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paper text:

East Java Tourism Economic Development through Travel Trip Planner Application using Hybrid Collaborative-Content User Rating on Android Andreas Handojo¹, Henry Novianus Palit¹, Fransisco Edo W P¹, Resmana Lim²

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ac.id ABSTRACT Tourism is a trips activity that made for the purpose of recreation. Generally, before traveling, someone is going to determine the tourism places to be visited and then search for information about these locations. Usually this information is available on the Internet or tourism mobile device applications. Generally, user will determine the places based on something he likes, such as when someone loved quiet and chill place will love to visit tourism location that have mountain sites. Currently, there are only a few applications that have features to provide recommendations tourism location based on user preferences. This research, will initiated Hybrid Collaborative-Content User Rating (HCCUR) methods which will provide tourism places recommendations that compliance with user preferences and tourism places categories, and also consider input from other users (rating) on tourism destination. This HCCUR method will be implemented on android mobile device applications. Tourism data that will be use is tourism places on East Java that already have a variety tourism categories to test the application algorithm. Goal from this application also is to increase the east java province economic development via tourism promotion. The Android application will display several lists tours that suit user preferences, alternative travel route, details and travel information, view the tourism location by using Google Map. From the testing that conduct to 50 potential users, we found that this recommendation application quite able to fulfill the interest of the user. Keyword: collaborative based, content based, recommendation, tourism, east java, android 1. Research Background To conduct search for tourism place that compatible with the user interests, user preferences, time, and another user recommendation is not easy. The general information on the internet or mobile device applications on tourism usually not provide any advice for tourism locations based on the user preferences, but only limited on tourism information or based on the distance location of the user. So the user must see and compare many tourism sites to see which one that match to the user interests / user preferences. This research would like to proposed Hybrid Collaborative User-Content Rating (HCCUR) method using user preferences to search tourism places that have something that compatible

with user preferences. Recommended selection of these tourism places will be rank by calculated it based on recommendation from another user. This recommendation by another user will also base on the degree of similarity from user preferences. This hybrid method will combine Collaborative Filtering (CF) and Content Based (CB) to calculate user preferences, tourism preferences, and user ratings. Results of HCCUR process then displayed on Android mobile device application. This recommendation tourism locations that will be displayed will be add with tourism locations information (picture, map, etc.), opening and closing hour from the tourism location, how much it cost to enter the location. This research tried to use user references with ten categories:

Beach Goer, History Buff, Family Vacationer, Backpacker, Thrill Seeker, 5

Arts and Architecture Lover, Lover Green, Sport Adventurer, Mountaineer, Animal Lover. This category can be added later when it is necessary. Each user is expected to entry their preferences based on the same categories (user can entry more than one category), so it can be used to determine the tourism location to visit. This ten categories also inserted on each tourism sites (each tourism sites also can have more than one category). The tourism sites that selected for example are tourism sites on East Java Province. The tourism places in East Java Province has many variations that sufficient enough for testing the method. Such as beach tourism, mountain tourism, rafting, zoo, museum, etc. This application can be used to increase the economic income of East Java Province. Where currently, the exploration of tourism potential is still get less exploration in Indonesia. One of the obstacles is the lack of tourism promotion. Tourism promotions that are currently conduct still sporadic, fragmented, inadequate/incomplete, and not well integrated. Moreover, commonly the promotion still use traditional method like paper, leaflets, a simple website that less attract attention and less able to provide information. The potential use of mobile device applications for tourism information is very highly potential, consider the growth rate of penetration of mobile devices today especially in the Indonesia. Tourism potential has been recognized by the government where the tourism sector is the fourth largest contributor of country revenue (9%) after oil and gas, coal, and oil palm (Tempo, 2014). On the other hand, the tourism sector is able to absorb 10 million workers. Compared to other countries, the value of travel services Indonesia is still low compared to other countries such as Thailand, Malaysia, and Vietnam. The government is targeting a significant increase is 9 million (2014) to 20 million foreign tourism (2019) with a target of 260 trillion rupiah, which means an average growth of 16% per year (JPNN, 2014). 2. Literature Review By the definition, tourism is the practice of traveling for recreation, the guidance or management of tourist (Webster, 2016). The tourism also defined as the activity of traveling to a place for pleasure, the business and the business of providing hotels, restaurants, entertainment, etc., for people who are traveling (Learner's Dictionary, 2016). So as a conclude tourism is a journey that carry out

by a person or group of people to visit a particular place for the purpose of recreation, personal development, or to learn 4

visited tourism location in the short time period. While the

East Java itself **is a province in the eastern part of Java, Indonesia.** East Java **area is 47,922 km² and have 37,476,757 population (2010 census).** **East** 3

Java is the largest area among

6 provinces in Java and has the largest population in Indonesia after West Java Province. **East Java** boundary is **Java Sea** in the north, the **Bali Passage** in the east, **Indian Ocean** in the south, and **Central Java Province** in the west. **East Java region also includes the island of Madura, Bawean, Kangean island**

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as well as

a number of small islands in the Java Sea (Masalembu Islands), **and** the **Indian Ocean** (Sempu **Island and Nusa**

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Barong) (KPRI, 2013). Nowadays, the East Java Province Tourism is a combine from very wide range of cultural tourism, nature tourism, historical and archeological tourism. For example Mount Bromo, Kawah Ijen, Baluran National Park, National Park Foundation, Singosari Temple Clowns, Candi Jajaghu, Candi Queen Bajang, Candi Tikus, Brahu, Temple Wringin Lawang, Trowulan, Wildlife Safari East Java, Betiri Meru National Park, Purwodadi, Mount Penanjakan, Rafting Pekalen Probolinggo, Museum of Heroism, Museum Trowulan, Balekambang Beach, waterfall Makadipura, Sempu Island, Red Island Beach, Popoh Beach, etc. (Wisata Indonesia, 2014). So the question is, there is so many tourism location to choose, which one is interesting and suitable for the user. To answer that question this research will try to build tourism place recommendation by using hybrid the idea of two methods called Content Based and Collaborative Filtering Recommender System. This recommendation that build on this research will not use the formula on that two methods, but only get the idea of these method. The Content Based, according Bogers & Bosh (2009), is a content-based recommendation that conduct as the information filtering system based on the content of the information. Content-based recommendation system starts with understanding the needs of the user, preferences, and constraints if any. On the implementation this information can be combined with logs from previous user interaction (if any) to build user profiles or just ask the user to entry their preferences/profile. Then a recommendation system will be matched the user's profile with information about a product that has been stored in the database. On this research the Content Based will be used to get user preferences and also calculated (to see the compatibility) with another user preferences as recommendation. Meanwhile, the Collaborative Filtering Recommender Systems, according to Nilashi

et al (2012) is a **collaborative filtering** recommendation system **to the**

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items that other users with similar tastes liked in the past are recommended to the target user. The likeness in taste of two users is computed with regards to the likeness in the past ratings of the users.

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This method used to predict the usefulness of items based on previous user recommendation. On this research this idea will hybrid with content based to find a recommended tourism places by rating of user to a tourism places. The detail information about how to use this two idea will be explain with example case and calculation later on. 3. Research Design and Result When user enter to the system for the first time (via Android apps), user will be ask to input user preferences (10 categories) for tourism places

(Beach Goer, History Buff, Family Vacationer, Backpacker, Thrill Seeker, 5

Arts and Architecture Lover, Green Lover, Sport Adventurer, Mountaineer, Animal Lover) as can be seen on Figure 1. This input will be calculated for decide the tourism places recommendation. Figure 1. User Preferences for Tourism Places Based on this data, the system will be build preferences compatibility from the new user with another user (Content Based Model). For example (Table 1) there is three another user that already on this system. So they have their own user preferences. The system will calculated the compatibility by compare new user preferences with each another user preferences. If there is a match (the same) so the system will add the compatibility with 1 point, if not match so it will not count (zero). This number will be added and divide with the total number of categories, so the system will have the average for the preferences compatibility. Table 1. User Preferences Compatibility Id Preferences User 1 User 2 User Preferences User 3 New User 1 Beach Goer

v v v v 2 History Buff v 8

3 Family Vacationer

v v v 4 Backpacker v v 5 Thrill Seeker v v 8

6 Arts and Architecture Lover

v v v v 7 Green Lover v v v 8 Sport Adventurer v v v 9 Mountaineer v v v v 10
Animal Lover v v v v 6

So the calculation result from table 1 can be seen like this: New User and User 1 = 1 + 0 + 0 + 0 + 0 + 1 + 1 + 0 + 1 + 1 = 5/10 = 0.5 New User and User 2 = 1 + 0 + 1 + 0 + 0 + 1 + 0 + 1 + 1 + 1 = 6/10 = 0.6 New User and User 3 = 1 + 0 + 1 + 0 + 0 + 1 + 1 + 1 + 1 + 1 = 7/10 = 0.7 From this calculation number, we can conclude that User 3 have highest preferences compatibility with new user and User 1 have lowest preferences compatibility. This preference compatibility will be used to calculate user rating (recommendation) to a tourism places. The rating will calculated based on preferences compatibility (Hybrid Collaborative-Content User Rating) from another user. For example, as seen on Table 2, when User 1 give Surabaya Museum high recommended place to visit = 5 point (with rating scale 1 = highly not recommended and 5 = highly recommended) and there is no another user that give their recommendation.

So, the system will calculate that Surabaya Museum has a total point for the new user recommendation as (5

$$5 \times 0.5 + (0 \times 0.6) + (0 \times 0.7) = 2.5$$

The number 0.5, 0.6, and 0.7.

10

7 will be collected from New User preferences compatibility with another three users. So, the calculation for Jatim Park 2, the total point is (3

$$3 \times 0.5 + (0 \times 0.6) + (5 \times 0.7)$$

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= 3.5. With this calculation we could see that even though a place (Surabaya Museum) has 5 points (highest) recommendation from a user (user 1), but if User 1 doesn't have high preferences compatibility to the New User so the place recommendation will not be as high as the place (Jatim Park 2) that is recommended by a user that has high preferences compatibility (User 3). Rating recommendation for each tourism place will be calculated as an average from all of user input. Table 2. Tourism Places Recommendation Rating For New User

Tourism ID	Tourism Place	User 1	User 2	Tourism Rating	Recommendation	User 3
173	Surabaya Museum	5	5	$5 \times 0.5 + 0 \times 0.6 + 0 \times 0.7 = 2.5$	2.5	170
170	Sampoerna Museum	1	0	$1 \times 0.5 + 0 \times 0.6 + 1 \times 0.7 = 0.7$	0.7	168
168	Monument Bambu Runcing	1	0	$1 \times 0.5 + 1 \times 0.6 + 0 \times 0.7 = 0.6$	0.6	166
166	Jatim Park 2	5	3	$5 \times 0.5 + 0 \times 0.6 + 5 \times 0.7 = 3.5$	3.5	165
165	Sanggar Agung Temple	4	0	$4 \times 0.5 + 4 \times 0.6 + 0 \times 0.7 = 2.4$	2.4	164
164	Tugu Pahawan 2	2	2	$2 \times 0.5 + 0 \times 0.6 + 0 \times 0.7 = 1.0$	1.0	161
161	Surabaya Zoo	5	0	$5 \times 0.5 + 5 \times 0.6 + 0 \times 0.7 = 3$	3	159
159	Pantai Ria Kenjeran	4	4	$4 \times 0.5 + 0 \times 0.6 + 4 \times 0.7 = 4.8$	4.8	

Beside from user preferences compatibility with another user rating, this application also uses tourism preferences categories as recommendation to user. Each tourism place will have their own rating on each ten preferences categories. This rating will have a scale from 0 to 9, the bigger the number it means that a tourism place has a big correlation with that preferences category. This rating category will be inputted to the system by administrator. For example, as illustrated on Table 3, Jatim Park 2 has preferences number 9 on animal lover, 7 on sport adventurer, 7 on family vacationer, 6 on green lover. So that means that Jatim Park 2 has facilities for animal lovers (maybe like zoo) but also has sport or game facilities, and this place will be suitable to visit by family (old people, couples, children, etc.) and also has green view (maybe like park). This tourism place preferences category will also give user recommendation which tourism places to visit that are close to user preferences. All of the tourism place preferences categories that have compatibility with user preferences will be added and sorted, so the tourism place that has the biggest compatibility can be seen as highly recommended place to visit. So, for Jatim Park 2 (has all the new user preferences) the preference point that is calculated is $7 + 6 + 7 + 9 = 29$, but for Red Beach the point that is calculated is only $9 + 7 + 5 + 5 = 26$. The point from backpacker and thrill seeker category will not be calculated because those preferences are not new user preferences. From these 4 tourism places the sorted tourism places will be Jatim Park 2, Red Beach, Mount Bromo, and Surabaya Museum. This recommendation of tourism places will also be suggested to user along with Tourism Places Recommendation Rating. So the user has a view of alternative recommendation of tourism places to pick. The result from this recommendation will be shown to the user (as can be seen on Figure 2), and user can find more detail information about the tourism location that interests the user for example where it is on the map and how to get there – using Google Map (Figure 3). Table 3. Tourism Places Preferences Categories

Id	Preferences	Jatim Park 2	Mount Bromo	Tourism Place	Preferences	Surabaya Museum	Red Beach	New User
1	Beach Goer	9	2	History Buff	9	3	Family Vacationer	7 7 7 v 4
2	Backpacker	7	7	Thrill Seeker	6	6	Arts and Architecture Lover	8 v 7
3	Green Lover	6	8	Sport Adventurer	7	5		v 9

Mountaineer 9 v 10 Animal Lover 9 v Total for New User Recommendation 29 24 24 26 Figure 2. List of Recommended Tourism Location Figure 3. Tourism Location using Google Map API From the testing to 50 potential user, this Trip Planner Application using Hybrid Collaborative-Content User Rating quite able to show the recommended tourism places compatible with user preferences (90% strongly agree) and fulfill the interest of the user (93% strongly agree). 4. Conclusion and Discussion From this research we could conclude that Hybrid Collaborative-Content User Rating (HCCUR) could get user preferences (content based) to find the compatibility with another user preferences. Another user with high compatibility most likely will have a close preferences (they maybe have a big chance to like the same food, like the same sight-seeing, like the same ambience). So there's a big chance that what they think it's a good tourism place to visit, it's also a good place to visit by another user that have a quite same preferences. This idea is calculated with collaborative based (via rating system) to give tourism places recommendation to visit. This research also give a lot of opportunity to explore the preferences, for example to break down some point of interest like what kind of history buff that user like, is it an archeological history, war history, culture, or else. So, the algorithm will find more deep preferences to give a more good recommendation. Another exploration opportunity is what if we also input distance of tourism places to visit as a parameter to build the recommendation. So user can pick not only one location to visit but multiple location in certain allocation of time.

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