Android Black Tiger

Location Based Language Learning

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Project Repository: https://github.com/curlex/AndroidBlackTiger

1 Introduction

Our App aims to assist a user in increasing their vocabulary specifically of places. The concept was to easily integrate learning with everyday life in a manner which is minimal in time consumption and maximize memory learning techniques. The idea is that both through repetition of commonly passed places and seeing them in real life the new words can be committed to memory in an easy manner. By having just short notifications as you go about your daily life we hope that the learning becomes effortless and requires very little dedicated time to sit and actively concentrate on the additional vocabulary. That is to say through the small short repetitions the learning will be subconscious for the user making it hassle free and simple to increase your vocabulary. To supplement this the user can also actively decide to learn by using the map feature to see places nearby rather than have a random suggestion. To facilitate revision or if a word is need on the spot a history will be kept for the user to review at their leisure. We hope that seeing the place in person will increase the efficiency of the user's ability to commit to memory but to assist in this process the user can add an image by taking a picture. The process of adding the image will also be a focused activity which should help memory recall in the future.

1.1 How this app is different

Most of the language apps available in google play present to the user a restricted set of words, pictures and sentences for the user learn. We analysed two of the most popular language learning apps, Voxy and DuoLingo. Voxy is a paid app which provides video lessons in which the users learn by real-life situations. DuoLingo is a free to use app which has two interesting features: the use of pictures with foreign words and short lessons in case the user do not have much time. Our app was designed to be totally unrestricted. The user not only can choose the word he/she will learn but also they can take a picture they believe will help them better to remember the word. Another remarkable feature we implemented is the use of GPS to obtain the new words based on the user's location.

2 Literary Review

Our app was influenced by literary review of papers on Augmented Reality. The area of augmented reality research has aspects which are directly applicable to our app. Sheng highlights the use of location and how it can assist the learning process. "Geolearning where sensors built into the mobile devices can identify the learner's location to trigger the retrieval and display of location-sensitive educational resources of the surrounding environment.This is said to enable formal and informal learning in the settings of a real physical world, enhancing and framing the subject matter by creating a blended learning space of an onsite rich sensory experience with the mixing of digital information and interactions." Sheng(2013).[6] The

sentiments of Sheng on the value of the augmented reality in learning was previously identified by Dunleavy.“The importance of the research detailed in this paper is not the technology itself, but rather what added value the technology brings to the learning environment”...”At this early stage of AR research, its most significant affordance is the unique ability to create immersive hybrid learning environments that combine digital and physical objects” Dunleavy et al (2009) [9]. These findings were key in our decision to use physical location with the information we provide to aid learning a language in a new and innovative way which has the capacity to be expanded further to implement more aspects of augment reality in the future beyond the real time with location aspect.

Li et al (2013) [5] discuss an accurate indoor positioning system utilising “WiFi, accelerometer, gyroscope and digital compass”. This kind of system could be used to expand our system to work in, for example, shopping malls, a location with a wide range of associated vocabulary. Bhuvana Sekar and Jiang B.Liu(2014)[8] covers developing a mobile app with geolocation services. Location based mobile apps provide context sensitive information that applications on desktops cannot. Some of the features, such as a geo-location battery monitor that will preserve your battery life depending on your location is really interesting since I had never seen something like that implemented before.

Geo-Location based apps improve user engagement and interaction and as mentioned in this paper “..objective is to take advantage of the location-based features in order to achieve a more challenging and socially engaging gaming experience.” this is why we integrated GPS location into our app. As this paper discusses the results achieved prove that using geolocation integration adds a social engagement and familiarity. [7]
User Experience is discussed in this paper exploring what a user should gain from the usage of their location as means to provide a service. Consent of location-based service is something a user should be allowed to give and this was factored in our application to prevent any unnecessary usage of the users details. How the user's location is represented to them “should be close to ..their cognitive model of location” and should be justified. The paper discusses the usage of a middleware to introduce a second layer between the app and sensors that provide the location information helping to keep the user aware of what is being used to get their location amongst other information. This is why we have implemented a way to help the user gain access to what information is being used and how. [10]

Carpenter and Olson (2012) [3] presented in this article a sequence of experiments related to the use of pictures for learning new vocabulary in foreign languages. They were trying to analyse a phenomenon called picture superiority effect, which consists of remembering concepts through picture instead or words. To perform their experiments, a group of participants was divided into two groups, one of the groups would be presented to the foreign language and its translation in English and the other group was presented with the foreign language and a picture representing that word. Different methods for testing the recall of those words were used, free recall and cued recall. According to their results, the participants that were presented with image and the word in foreign language performed better when free recall test was applied. Rowe et al. (2012) [4] revelled in their paper the use of picture for teaching preschoolers a secondary language. In their experiment, the word was associated with the image representing

that word. According to their results, the students learned in a faster pace than if they were presented only with the word and translation.

Webb (2007) [2] discusses the effect of repetition on knowledge of vocabulary while learning a foreign language, testing on Japanese students learning English. It found that when the students are learning languages, repetition of vocabulary in context significantly improved the rate at which the students gained vocabulary. Peter Robinson (2003). Task-based language learning proposes that tasks related to learning be adjusted to a person's level of cognitive ability. The results of the paper were that adults learn languages at slower pace than children simply because they try to reason and interpret their second language based upon the first language they had learned when growing up.

3 Design Considerations

Our App was designed around people who are already learning a new language but want to supplement/extend their range of vocabulary. This played a crucial role in the initial discussions and paper prototypes at the start of the development process. When we were designing our App, we took this into account by introducing a “don't show this again” button allowing the user to decide when they have learned a word. Allowing the user to set the duration between notifications also fits the application to the user’s preference so as to prevent annoyance.

We looked at the use-case scenarios for our application:

- As a user walks around a town, they would be presented with notifications for nearby places of interest, expanding their vocabulary.
- There are many different Bus tours throughout Dublin that take you to places of historical interest. You could use the App to learn these placenames in a different language as you partake in the tour.
- If you take public transport, you could get a list of placenames along your route when you’re commuting.

The app is useful for a user to learn vocabulary relating to places close-by. Some words may take longer than others to learn, resulting in the user retaining notifications for this word for longer. “Context may be one reason the number of repetitions needed to learn individual words varies. In some sentences the meaning of an unknown word might be transparent but in others it may be opaque”[2].

4 Implementation

Our app’s goal is to provide a user with additional vocabulary to support their learning of a language. To support this goal our app provides 6 functions:

a. GPS tracking of the user and getting nearby places
b. Notifications of new vocabulary
c. Map display for easy viewing of all nearby places
d. History of all vocabulary seen
e. Individual word details (translation, location seen, associated photo)
f. Camera for taking a picture associated with a word

These functions can be divided up into 1 Service (GPS), 1 Notification (New Vocab), 4 Activities (Map, History, Detail and Camera). We then chose to add two additional supporting activities

(Initial and Menu) to better serve this functionality. This implementation also required some further supporting functionality (Database, Translation and Settings) for this implementation.

4.1 Translation

Translation is completed through a Java implementation of the Yandex Translate API. The translation is completed in an AsyncTask so as not to block the UI while waiting for the request to complete. It takes an ArrayList of Strings and returns a new ArrayList of translated strings in the Language specified in the application preferences.

4.2 Database

The database stores all vocabulary-based data associated with the app.
The database consists of two tables. A table for all vocab that has been seen (History), and a table for locations, as an item of vocabulary may have been seen at more than one location (this feature is not utilised in the UI of the application but would be implemented in the future). The key used for the History table is the word in english, plus the language being translated into, as when the users switch to a new language, they should start again afresh. Additionally, the History table contains the translated word, how many times it has been shown and whether the user wishes to see the word again. The key for the locations table is latitude and longitude as two words will not share the exact same coordinates, this table also contains a word column to link to the History table. The database provides several methods for database functions (find a word, get all words, add a word).

4.3 Settings

The app has 4 user-controlled settings associated with it: Enable / Disable GPS Tracking, Choose Learning Language, Ringtone, Notification Frequency.
These settings all control the notifications that the user receives as this is the area of the app with the most potential for being “annoying”. All of these settings are solely accessed by the GPS tracker bar the learning language which is accessed in many areas of the app (eg: when displaying words seen so far to only display words from the current language).

4.4 Notification

A notification informs the user of new vocabulary. This notification displays the word in English and the word translated. If the user clicks the notification they are brought to the Map to view the location of the place spawning the notification. The notification also has an option to stop updates to save the user having to navigate to the setting.

4.5 GPS Tracking Service

Keeps track of the user’s location and only displays a notification when the statement below returns true:

((travelled > 100 metres) || (time_elapsed > notification_frequency))
&& (vocab_not_seen || vocab_show_again)

It accesses the Google Places library to find Places nearby the user’s current location, these location types are then accessed to retrieve the vocabulary. This vocabulary is then translated using the Translator and a notification is then sent to the user.
Getting the nearby places and translations is achieved in an AsyncTask with callbacks to avoid blocking the UI thread. Due to the nature of the requests made this can be rather slow so it was

majorly important not to block the UI. The situation where a user navigates away from the calling activity is also handled.

4.6 Activities

Camera allows the user to take a picture and associate it with a particular word using the existing Camera application on the user's phone. The file is then stored to the user's SD Card (if they have one, otherwise it is stored to the emulated SD Card) and the image file path is used in the Details activity to be stored to the database in association with a particular word.
New Vocabulary displays all information about a particular piece of vocabulary (Word, Translation, Where it was seen, Amount of times shown, Image and Whether to show it again). This allows the user to go to the Camera to add a picture for this piece of vocabulary and also to modify whether the word is to be shown again. The Map has two different functions: 1. If the user has come from clicking a notification, it displays the location of the clicked word as well as the user's current location. 2. if the user comes from the Main Menu, the user is able to search for nearby places, which get displayed on the map with detail such as the name and translation of the place. If the user selects a marker they are brought to the Details screen.
History displays all words that are in the database for the current selected language. This allows the user to scroll through all words they have seen so far. If a user selects a word they are brought to the details screen for that word.

5 Key lessons

Our app, over the course of the development has taught us many valuable lesson in technical android programming and group collaborations. What we learned while designing and developing the app is never-ending therefore we will focus on the most technically challenging issues.

5.1 Background Service

For the purpose of our app we required the GPS to be running in the background even if the app was not being used and this task required the use of a Service. We considered other options and found that this option did exactly what we required. It doesn't get destroyed with the activity that created it and we specified that it runs on another thread to avoid blocking the UI. We learned this after we noticed many frames being skipped while we were testing the app, especially when it was parsing the JSON information that was being retrieved from Google Places web services. We have discussed the potential battery usage of this and decided that by adding an option to remove the location update was the best option to tackle this issue. We have also acknowledged that the user may not be interested in receiving updates quite frequently and decided to add an option to change the frequency.

5.2 UI Blocking

We used AsyncTasks to carry out particular services such as the translation and the JSON reply retrieval from Google Places. The application was skipping frames, resulting in (sometimes) considerable lag. After much research the issue was resolved to being an issue with assigning the results of the asynctasks to variables that were later being used by the UI thread to perform UI updates. We solved this by using a callback receiver to receive the results and assign the results in the onPostExecute. We originally had an asynctask for both the JSON query and the

translate where both depended on each other causing slow execution and UI blocking, so we opted to using the translate as a separate class where it was called by the JSON parser asynctask. Another example of UI blocking was when we were assigning markers to the be displayed onto the map for the nearby locations, we solved this by creating a subclass implementing an asynctask so that it has access to the variables in the map activity.

5.3 Unexpected challenges

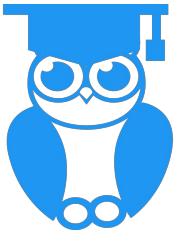
We initially planned on using google translate and the google places api, but after further research we discovered that google translate required a paid subscription which we then solved by looking for further options and found many free alternatives, and settled on Yandex translate for being the most comprehensive well developed service. Google Places api didn't allow for the use of types as a search criteria and so to be able to use the google places type to be able to identify the locations we decided to use the web service where the JSON response contained all the information we required.

5.4 Component Interaction

We used android's SQLite to implement our local database to store the user's progress. After the initial development we faced some challenges with updating the database from the other app components. To solve this, we initialised the database as a field of the application class to ensure it's availability in all activities. After the initial development of the database we also discovered the need for an extra table to hold the locations independent of the translated words to allocate for multiple language learning.

6 Final Conclusions

Through relevant research of academic papers on increasingly popular research and development areas (Augmented Reality), features of successful language learning techniques and applications already in the marketplace we identified a new and innovative way to approach learning vocabulary in a new language through an android application. By using many of the tools available on android, we utilise many different ways to reinforce the learning and as such make the best use of the possibilities of using an application as learning tool. We also took into consideration the improvement of learning through repetition, as mentioned in Webb (2007) paper about the effectiveness of repetition when learning vocabulary. The various implementation details across many different aspects of android supplied plenty of learning opportunities and required active teamwork to achieve our end product. We succeeded in supplying an app that was true to our aim with the possibility of being extended in the future as many other functionalities that help improving and increasing vocabulary can also be implemented.



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