Destiny - A Cognitive Mobile Guide for the Olympics

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ABSTRACT

In this work we present *Destiny* a cognitive mobile guide for Olympics games in Brazil that identifies user characteristics to deliver content. It will help visitors, athletes, and athletes' parents to localize themselves and receive tailored historical, cultural and entertainment information at a particular point of interest (POI). The application will recommend places to go and show POI contents according to user context based on several attributes such as personality (closeness, curiosity, adventurous), nationality, favorite places already visited, trip length, price range and favorite sports.

CCS Concepts

•Human-centered computing → Social recommendation; Ubiquitous and mobile devices;

Keywords

social recommendation, cognitive, mobile, travel, tourism

1. INTRODUCTION

Travelers are overwhelmed by choices. Knowledge of the characteristics of visitors in tourist sites is fundamental in developing tailored mobile guides. Socioeconomic, demographic and behavioral characteristics, and also motivation and satisfaction, are central concepts to provide information for sightseeing tourists. Adapting user interfaces to a user's cultural background can increase satisfaction, revenue, and market share [12]. Recommender Systems (RSs) are information and decision support tools providing users with suggestions for items that are likely to be interesting to them or to be relevant to their needs and are well distributed thoughout in the tourism area [2, 8, 9, 6]. Recommender systems methods are particularly useful for areas of tourism and leisure [8], in which users have a wide range of activity choices and limited time in situ.

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There are several known problems with current recommender systems. The cold start issue is also a problem for tourism applications, as well as the gray sheep individuals and overspecialization. The gray sheep problem (i.e.,tourists that don't fit in any group profile) might be minimized when several user's attributes, that do not depend on user input or feedback, are taken in consideration. The problem of overspecialization might restrict users to see only items that are similar to the ones he/she have already seen while using a recommendation system [6].

One project that illustrates these issues is the Tourist Information Provider (TIP) a system created by Hinze and Junmanee [6]. In this project they apply user's personal information (preferences and travel stories) to provide the missing information. The system delivers information about sights based on user location, interest, travel routes, and sight-related information to a mobile device. According to the authors, because TIP is based on feedback scores it minimizes the cold start problem. However, the gray sheep and overspecialization problems still need further research. They addressed the gray sheep problem by favoring the more frequent recommendations for neighborhood members and the overspecialization problem by extended content-based recommendation.

In our system, *Destiny: A cognitive mobile guide for the Olympics*, we intend to minimize the problem of cold-start by identifying personality traits retrieved from user's social networks feeds and/or their self-description. We infer personality traits using one of the most influential models in psychology, namely the Five Factor Model (FFM) or Big Five dimensions of personality, in which personality is conceptualized in terms of openness, conscientiousness, extraversion, agreeableness and neuroticism [4]. The rationale behind the choice of the FFM is that these factors account for most of the variance among users in terms of trait terms. Previous research has shown that personality influences human behaviours and that there exist direct relations between personality and tastes/interests.

Users may describe themselves by audio or by a self-description text. Additionally, users provide information of their favorite places ever visited (restaurant, city), nationality and sports/games categories they want to follow/watch during the Olympics. The system provides a tailored schedule of points of interest for users, and users can follow or change POIs (Point of Interests) by others POIs, also recommended by the system with less strength of matching. *Destiny* also provides editorial content based on their Nationality context.

We use the nationality of the user to help address the gray sheep problem. Building on prior research, [11, 7, 14]. We use nationality as one of the main characteristics to filter information for tourists. Nationality also might help in the gray sheep issue, since users will have a group to belong to, a default profile fit.

In *Destiny*, the question of overspecialization might be minimized by the range of POI tailored choices users might want to replace, in a situation they do not like the first POI option recommended by the system. Each POI has a brief editorial content and location-based information. The POI description is accompanied by a editorial content of other POI familiar to the user, according to their nationality. Tourists will learn informally the local concepts, because the new concepts are anchored to known concepts. *Destiny* associate attributes from user context to show local information. For example, comparing height information of Tower Of London (London) and The Christ (Rio), in case the person is British.

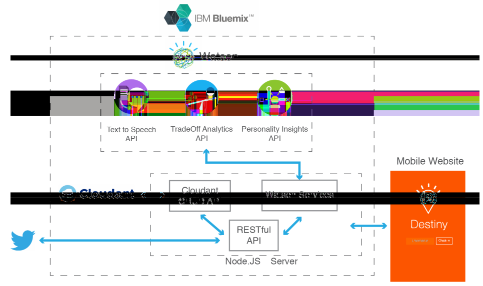

Figure 1: *Destiny's* Architecture - Bluemix plattform used to bind Watson Services: Text to Speech, TradeOff Analytics and Personality Insights. Cloudant database used to store user and POIs information. Twitter can be used to collect user information to analyze personal traits.

2. *DESTINY*

We choose Rio de Janeiro in Brazil, the site of the 2016 Olympics, to be our first case study. The target audience are tourists, athletes and athletes' parents. With the aim to design a user-centred system, several design thinking workshops were conducted with the project team. A designer research team member, who is responsible for user research, brought a user-centered vision to the team [1]. Personas were created to help in the design process decisions. We used three personas, one for each of our target audience: tourists, athletes and athletes' parents that. For example, David. David's son, Michael, is a Team GB (Great Britain) Olympic swimmer. He and his wife are accompanying Michael to Rio. They are British and they will be in Brazil for one month. Those scenarios helped us in design decisions. With users in mind, we did an Experience Map [10] with sticky notes for motivation to use *Destiny* and another for the outcome. Team members were then asked to do a Storyboard based on the Experience map. Each team member draw in six frames (six sticky notes) the user experience for a certain experience map. We shared our views and decided how should be the user flow in that session. The visual designer collected the paper ideas and the main flow page and used them to prototype the interface design.

2.1 Architecture

Destiny was develop using IBM Bluemix platform (Platform as a Service - PaaS)[1] which is the IBM open cloud platform that provides mobile and web developers access to IBM software for integration, security, transaction, and other key functions, as well as software from business partners.

Figure 1 shows *Destiny's* architecture and how Bluemix services were used. We use four services: Cloudant Database [2], Text to Speech, TradeOff Analytics [13, 3] and Personality Insights [5]. The last three are examples of Watson Services.

Cloudant is a NOSQL database that's store JSON documents and works well with web and mobile apps. It was used to store user information and personal traits and POIs information.

The "Personality Insights Service" provided by IBM Bluemix, uses linguistic analyses to infer personality and social characteristics using the well-studied Big Five personality model and uses tweets or text written by user to compute personality scores. The personality model characterizes a person with 5 traits: openness, conscientiousness, extraversion, agreeableness, and neuroticism (the five are known as OCEAN). Each trait is broken down into 6 lower-level facets, such as anger, anxiety and depression under conscientiousness. The traits and facets are derived by a linear combination of LIWC category scores using Yarkoni's correlation coefficients [5]. In our application we use only three characteristics to compose the user profile: adventurousness, closeness and curiosity.

For the **closeness** trait, we expected get people that enjoy being connected to family and setting up a home. For the **curiosity** trait, we are looking for people with artistic interests, as this facet is one of the two most important, central aspects of this characteristic. The **adventurousness** trait describes people who willingness to experiment new activities and experience different things.

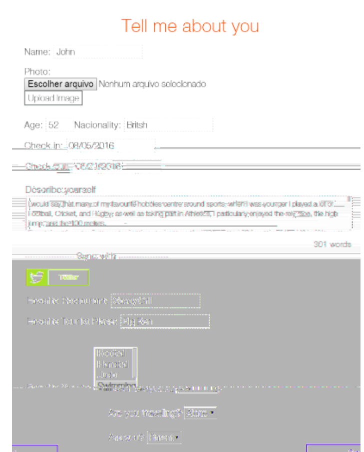

Figure 2: Screen where user fill with personal information. The describe myself input can be written by the user or pull from lastest user tweeter posts.

[1]http://bluemix.net/
[2]https://cloudant.com/

The idea of text to speech services is to produce an audio of the summary returned from Personality Insights. The TradeOff service helps people make better choices when faced with multiple, often conflicting goals and alternatives. By using mathematical filtering techniques to identify the top options based on different criteria, the service can help users explore the trade-offs between options when making complex decisions. The service combines smart visualization and analytic recommendations for easy and intuitive exploration of trade-offs. This service was used to allow users to change the recommendation made by *Destiny* for a more informed decision. The attributes used were price, distance, closeness, curiosity and adventurousness. Thus, the user can select other options that sounds more interesting.

To use *Destiny* the user must first login as shown in Figure 2. In this screen the user will provide personal information that will be used for recommendations, such as nationality, sports, if he/she is an athlete, an athlete parent or a tourist. The text that the user has to write about himself can be either taken from his/her latest twitter posts or written by himself.

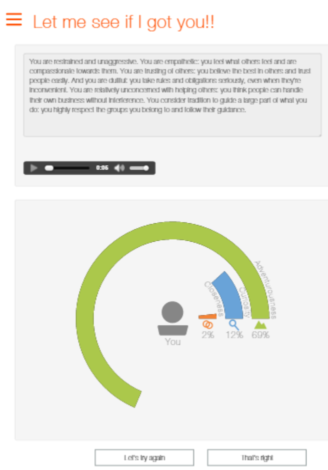

Figure 3: Personality Insights results present to the user.

After a user inputs his/her data, this will be analyzed by the personality insights service and the results will be shown as presented in Figure 3. The result will be shown in the form of text, audio, and through a graphic where we show the percentage of adventurousness, closeness and curiosity associated with that recommendation.

For each user we built a feature vector including the three characteristics from personal insights, user nationality and the selected sports.

For the personal insights characteristics we divide each of them into quartiles. Each person is then classified into a quartile: 1, 2, 3 and 4. One bellow to 25%, two between 25% and 50%, three between 50% and 75% and four above 75%.

For each POI (Point of Interest) in the database we use 10 reviews for each place from users that like the place as a proxy to extract the values from adventurousness, closeness and curiosity of each place.

For the games we match the user interests with the official schedule of the games and they are display using blue color in calendar. For the POIs we use the euclidean distance

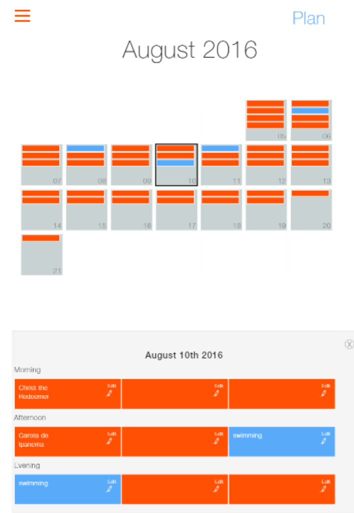

Figure 4: Calendar with recommendation made by *Destiny* and a planning detail.

function to do the recommendation, thus the POIs that are closer to user are the ones selected. We use the number of empty slots in the user calendar as the maximum number of POIs. We also use a threshold for selecting the POIs. If the number of slots is higher than the number of POIs selected with the threshold we leave some slots empty. Otherwise we select the number POIs equal to the number of slots, always getting the top ones. Restaurants are always recommended for lunch or dinner calendar spots and the other POIs are distributed during the period selected by the user. We also use the time where the attraction is open and some events are classified as better morning, evening or night.

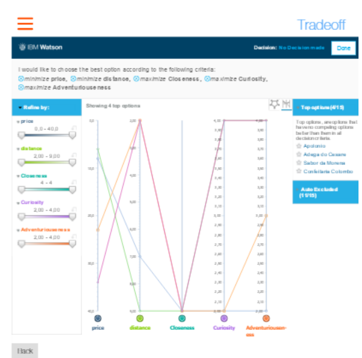

Figure 5: TradeOff Analytics allows user change the recommendation for another option that he/she might think that is more convenient.

Figure 4 show a calendar with some recommendations. Each block in the calendar represent a recommendation, the blue blocks are the games and the oranges blocks are POIs. The user will be able to see, in detail, the plan by clicking on the days of the calendar so the information appears below. The hours available for activities are represented by slots, each slot is two hours, starting 6am until 12pm. The user will have the option to edit the events by clicking the edit image located on the right side of the slot.

If user chooses to edit the proposed schedule, the screen that contains the TradeOff will be displayed as shown in Figure 5. In the TradeOff screen the user will be able to compare other POIs and chosen another option.

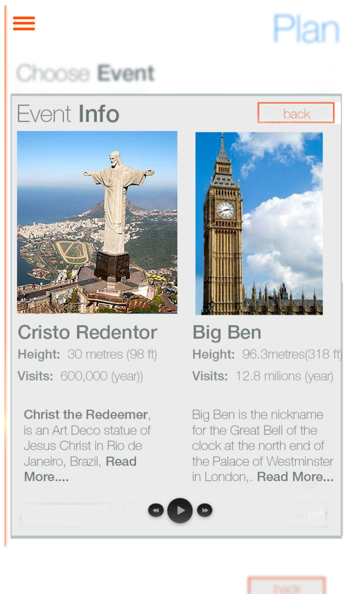

Figure 6: Comparison between a POI recommended and another POI from the nationality of the user associating attributes from user context to show local information. In case the user is British

On the other hand, if the user clicks on the event name detailed event information will be presented to the user. In this way, it is possible to the user compare the presented POI with another POI from his nationality. For example, as presented in Figure 6, Christ the Redeemer is compared with Big Ben since the user is British.

3. CONCLUSION AND FUTURE WORK

Currently, search filter techniques are not efficient and not tailored to user's personalities. Curating data for travel is difficult. Usually it addresses diverse audiences (old, young, different purposes). Olympics is an elite event (passive and active tourists), thus molding user's path can help them to spend less time weighing the pros and cons.

Destiny simplifies the path choice filtering results in a clear and ordered manner. Also, *Destiny* helps identify niches of users and their behavior as sometimes they search on mobile phones and by on other platforms. We choose Rio de Janeiro in Brazil to be the first city to have the Cognitive Mobile Guide - Destiny. Tourists, athletes and athletes' parents are the main focus from it during the Olympic games. As a future work we plan to evaluate *Destiny* with real users. Also, we will improve the choice of traits characteristic and try other distance functions.

4. REFERENCES

[1] K. Baxter, C. Courage, and K. Caine. *Understanding Your Users: A Practical Guide to User Research Methods*. Morgan Kaufmann Publishers Inc., San Francisco, CA, USA, 2 edition, 2015.

[2] L. Cao, J. Luo, A. Gallagher, X. Jin, J. Han, and T. S. Huang. Aworldwide tourism recommendation system based on geotaggedweb photos. In *ICASSP, 2010 IEEE International Conference on*, pages 2274–2277. IEEE, 2010.

[3] S. Chen, D. Amid, O. Shir, L. Limonad, D. Boaz, A. Anaby-Tavor, and T. Schreck. Self-organizing maps for multi-objective pareto frontiers. In *Visualization Symposium (PacificVis), 2013 IEEE Pacific*, pages 153–160, Feb 2013.

[4] L. R. Goldberg. An alternative "description of personality": the Big-Five factor structure. *Journal of personality and social psychology*, 59(6):1216–1229, 1990.

[5] L. Gou, J. Mahmud, E. M. Haber, and M. X. Zhou. Personalityviz: a visualization tool to analyze people's personality with social media. In J. Kim, J. Nichols, and P. A. Szekely, editors, *IUI Companion*, pages 45–46. ACM, 2013.

[6] A. Hinze and S. Junmanee. Advanced recommendation models for mobile tourist information. In R. Meersman and Z. Tari, editors, *OTM Conferences (1)*, volume 4275 of *Lecture Notes in Computer Science*, pages 643–660. Springer, 2006.

[7] C. JÃűnsson and D. Devonish. Does nationality, gender, and age affect travel motivation? a case of visitors to the caribbean island of barbados. *Journal of Travel & Tourism Marketing*, 25(3-4):398–408, 2008.

[8] N. Luz, R. Anacleto, and A. Almeida. Tourism mobile and recommendation systems - a state of the art. *In Proceedings of the International Conference on E-Learning, E-Business, Enterprise Information Systems, & E-Government*, pages 277–283, 2010.

[9] K. Meehan, T. Lunney, K. Curran, and A. McCaughey. Context-aware intelligent recommendation system for tourism. In *PERCOM Workshops, 2013 IEEE International Conference on*, pages 328–331, March 2013.

[10] J. Patton and P. Economy. *User Story Mapping: Discover the Whole Story, Build the Right Product.* O'Reilly Media, Inc., 1st edition, 2014.

[11] A. Pizam and S. Sussmann. Does nationality affect tourist behavior? *Annals of Tourism Research*, 22(4):901 – 917, 1995.

[12] K. Reinecke and A. Bernstein. Knowing what a user likes: A design science approach to interfaces that automatically adapt to culture. *MIS Q.*, 37(2):427–454, June 2013.

[13] O. Shir, S. Chen, D. Amid, O. Margalit, M. Masin, A. Anaby-Tavor, and D. Boaz. Pareto landscapes analyses via graph-based modeling for interactive decision-making. In A.-A. Tantar, E. Tantar, J.-Q. Sun, W. Zhang, Q. Ding, O. SchÃijtze, M. Emmerich, P. Legrand, P. Del Moral, and C. A. Coello Coello, editors, *EVOLVE - A Bridge between Probability, Set Oriented Numerics, and Evolutionary Computation V*, volume 288 of *Advances in Intelligent Systems and Computing*, pages 97–113. Springer, 2014.

[14] ÃŸystein Jensen, J. S. Chen, and T. Korneliussen. *Cultural-Geographic Influences of Destination Images: A Case of Northern Norway*, chapter 7, pages 3–19.