DOI: 10.36108/ujees/2202.40.0130

UNIOSUN Journal of Engineering and Environmental Sciences. Vol. 4 No. 1. March. 2022

# Tourist Site Classification Using Keyword Matching Approach: Towards the Development of a Personality Based Tourist Recommendation System

**Ogunbiyi, D.T., Adigun, A.A., Jimoh, K.O. and Adedokun, S.O.**

**Abstract:** The tourism domain consists of emotionally driven experiences between the tourists and their destinations. Psychological aspects of tourists' preferences are increasingly becoming an important factor to consider in the development of systems that enhance better recommendations. Studies on analysis of personality traits as well as developed systems on tourism guide/recommendation exist, however, there is less effort towards the classification of tourist sites according to personality traits and its implementation. This study, therefore, attempts to develop a tourist attraction guide through matching keywords from personality types (Big Five personality dimensions) to tourist locations in order to suggest suitable locations. Data on tourist sites were obtained from online sources with a focus on Nigeria tourist sites. The classification and matching of personality type to tourist site was done using trait keywords obtained from reviews, ratings and feedback. The tourist site information was filtered based on the personality type classification in order to deliver information about the tourist site to a user. The system prototype was implemented using HTML, CSS, JavaScript, PHP and MySQL. The resulting system is a web-based application that suggests tourist locations based on the personality preference specified by a user.

**Keywords:** Big Five, Keyword matching, Personality type, Recommendation, Tourist site

## I. Introduction

Year in year out, tourism has continued to gain massive interest on a global scale [1]. It is a major foreign exchange earner for a good number of advanced and emerging economies and countries that have continued to invest resources in order to continuously attract tourists worldwide. An example of such country is Nigeria which offers a wide variety of tourist attractions from natural to man-made locations. Information about these tourist attractions and their peculiarities are usually found on blogs, forums, websites, and ratings, from friends and families etc. A tourist however, may find searching for a suitable tourist destination overwhelming when there is so much information obtained from these sources which may not be adequate to meet their specific concerns or expectations. One way to address the issue is to develop methods that can suggest tourist locations to people based on related, relevant and specific needs.

Recommendation systems are widely used to generate personalized recommendations and predict a user's preference and interest based on the users' past and present behaviour [2]. Literature considered in this paper have attempted the development of various types of recommender systems in the tourism domain, using various methods, however, only few studies have considered the personality of users in relation to their destinations which is a key factor for the success of a recommender system in the tourism domain and it is also one of the main reasons why tourists enjoy or not, their

**Ogunbiyi, D.T., Adigun, A.A., Jimoh, K.O. and Adedokun, S.O. (**Department of Information and Communication Technology, Osun State University, Osogbo, Osun State, Nigeria)
**Corresponding author:** dimple.ogunbiyi@uniosun.edu.ng
**Phone Number:+2348163567927**
**Submitted:09-12-2021**
**Accepted: 04-02-2022**

destinations. For example, some people are more reserved and would prefer more quiet locations or nature filled destinations than some other people who may like open spaces with the presence of other individuals, loud music, etc. In developing suitable personality type tourism recommendations to tourists, a major question arises, "how can personality type(s) that corresponds to a tourist site be determined?"

Various studies have been presented on personality type analysis [3-5], recommendations considering personality in several domains [6], [7], and the development of recommender systems in the tourism domain. In [8] a user-based tourist attraction recommender system was developed. The recommender system was constructed as an online application, which is capable of generating a personalized list of preference attractions for the user. The system made use of collaborative filtering as well as three pattern matching and clustering data mining algorithms to calculate the similarities between users for the generation of tourist recommendations based on the visiting history of the user's nearest neighbour. [9] presented a tourism recommendation system based on users' reviews. They considered three factors in the user reviews which are; number of reviews, rating and sentiment. The system consisted of four major elements: input, user review, recommendation technique and output, which obtained the location as well as the user reviews and then applied content-based recommendation to come up with suitable hotels for the user in textual and graphical forms. [10] proposed a model that recommends hotel based on personalized preferences and implicit relationships. A two stage hotel recommendation approach that employs hotel feature information to support preference analysis was proposed. In the filling stage, association rules between features are considered to accurately capture users' personalized preferences, which can be incorporated with public preferences to estimate potential ratings of users for unvisited hotels. In the recommendation stage, collaborative filtering was applied to combine rating similarities between users with their closeness relationships to identify more reliable neighbours.

In addition, [11] and [12] which are two of the few authors that considered Big Five personality types for the tourism domain in their studies, focused on the personality types in relation to their preferences. [11] studied tourists' personalities in recommender systems, to provide accurate prediction of tourist attraction preferences. A large-scale study was carried out to determine how the Big Five personality dimensions influences tourists' preferences and decision for tourist attractions. Data was gotten through online questionnaires sent to Portuguese individuals. Eleven main categories of tourist attractions and personality dimensions were analyzed using exploratory and confirmatory factor analysis. As a result, a model that relates the five personality dimensions with preferences for tourists was proposed. [12] in relation to tourist preferences, presented a sightseeing spot recommendation system based on personality, using data obtained from social media. Tourist spots including parks and mountain spots, shrines and temples, hotel spots and museum spots in Japan were used to verify the system. Personality Insights (PI) was used to quantify and visualize different personality trends for each spot.

In answering the aforementioned question, this work proposed a simple method for classifying tourist sites according to personality type using keywords obtained from "Big Five" traits given

by [13] as shown in table 1. This paper specifically attempts to (i) determine and classify the tourist sites related personality type(s) (ii) implement a web based prototype based on (i). The implementation of the system focused on its application to Nigeria tourist locations which can be extended globally and integrated into tourism platforms with larger databases. Data about tourist destinations whose information were easily accessible were collected and matched with defined personality types by traits, through synonyms terms/expressions from websites, blogs review. The remaining sections of the paper are organized as follows: section II presents the methodology used in the study, section III presents the results and prototype implementation and section IV concludes the paper.

Table 1: Personality Dimensions and Their Respective Traits

| Big Five | Traits |
|---|---|
| Extraversion | Outgoing; Talkative; Sociable; Enjoy social events; Excitement seeking; Positive emotions |
| Agreeableness | Trustworthy; Tolerant; Sensitive; Straightforward; Friendly; Cooperative |
| Conscientiousness | Competence; Orderliness; Dutifulness; Achievement striving; Self-discipline; Organization |
| Neuroticism | Anxiety; Anger; Depression; Self-Consciousness; Moody; Vulnerability |
| Openness to Experience | Imaginative; Artistic Interest; Creative; Adventurous; Intellectual; Liberal |

Source [13]

## II. Materials and Methods

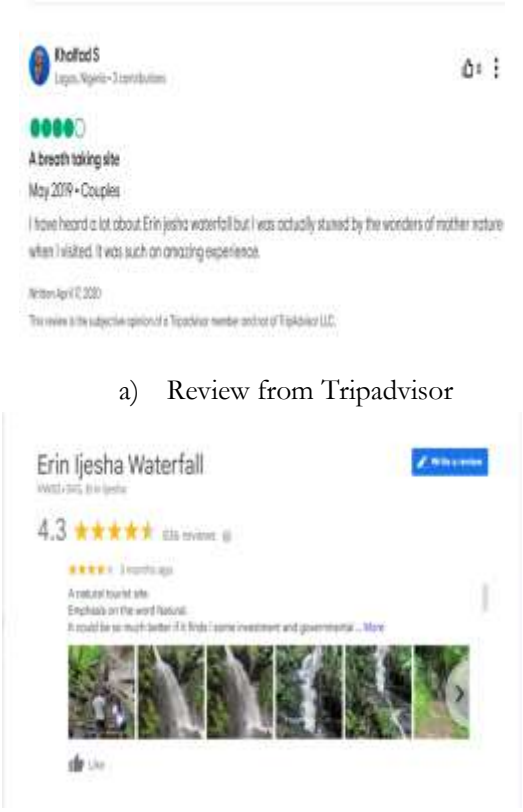
This section presents the methodology carried out for matching and classifying tourist sites. The study is rooted in personality psychology theories used in the development of personality aware recommendation models which assess the personality type of users using several means as source including, personality assessment questionnaire or application of automatic personality recognition method on users' previously available data, such as online social network data. For personality matching, the users' personality type is matched with relevant items, done either by linking the textual description of the items with the associated personality types, or using rules that can match items with personality types [14]. Personality matching is computed as shown in equation (1).

$$TPM(u, pt) = \mu(MS(u, pt, dim)) \quad (1)$$

Where $MS(u, pt, dim)$ denotes the personality matching score of the user $u$ and the potential matching tourist site $pt$ in the respective personality types and $\mu$ is the average value of each type.

### A. Data Collection

The data collected for the purpose of this research were obtained from online sources, various tour websites and blogs. Firstly, major tourist sites in Nigeria were identified from tourism websites including, Nigeria High Commission, Tripadvisor, Wikipedia and Hotels.ng. Some tourist sites which do not have adequate information/reviews needed for the study were dropped and a total of 20 tourist sites were further studied. Secondly, reviews for the tourist sites were collected from tourism sites such as Tripadvisor and Google reviews in their textual form (an example is shown in Figure 1). Additionally, the reviews were analyzed manually by identifying frequently written keywords, phrases and synonyms (all referred to as keywords) paying attention to




a) Review from Tripadvisor

b) Review from Google reviews

Figure 1: User Reviews on a Tourist Site

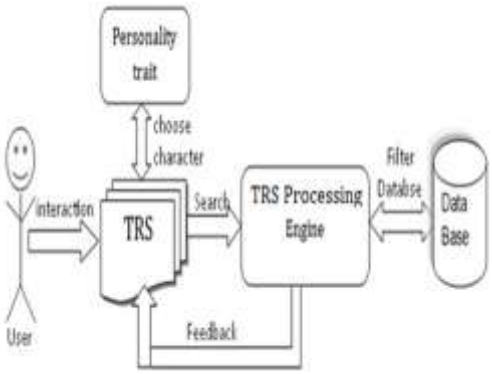



Figure 2: Architecture for Personality based Tourist Site System

adjectives, nouns, and verbs. Also, Monkey Learn software was used as an automated text analysis means to identify and filter out the keywords, topics and phrases in users reviews that may match the manually identified keywords. This will help to identify various traits and keywords that are synonymous in order to determine the personality type(s).

### B. System Architecture

The architecture for the implemented system is shown in Figure 2. The system comprises three main components which are the User Interface (UI) that provides a means for interaction with the system; the tourist site processing engine which provides programmed rules based on keyword matching that suggests a tourist site to a user and the database which stores various data on tourist sites. Summarily, a user can search or select a personality type and a matched tourist site(s) along with details are displayed.

## III. Results and Discussion

### A. Classification Using Keywords from Reviews

Table 2 presents an excerpt of the classification results gotten from the keyword matching. It shows the keywords identified from the reviews of tourist sites and the personality type synonymous with them. As an instance, a total of 17 reviews were found for Abgokim Waterfalls where words like "nature", "breathtaking" and "breathgiving" were common to 5, 10 and 2 reviewers respectively in addition to the average of their ratings. Traits of openness to experience include being 'Imaginative; Artistic Interest; Creative; Adventurous; Intellectual; Liberal' which is offered by tourist sites that are nature filled.

Table 2: Tour Sites and Personality Type Matching Samples

| S/N | TOUR SITES | KEYWORDS | PERSONALITY TYPES | VISITORS REVIEWS |
|---|---|---|---|---|
| 1 | Agbokim Waterfalls | Natural, Breathtaking & Breathgiving | Openness to experience, Extraversion, & Neuroticism | Nature: 5/17 Reviews, Rate: 5/5 Stars<br>Breathtaking: 10/17 Reviews, Rate: 4/5 stars<br>Breathgiving: 2/17 Reviews, Rate: 4/5 stars |
| 2 | Erin Ijesa Waterfalls | Waterfall, Climb, & Government | Agreeableness, Openness to experience, & Neuroticism | Waterfall: 60/100 Reviews, Rate: 5/5 stars<br>Climb: 25/100 Reviews, Rate: 4/5 stars<br>Government: 15/100 Reviews, Rate: 3/5 stars |
| 3 | Agodi Garden | Beautiful, Zoo, & Relaxation | Agreeableness, Neuroticism, Extraversion, Conscientiousness, & Openness | Relaxation: 150/300 Reviews, Rate: 5/5 stars<br>Beautiful: 100/300 Reviews, Rate: 5/5 stars<br>Zoo: 50/300 Reviews, Rate: 4/5 stars |
| 4 | Ikogosi warm spring | Vacation, Hangout, and Nature | Openness, Extraversion, & Neuroticism | Vacation: 100/300 Reviews, Rate: 4/5 stars<br>Hangout: 80/300 Reviews, Rate: 4/5 stars<br>Nature: 120/300 Reviews, Rate: 5/5 stars |
| 5 | Ogbunike Cave | Adventure, Nature, & Emotions | Openness, Extraversion, & Agreeableness | Adventure: 30/100 Reviews, Rate: 3/5 stars<br>Nature: 40/100 Reviews, Rate: 5/5 stars<br>Emotions: 30/100 Reviews, Rate: 4/5 stars |
| 6 | Olumo Rock | Fun, Adventure, & Culture. | Extraversion, Conscientiousness, & Openness | Fun: 50/200 Reviews, Rate: 5/5 stars<br>Adventure: 50/200 Reviews, Rate: 4/5 stars<br>Culture: 100/200 Reviews, Rate: 4/5 stars |
| 7 | Osun Osogbo Sacred | Tradition, Culture, & Monkeys | Openness, Extraversion, & Agreeableness | Monkeys: 50/100 Reviews, Rate: 5/5 stars<br>Culture: 30/100 Reviews, Rate: 4/5 stars<br>Tradition: 20/100 Reviews, Rate: 3/5 stars |
| 8 | Idanre Hill | Life, Experience, & History | Conscientiousness, & Openness | History: 25/50 Reviews, Rate: 5/5 stars<br>Experience: 15/50 Reviews, Rate: 3/5 stars<br>Life: 10/50 Reviews, Rate: 4/5 stars |
| 9 | Lekki Conservation Centre | Monkeys, Walkway, & Canopy | Openness, Extraversion, & Agreeableness | Monkeys: 500/1000 Reviews, Rate: 4/5 stars<br>Walkway: 300/1000 Reviews, Rate: 4/5 stars<br>Canopy: 200/1000 Reviews, Rate: 4/5 stars |
| 10 | Kajuru Castle | Beautiful, Experience, & Pool | Openness, Extraversion, & Neuroticism | Beautiful: 80/150 Reviews, Rate: 4/5 stars<br>Experience: 40/150 Reviews, Rate: 3/5 stars<br>Pool: 30/150 Reviews, Rate: 4/5 stars |

Breath taking with synonyms such as "thrilling" and "exciting" can be attributed to the extraversion personality type. Also, "self-consciousness, quietness", attributed to neuroticism can be synonymous with breath giving which means a "new birth or finding one's self". A tour site may have one or more personality type attributed to it depending on the keyword and synonyms. Number of reviews analyzed for each tour site according to the excerpt is shown in Figure 3.

## B. Prototype Implementation

The results from the keyword review matching is important in driving the categorization of tourist sites to personality type during implementation. A prototype implementation for the system architecture was done using HTML, CSS, JavaScript (front-end) for the UI design, PHP (back-end) for processing and MySQL (database).

The logical structure of the database is shown in Figure 4. The use case diagram in Figure 5 shows the specification of the system. The diagram shows the various processes considered for the system implementation and interactions between the users and the system. A tourist can search and view tourist locations which will be suggested based on the type of personality specified. An admin, who manages many of the system's functions, can add more tourist locations to the database, include a personality trait, delete a tourist location and a personality trait.

The implementation code (see code snippet in Figure 6) was written in Sublime Text editor and database stored on a local server. Figure 7

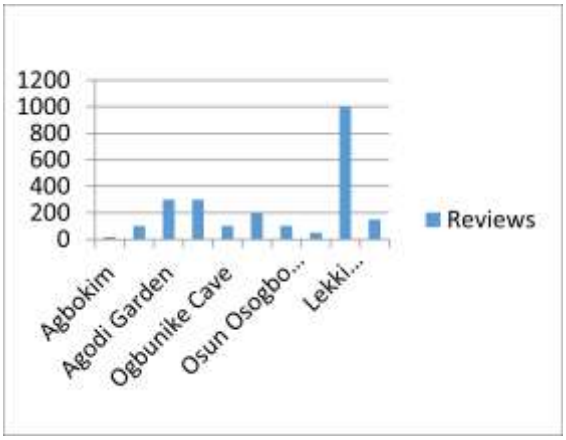



Figure 3: Chart Showing Total Number of Reviews for Tour Sites

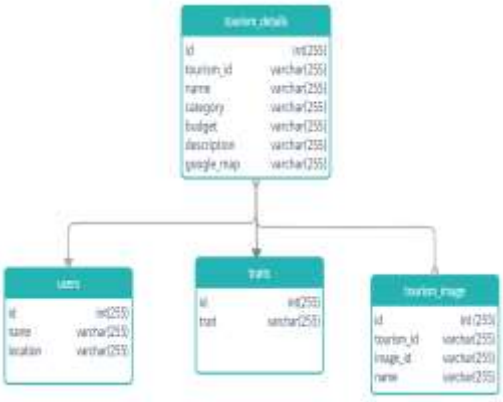


Figure 4: Database Structure for Personality Based Tourist Site System

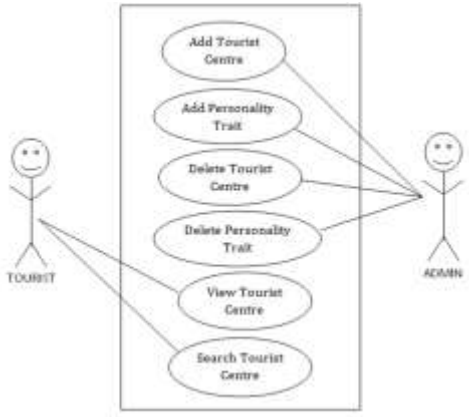



Figure 5: Use Case Diagram for the System

and Figure 8 show interfaces for the prototype implementation. Figure 7 shows a dropdown list of personality types in which users can select their personality type while Figure 8 shows the result of a personality type already selected with information about the tourist site.

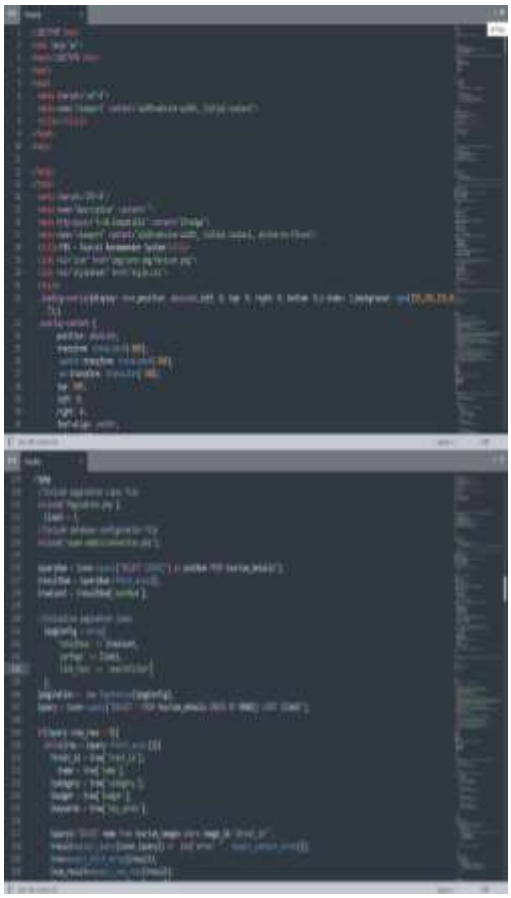


Figure 6: Implementation Code Snippets


Figure 7: Personality Type Search/Selection


Figure 8: Suggested Tourist Site

This is as a result of the keyword matching initially done to determine which tourist site(s) is classified under a personality type. A user can search or select personality type preference and the system displays the tourist site(s) that is classified under that type as a way of suggesting possible tourist destinations. The classified tourist site is displayed along with a brief description of the site, more images of the site as well as the location on the map.

## IV. Conclusion

This paper presented a keyword matching method for the classification of tourist sites to personality type which is towards the realization of a personalized recommendation system based on personality type. The Big Five personality types were considered and keywords from reviews of selected tourist sites in Nigeria were used to determine the personality type a tourist site belong. The resulting classification was implemented to suggest tourist sites when a user selects a personality type. For future works, this study can be extended to include, analyze and classify more tourist sites around the world and be improved to develop personality type based systems that deliver intelligent recommendations.

## References

[1] OECD "Tourism Trends and Policy Priorities", In OECD Tourism Trends and Policies 2020, OECD Publishing, Paris.

[2] Lu, J., Wu, D., Mao, M., Wang, W. and Zhang, G. "Recommender System Application Developments", *Decis. Support Syst.,* vol. 74, no. C, 2015, pp. 12-32.

[3] Soto, C.J. "Big Five Personality Traits, In Bornstein, M.H., Arterberry, M.E., Fingerman, K.L. and Lansford, J.E. (Eds.)", *The SAGE encyclopedia of lifespan human development,* Thousand Oaks, CA: Sage, 2018, pp. 240-241.

[4] Jani, D. "Relating Travel Personality to Big Five Factors of Personality", *Tourism,* vol. 62, no. 4, 2014, pp. 347-359.

[5] Yakhchi, S., Beheshti, A., Ghafari, S.M. and Orgun, M. "Enabling the Analysis of Personality Aspects in Recommender Systems", *Pacific Asia Conference on Information Systems (PACIS)*, China, June 15, 2019, pp. 1-15.

[6] Khodabandehlou, S., Hashemi Golpayegani, S.A. and Zivari Rahman, M. "An Effective Recommender System Based on Personality Traits, Demographics and Behavior of Customers in Time Context", *Data Technologies and Applications,* vol. 55, no. 1, 2021, pp. 149-174.

[7] Wang, H., Zuo, Y., Li, H., and Wu, J. "Cross-domain Recommendation with User Personality", *Knowledge-Based Systems,* vol. 213, no. 106664, 2021, pp. 1-10.

[8] Manjare, P.A., Ninawe, P.V., Dabhire, M.L., Bonde, R.S., Charhate, D.S. and Gawande, M.S. "Recommendation System Based on Tourist Attraction", *International Research Journal of Engineering and Technology,* vol. 3, no. 4, 2016, pp. 877-881.

[9] Alnogaithan, O., Algazlan, S., Aljuraiban, A. and Shargabi, A. "Tourism Recommendation System Based on User Reviews", *International*

*Conference on Innovation and Intelligence for Informatics, Computing, and Technologies,* 2019, pp. 1-5.

[10] Chen, K., Wang, P. and Zhang, H. "A Novel Hotel Recommendation Method Based on Personalized Preferences and Implicit Relationships", *International Journal of Hospitality Management,* vol. 92, no. 49, 2020, pp. 1-12.

[11] Alves, P., Campos, P., Saraiva, P., Martins, H., Marreiros, G., Carneiro, J. and Novais, P. "Modeling Tourists' Personality in Recommender Systems: How Does Personality Influence Preferences for Tourist Attractions?", *In Proceedings of the 28th ACM Conference on User Modeling, Adaptation and Personalization (UMAP '20)*, Association for Computing Machinery, New York, USA, 2020, pp. 4–13.

[12] Ito, M., Enoki, M. and Oguchi, M. "A Study of Spot Recommendation Personalization by Considering Personality Traits", *Global Humanitarian Technology Conference,* IEEE, 2020, pp. 344-349.

[13] Costa, P.T. and Mccrae, R.R. "Revised NEO Personality Inventory (NEO PI-R) and NEO Five-factor Inventory (NEO-FFI)", FL: Psychological Assessment Resources, 1992.

[14] Dhelim, S., Aung, N., Bouras, M.A., Ning, H. and Cambria, E. "A Survey on Personality-aware Recommendation Systems," *Artif. Intell. Rev.*, 2021, pp. 1–17.