

# Matching Current Search with Future Postings

Kim Nee Goh, Viknesh Kumar Naleyah

**Abstract**—Online trading is an alternative to conventional shopping method. People trade goods which are new or pre-owned before. However, there are times when a user is not able to search the items wanted online. This is because the items may not be posted as yet, thus ending the search. Conventional search mechanism only works by searching and matching search criteria (requirement) with data available in a particular database. This research aims to match current search requirements with future postings. This would involve the time factor in the conventional search method. A Car Matching Alert System (CMAS) prototype was developed to test the matching algorithm. When a buyer's search returns no result, the system saves the search and the buyer will be alerted if there is a match found based on future postings. The algorithm developed is useful and as it can be applied in other search context.

**Keywords**—Matching algorithm, online trading, search, future postings, car matching

## I. INTRODUCTION

TRADING of products online is becoming common nowadays. Quoting [1], the popularity of e-Marketplaces is largely attributed to their improvement in economic efficiency, reduction in margins between price and costs, and speeding up complicated business deals. However, as pointed out, search is often ineffective because the matchmaking functions are relatively new and services supporting domain-specific product knowledge are rare.

People trade all kinds of products online, and cars are not of any exception. Car-matching service is a way of selling cars in which it offers car sellers the details of potential buyers or vice versa. This service is operated by companies that claim to have successfully matched the advertised car to sell with one or more interested buyers. This scheme is most popular in the United Kingdom nowadays in which there exists a huge market for used car trading business [2]. Most of these bogus companies claim to have found the buyer / seller for a particular car model that one advertised over the internet. They cheat people by asking them to transfer some amount of money for them to reveal the buyer / seller but in actual fact, there is none. Quoting [3], trust plays a very important role as it provides a form of social control which allows agents in e-marketplaces to reason about reliability, capability and honesty of others, in order to choose the best business partners. The Office of Fair Trading (OFT) Britain [4] has produced a statement that car-matching scam costs consumers around £3 million annually. Although this scam is prominent in the European countries, it would not be long before the scam affects Malaysia.

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These so called 'matching agents' look for advertisement details provided by car sellers over mass media and internet. Then, they will cold call the car seller and lure them by saying that they have found matches for the advertised cars. But, before they can reveal the matches, car sellers are required to pay some amount of fee to the company. It was reported that sellers can be charged up to £99 for the matching service [2]. The company promises that the buyers will directly contact the sellers once the payment is done. Once the car sellers make the payment, these potential buyers 'disappears'. Most car sellers will only notice that they have been cheated when the time taken is too long. Reference [5] reports that over 1,600 private sellers have been duped by such a scheme and predict that the actual figure of those affected is much higher. Although most of these companies are fake, but there is a possibility of applying this matching concept in real business. The objective of this paper is to develop a system which includes a new matching algorithm that saves requirements from buyers and finds a match to future advertisements posted by sellers. The users will then be informed via Short Message Service (SMS) of any match found.

## II. PREVIOUS WORK

Most automobile seller websites are currently providing basic services only when it comes to matching between the seller's car and the buyer's requirements. But there are many other websites that have already used matching algorithm. One such website is Match.com (2009) [6]. This website will gather information about all users and store it in its database. All the gathered information is stored as a profile in the database. In order to find any match of the profile, users are required to subscribe and pay for the service. Once subscribed, users will get match alerts to their registered Email account. The matching algorithm works by running all the data gathered from a user with the database in a form of query. Once a few matches are found from the data, the system then will sort out the matches for further processing. Ontology was found to be an effective technique in semantic web to match search results accurately. Authors [7] used ontology to demonstrate the effectiveness of the matching approach in course catalogue of two universities and also two search engines. As done by [1], they applied ontology technique in their Used Car Matching System (UCMS) to correctly match users search to the relevant results. The workflow of the system is depicted in Fig. 1.

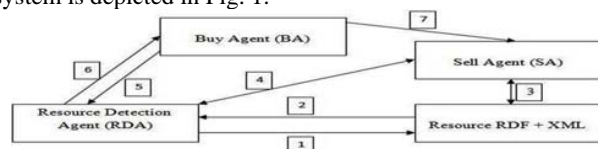


Fig. 1 Workflow of a Used Car Matching System (UCMS)

The system works when there are interactions between the four components in the above Fig. 1. The Resource Detection Agent (RDA) is the programming entity that looks up all the resources and through the Sell Agent (SA) to build up the car to be in sell list. Resource RDF + XML is the programming entity that will act as a connector between the RDA and Sell Agent (Step 1-3). At the same time, the SA will also remove the sell order from the purchase requests (Step 4). This is the reason for both Step 3 and Step 4 allow two-way communication. The Buy Agent (BA) is the programming entity that will be involved by the user who wants to buy cars. The BA will then transfer the requirements to the RDA and store the information into the buy list. Then RDA will return a subset of the sell list that matches the criteria placed in the buy order back to the BA (Step 5, 6). The BA will then ask the SA about further information that the user would like to obtain (Step 7). If the trade is successful, the BA will remove the buy requests, limiting the potential buyers and classify them as matches. Some of the local and international car classified web portals and its services are listed in Table 1.

TABLE I  
COMPARISON OF SERVICES PROVIDED BY EXISTING CAR CLASSIFIEDS

Car Portal	Searching Service	Matching Service
mudah.my	Yes	No
globalcardealers.com	Yes	No
autotrader.co.uk	Yes	No
carlist.my	Yes	Yes – Mail based
tradecarview.com	Yes	Yes - Mail based
matchimedia.com	No	Yes - Mail based
carsearch.com	Yes	Yes - Mail based

Table I lists some of the prominent car portals. It is noted that although all the listed car portals do provide searching and matching services, none of them provide an alert mechanism via SMS. Only tradecarview.com, carlist.my, matchimedia.com and carsearch.com alert their users via Email. There has been much research work for in terms of matching searches to the returned results. One study done by [8] proved the effectiveness of search engines in searching for ecommerce queries. The author also mentioned that most studies are interested on how users search the web to address ecommerce needs but they have ignored how effective these searches are. Referring [9], the authors did a precision evaluation of search engines. It was found that Google rated the best among the six different search engines that was compared. What about a search that has no result as yet, at the time of their search? Another work done by [10] which studied results returned from searches in digital forensic search process. They re-ranked search results using adaptive user interest hierarchies (AUIH) which considers both investigator-defined keywords and user interest learnt from electronic evidence. It was found that this method reduces the amount of time needed to search for relevant results.

III. RESULTS

A matching algorithm is developed for a web portal to list available cars and buyer's requirements. The unique feature of

this portal is it will be able to get user's criteria, store in the database and compare it repetitively against all the available models in the database for a match. Users in this context refer to either the sellers or buyers that submit a post to the system. The post can be either in the form of search criteria (by buyers) or in the form of a new advertisement (by sellers). This will be done by searching and sorting algorithms. The matching mechanism placed in the system automatically retrieves the data entered and match the buyers requirements to all the advertisements available in the database, including the advertisements entered after the buyer's requirements are made. If one or more matches are found, the system will automatically send a Short Message Service (SMS) alert and Email to that particular user mobile and registered email address. The goal is to update (alert) users when there is a new match found. Other than the matching service, there will be some other functionalities and modules in this portal which are relevant to the automobile business.

A. Matching System Framework

The difference between normal search and match mechanism and the proposed system is shown and explained as follows.

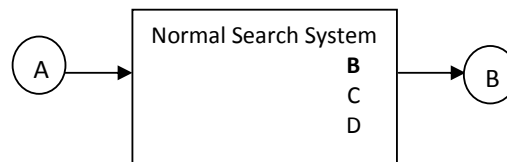


Fig. 2 Normal search and match mechanism

Normal search mechanism works as depicted in the Fig. 2. Assume A is the search criteria entered by buyer into the system. The system searches for a matching result data within the system. If there is a match (in this case B), B will be returned to the buyer. If there is no match, then the system prompts a no match message and ends the search.

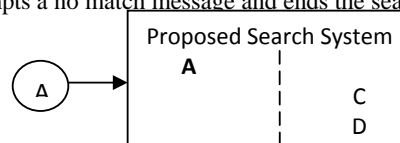


Fig. 3 Proposed search and match mechanism

The proposed system as in Fig. 3 stores buyer's search criteria into the system. This is done so that once there is a new advertisement posted by a seller; the system runs the entire requirement existing in it to find a match. In this case, the match is shown in the Fig. 4.

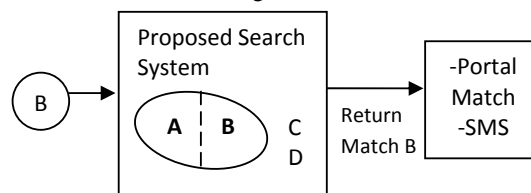


Fig. 4 Proposed search and match mechanism

As in Fig. 4, B is the new advertisement entered by seller. Once B is entered into the system, it triggers the system to run the matching algorithm. Once the system runs, B is matched to A, which is stored earlier. Then, the system returns the result, B to the buyer in the form of alert in the Web portal and also a SMS alert.

### B. System Architecture

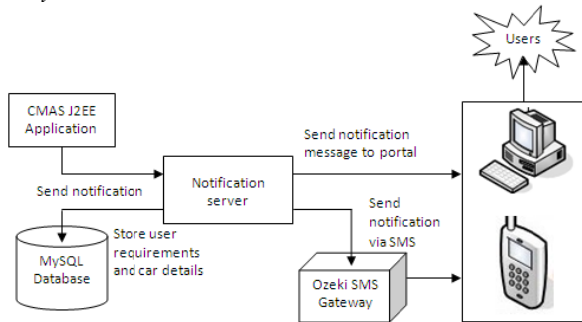


Fig. 5 Car Matching Alert System Architecture Diagram

Fig. 5 illustrates the system architecture of CMAS. The system is divided into four parts: 1. presentation layer, consist of CMAS interface, 2. application layer, consist of CMAS application and Ozeki SMS Gateway, 3. Server Layer, consist of notification server and Ozeki SMS server, 4. database layer, consist of MySQL database. This system is designed to cater for multiple users using the application at similar time while issuing the requests to the server. Application layer consists of the application software that provide presentation layer with the data and model. Server layer is an intermediary for connection between application layer and database layer.

### C. Automatic SMS Sending Mechanism

Once there is a match found for a car seller, there will be an alert mechanism that will indicate the seller through Email and SMS of the match found. The best medium to convey the alert in a fast and cheap way is through Short Message Service (SMS). The SMS alert will be sent on the next day after a requirement been submitted. The time of the SMS being sent is fixed at 9am. The SMS alert sending time is fixed to 9am everyday for users to anticipate whether there is a match for that particular day. If there is more than one match, there will still be only one SMS alert being sent. This approach is taken to minimize cost. To add SMS as a method to alert users, the implementation of SMS Java API technology with SMS Gateway is done. On the other hand, critical timing aspect will be emphasized in this system. This is vital in order to identify and store the data from users in a timely manner. Once requirement criteria from buyer or a new advertisement is posted by seller, the entry time will be captured and stored in the database along with other related information. This is done so that the system can be triggered to run the searching and matching algorithm every time a new entry is made. Also, critical timing is vital to capture the exact time an entry is made because there can be more than one entry made at relatively same time. For example, one advertisement is posted at 12.30pm and another advertisement is also posted on the same time. This may lead to data clash in the database.

However, by applying critical timing, the exact time of the post, which includes seconds, will be captured. When there is a more accurate timing system being entered into the database, it eliminates data clash problem. Since the advertisements posted in the portal will be valid for a period of 1 month, the advertisements will automatically expire and no longer be displayed in the portal after the one month period ends. Critical timing will be an advantage in the portal maintenance process. This is because by capturing the time of entry, it will be relatively easier to perform database clean up. Older entries can be identified and further processed. It will either be refreshed or deleted from the database, upon user request. Updating and editing the status of sold cars will be easier with critical timing implemented. As an example, once a car has been sold, administrator can remove the post entry based on the date of post, besides referring to the specification of the car.

### D. System Prototype

The system prototype, as shown in Fig. 6, has four major sections, namely, 1. Home, 2. Post Advertisement, 3. Match and 4. About Us. For Home, Post Advertisement and About Us the system prototype works as expected.



Fig. 6 CMAS' main page

However, the Match tab of this system consists of a MatchAlert module as shown in Fig. 7. This module allow buyers to select and submit requirements of their desired car in case there is no suitable car post found in the system as they searched. Requestor (buyer) can also edit, view or disable the requirement sent to the system.

Type:	New	<input type="checkbox"/>
Make:	Perodua	<input type="checkbox"/>
Model:	Myvi 3L	<input type="checkbox"/>
Price Range:	RM 10000 - RM 50000	<input type="checkbox"/>
Year:	2008	<input type="checkbox"/>
Location:	Perak	<input type="checkbox"/>

Submit Cancel

Fig. 7 Criteria that buyer will need to select

When a match, as entered by user requirement as in Fig. 7, has been found, an SMS (Fig. 8) will be sent to the user to inform user of the match. Users however have to log onto the website to see the details of the match as this will encourage returning customers.

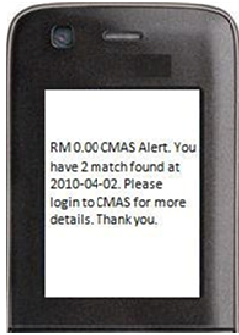


Fig. 8 Periodical SMS alert will be sent to user's mobile phone when a match is found

#### IV. CONCLUSION

Using the developed algorithm, CMAS enable users to perform searches and matches the requirements of buyers with future posts of sellers. It also sends out periodical SMS alerts to users, whom their requirements match with recently added advertisement posts. In this case, although the matching algorithm was applied in a car trading portal, this idea can be adapted and applied to other e-commerce website. This will encourage users to perform online purchases and retain customer's loyalty in a long run. Further testing needs to be done to gauge efficiency and effectiveness of the prototype developed.

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