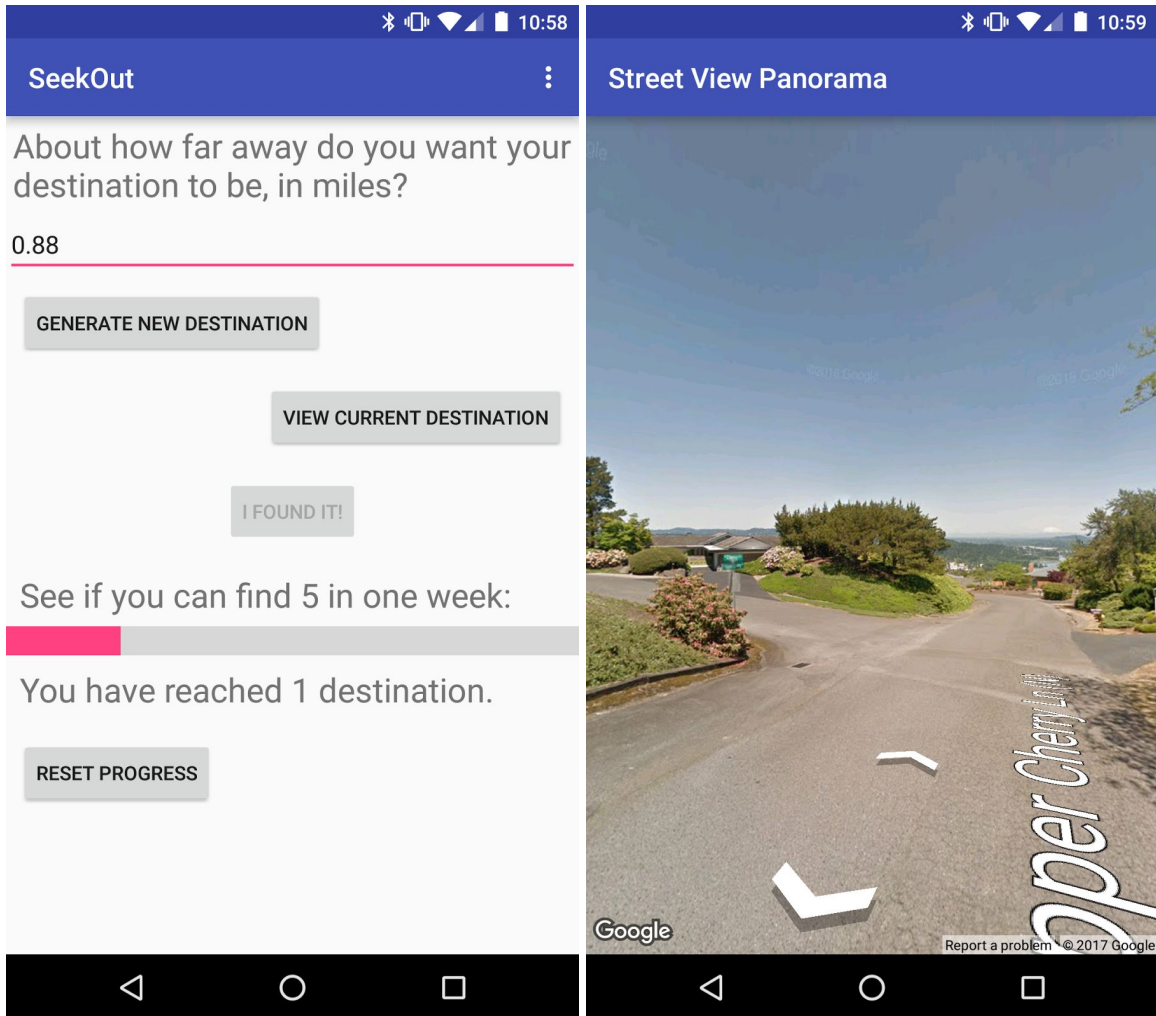


Figure 1. User interface and example destination panorama.

Design considerations included:

- Simple, clear UI: keep the focus on the activity, not the app
- Variable distance: allows people to adjust based on their preferred mode of exercise (walking, jogging, biking), time available, and physical capability¹
- Default distance (0.88 miles): aims to ensure at least 30 minutes of exercise on a round trip

¹ This is consistent with recommendations from research that games built to encourage exercise should provide achievable goals [5, 6].

- Progress bar and text: gives positive feedback to help motivation, encourages activity five times a week²
- Visible street names and navigation arrows in the panorama: while these could be disabled, the challenge of the game is still significant with them present. They have been left in to help make identifying the destination a bit easier, particularly in unusual cases such as indoor destinations.

Destination Generation

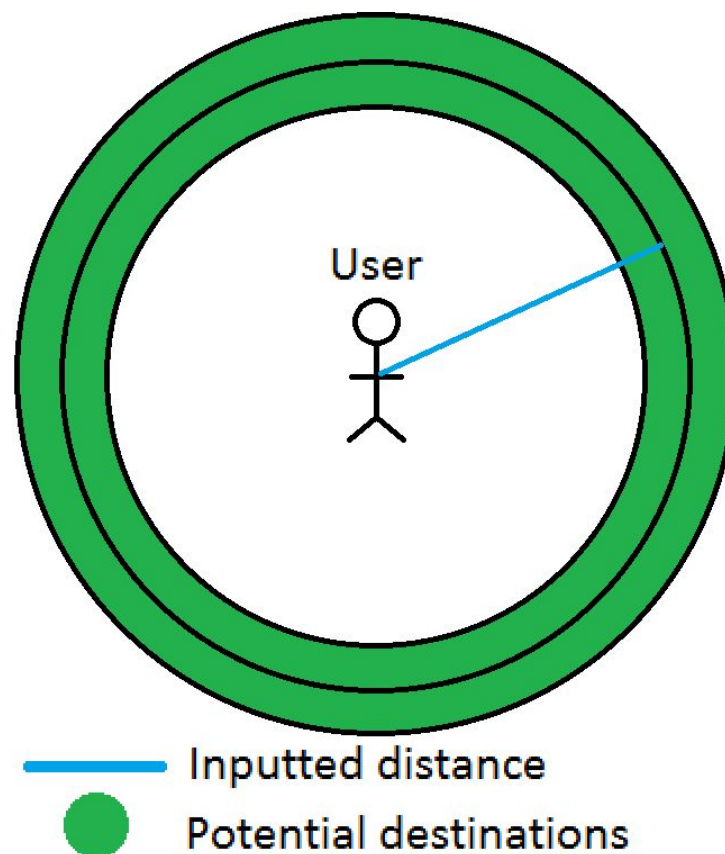


Figure 2. Visual representation of destination location selection.

1. Place a point at a random distance between $n \cdot \frac{6}{7}$ and $n \cdot \frac{8}{7}$ away from the user in a random direction, where n is the user-specified distance in miles. This variance is to produce a greater variety of potential destinations.
2. Show the closest Google Maps Street View Panorama within 50 meters of that point.
3. If no valid panorama exists within that radius (for example, if the point is in a body of water), pick another random distance and direction.

² The American Heart Association recommends at least 30 minutes of moderate-intensity aerobic exercise at least five days per week for overall cardiovascular health [3].

Alternatives approaches to destination generation:

- Use a more generous radius for finding a panorama (1120 meters instead of 50 meters), rather than picking another random point - while this could produce destinations in most cases, it made goal checking much less reliable.
- Generate destination based on walking distance, rather than as the crow flies - this would likely be preferable for most users, but has not been implemented as of this report. It may also rely on an API with usage limits.

Goal Checking

To check if the user has reached the destination, the app checks if the user is within 100 meters on the point chosen for the destination. Note that due to how the panorama is generated, the panorama may be up to 50 meters away from the chosen point. So the user will consistently succeed on a check done within 50 meters of the panorama image shown.

Alternative approaches to goal checking:

- Trust the user: The check always succeeds. This has the advantage of having no false negatives, even in cases where there are issues with properly detecting the user's position. However, if a user notices that the check always succeeds, they may be less motivated to actually reach the destination.
- Box method: If the user is within a roughly 200 meter by 200 meter square area centered on the point chosen for the destination, consider the destination found. This is similar to the radial distance method above. At first this seemed easier to implement, but due to complications in converting between meters and degrees of latitude and longitude, as well as the Google Maps Android API having a method for calculating the distance between two points, it turned out that the radial distance method was more straightforward.

Evaluation

The app works as expected, allowing users to specify approximate destination distance, generate and view destinations, check if they found them, and record their progress. It retains information across sessions, while allowing users to reset their recorded progress at any time. In testing, there was some difficulty in getting the goal checking feature to work - however, it seems to be working properly in more recent tests.

Certain limitations of the app at present include:

- Only works in areas mapped out by Google Street View
- Only available for Android
- Only available in English
- Distance is "as the crow flies", so it fails to account for impassable terrain

Future Directions

Potential future work for SeekOut includes:

- Testing - get user feedback about the app and revise accordingly. In particular, it would be good to see what impact the app has on exercise motivation.
- UI improvements - make the user interface more visually appealing while still keeping it simple and easy to use.
- Distance rework - base the distance to destination off walking distance rather than as the crow flies. One approach to do this would be to use the [Google Maps Distance Matrix API](#) to test whether each generated destination is within a range above and below the user-specified distance. However, the API has usage limits, so implementing this might require limiting users of the app to only a certain number of destinations per day.
- Availability - make the app available on the Google Play Store.
- Other languages and platforms - expand the potential user base by making a web-accessible version or by translating the app into other languages.

Potential additional features include:

- Other exercise motivation techniques - the literature on using games for exercise motivation has identified several recommendations [5, 6]. Possible considerations could be to include music or social support elements.
- Record the destinations the user reaches in an album - it may be more motivating for users to have a more detailed record of their accomplishments.
- Enable specialized destinations, such as parks or landmarks - this may be more appealing to certain users.

Note that any new features should be balanced against keeping the app focused and easy to use.

Conclusion

Much work remains to be done with SeekOut, as identified in the prior section. In particular, its effectiveness in engaging users and encouraging long-term behavior change remains to be determined. Nonetheless, it is a novel approach to promoting exercise while employing established recommendations. These recommendations include the frequency and quantity of exercise users should aim for to have good cardiovascular health [3] and providing achievable goals to enhance exercise motivation [5, 6].

In crafting an exercise game, Yim and Graham acknowledge that "perhaps the most important [requirement] is simply that games should be fun" [5]. It is my hope that users find the process of identifying a new area and journeying to it fun, and that SeekOut helps enable that process.

References

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