A CASE-BASED ONLINE HOUSING RECOMMENDER SYSTEM

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1 INTRODUCTION

Housing has central importance to the quality of life with considerable economic, social, cultural and personal significance [1]. A recommender framework gives suggestions and recommendations to clients when they are choosing while confronted with various decision options [2]. Recommender system has been applied to solve different housing problems by several researchers; [3] proposed a hybrid user-centric housing recommender system with the aid of fuzzy logic and item-based collaborative filtering technique; [4] proposed a hybrid real estate recommender system that combines collaborative and content-based filtering techniques. There is a need for a special housing decision support system that is channeled towards solving this problem and focused on giving the user, houses that matches what he/she is exactly looking for as his/her 'Dream Home'. This research work established a knowledge-based recommender system driven by a case-based reasoning approach for providing recommendations to potential home buyers and tenants. The case-based reasoning approach uses similarity measures function and weight to retrieve items from the system that are similar to the specified items attribute by the users.

2 METHODOLOGY

Ado-Ekiti metropolis, one of the cities in Nigeria was used as a case study. The datasets used in this research work contain six attributes, which are, property type, price, number of bedrooms, number of bathrooms, location, building area, and land area. Each attribute is assigned corresponding weight values between 0 and 1.

The local similarities $sim(a_i^I, a_i^R)$ between the user specified input attributes and each retrieved case attributes are calculated in Eq. (1)

$$sim(a_i^I, a_i^R) = 1 - \frac{|a_i^I - a_i^R|}{max_i - min_i} \quad (1)$$

where, max_i and min_i represent the maximum or minimum possible values of the attribute i, and a_i^I, a_i^R are the values of the *i-th*attribute in the input $c^I$and the retrieved c^R cases respectively.

Thereafter, the weighted sum function uses the local similarity scores with the weights as coefficients to calculate the global similarity as shown in Eq. (2).

$$Sim(c^I, c^R) = \frac{\sum_{i=1}^{n} w_i \times sim(a_i^I, a_i^R)}{\sum_{i=1}^{n} w_i} \quad (2)$$

where, $Sim(c^I, c^R)$ is the local similarity function used for their comparison and, $w_i \in [0,1]$ is the corresponding weighting factor.

3 RESULTS

The system evaluation was carried out using an online survey form attached to the developed system. The online survey was completed by eighty (80) users using a 5-point scale. The metrics used for the evaluation of the system include; trust, novelty, user interface experience, and ease of use. Table 1. depicts the summary of user's responses to the online survey.

Table 1. Summary of Users' Responses to Online Survey

	Questions	Very Good	Good	Fair	Poor	Very Poor
1	How easy is it to use the system?	49(61.25%)	24 (30%)	7(8.75%)	0	0
2	How friendly is the User Interface?	56(70%)	18(22.5%)	6(7.5%)	0	0
3	How relevant is the system's recommendation to your desired home?	39(45%)	25 (31.25%)	9(11.25%)	5(6.25%)	2(2.5%)
4	How reasonable is the system's recommendations?	25(31.25%)	33(41.25%)	9(11.25%)	7(87.5%)	6(7.5%)
5	How was your experience using the system?	59 (73.75%)	16(20%)	5(6.25%)	0	0
6	How would you rate the system's ability to recommend houses you do not know about?	25(31.25%)	42(52.5%)	9 (11.25%)	4(5%)	0

According to these results, the system found very high usability, with high user friendliness. It also performed fairly at providing required results to users. as majority of the users rated it well in this regard. In addition, the system rated fairly high in recommending new (previously unknown) houses to users. Finally, it showed fair performance at reasonable recommendation. The results call for the need for more intelligent systems to serve this purpose in the future.

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