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Semantic based e-Housing Platform for Urban Regions

[1]Omotosho, Oluyinka. I.; [2]Adeyanju, Ibrahim A.
[1]Senior Lecturer, Department of Computer Science and Engineering, Ladoke Akintola University of Technology Ogbomosho, Oyo State 10214, Nigeria
[2]Senior Lecturer, Department of Computer Engineering, Federal University, Oye-Ekiti, Ekiti State, Nigeria
oiomotosho@lautech.edu.ng; Ibrahim.adeyanju@fuoye.edu.ng

Abstract- Shelter is a basic necessity of life. Every human in all categories are entitled to securing a desired accommodation with an ease, in this advent of advancement in technology. Currently, the process of securing accommodations/houses in most cities of developing countries are characterized by stress, discouragement, confusion, fear of exorbitant rent charges and estate agents' commission among others. While there have been drastic improvements in the first and second world countries, enormous work is still required in the Third world countries to eradicate challenges surrounding acquisition of basic needs of life, among which accommodation is primary. This work maximizes the advent of semantic web technology in a platform that integrates all players in e-Housing for a lasting solution strategy.

Keywords: e-Housing, Semantic Web Platform, Ontology, Estate agents and Third world countries

1. INTRODUCTION

The need for a good desired accommodation cannot be overemphasized. All over the world, one of the most sought basic needs is accommodation/Housing, since it connotes rest. Around the globe, people migrate every day for settlement, from one location to the other and immediate securing an apartment could be difficult for transients and people moving into new areas. Most often, such categories of clients ends up being duped by fake and dubious so called "Estate agents", and at the same time loosing exorbitant income. Hence, securing accommodation is still a major challenge in the Third world countries. A fewer domains of the population such as the universities, tourism bodies and so on often provide online accommodation services along with other website tasks/information. These searches are usually characterized ambiguous search result contents. All these challenges among other arouse the need for a semantic platform as a solution strategy for concise and desired accommodation search. This will be inevitable for a wider scope of the populace. Nevertheless, the implementation technology is a daring concern as such considered this work.

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2. LITERATURE REVIEW

Housing literally is defined as shelters in which people lives and to the nations [9], a critical component in social and economic fabric. Housing represents one of the most basic human needs. As a unit of the environment, it has a profound influence on the health, efficiency, social behavior, satisfaction and general welfare of the community [9]. To most groups housing means shelter but to others it means more as it serves as one of the best indicators of a person's standard of living and his or her place in the society [6]. It is a priority for the attainment of living standard and it is important to both rural and urban areas. These attribute make demand for housing to know no bound as population growth and urbanization increase very rapidly and the gap between housing need and supply becomes widen. Cultural factors such as preferences and values or social status, taste and financial resources, also influence a home physical characteristics.

In developing countries, poor housing delivery has been attributed to inadequate mechanisms and systems for land allocation, funding, mortgage institutions and infrastructure [5]. Despite the significance of housing, adequate supply has remained a mirage to all carder of the society in Nigeria. Various authorities have proffered strategies [3] for improving housing delivery in Nigeria. Fasakin [3] suggested the cooperative housing model while Oduwaye [7] advocate for simply land allocation system and Omole [8] suggested affordable financing model. The WWW Consortium (W3C) is developing the Resource Description Framework [1], a language for encoding knowledge on Web pages to make it understandable to electronic agents searching for information. The *semantic web* is an evolution and extensions of the existing web that allows computers to manipulate data and information [2]. It provides a common framework that allows data to be shared and re-used across application, enterprise and community [10]. The semantic web is therefore regarded as an integrator across different content, information application and systems [10]. Ontology is an explicit specification of a conceptualization [4]. It can also be define as a structural framework for organizing information on the semantic web and within a semantic enterprise. They provide unique benefits in discovery, flexible access, and information integration due to their inherent connectedness; that is, their ability to represent conceptual relationships [4].

3. ARCHITECTURAL DESIGN

Our architectural design includes three main components which are web application/PHP MSQL/Dream weaver, OWL RDF/API and Accommodation ontology. Individual components are subsequently discussed in the following sections.

3.1 Accommodation Ontology: The Architecture is majorly driven by the ontology, which provides the semantic basis that enables or generates precise information result on request. As we could not lay our hands on any pre-existing or third party ontology for re-use, e-Accommodations ontology was developed from the scratch. Since accommodation domain is very wide with varying types, sizes, usage and so on, this work basically considers those based on rent ages apartment majorly. As a case study a highly population dense commercial city is considered in this work, of which demand for apartment rent ages is highly competitive and always on the increase. Hence to build the ontology, all information relating to various categories of apartment their rates was captured into a hierarchy of classes of which the superclass are Island and Mainland, which are the two major levels of accommodation on rentals in the city. The accommodations in the Island are characterized by both the high and Middle classes. While the latter is characterized by all category cadre/levels as shown in Figure 1. The lowest subclasses are the location within the city. We used top down class hierarchy developmental approach.

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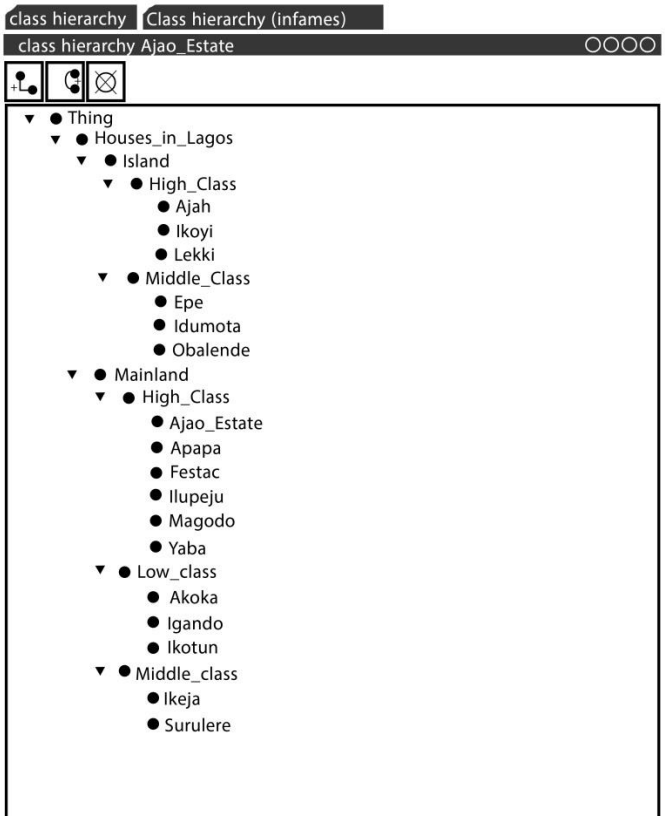

Figure 1: Hierarchical representation of accommodation classes

Properties are meant to establish relationships between classes and every other components of the ontology. For this work, the protégé 4.3 used two type of properties namely; object properties and data properties. Object properties are basically of relationship or interaction type while data properties are value typed or value based. Data properties are various range rents per annum of the categories of apartment. Fig. 2 and 3 depicts the Object and Data Properties.

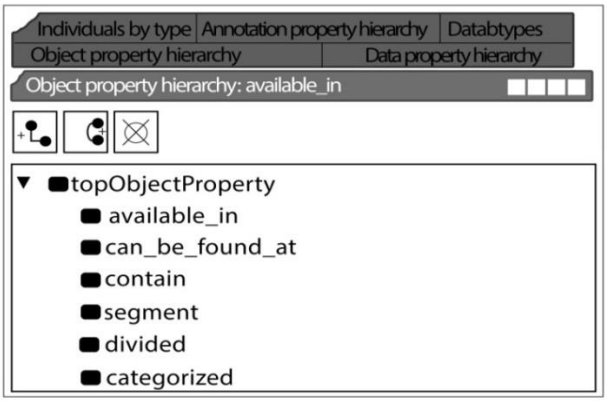

Figure 3.2: Represented object properties

Figure 2: Representation of object properties

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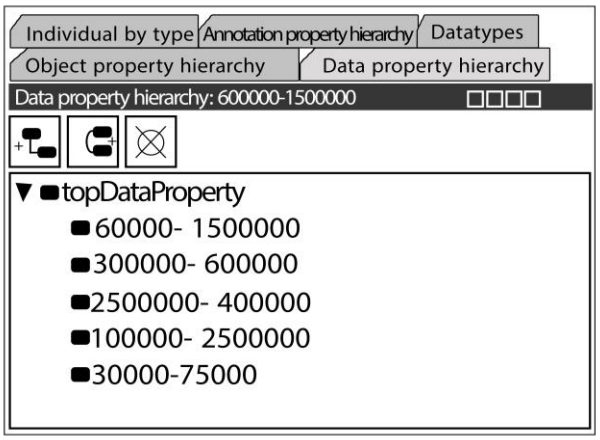

Figure 3: Represented of Data properties

Classes and object properties are arranged into subsumption relationships, which encodes essential background knowledge into the ontology that is necessary for consistent and correct inferences to be made this is achieved with the use of FaCT ++ reasoner. Figure 5 shows the classes and the relation mapping. Figure 4 shows the Classes and Individual tabs, which are the instances of the class, while Figure 5 shows a radial representation class, subclasses and their individuals of accommodation in the city.

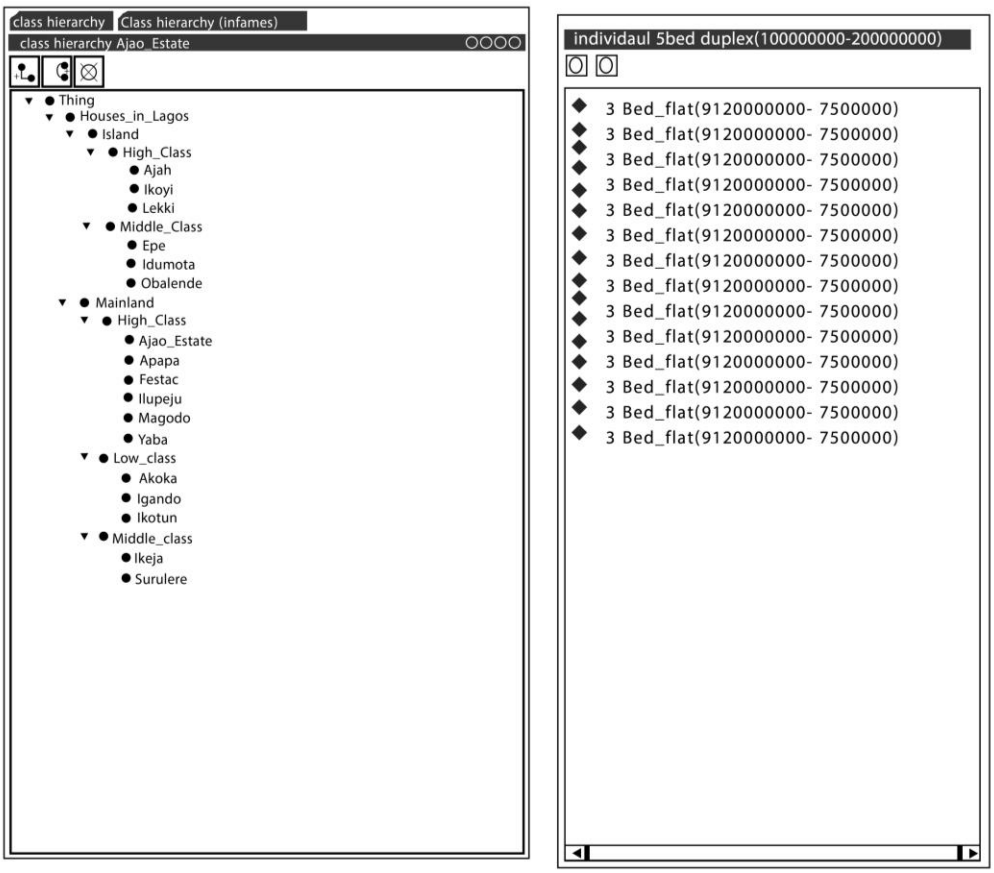

Figure 4: Class and individual tabs

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3.2 OWL API/RDF: After an interactive design of ontology, the developed ontology is by default of the extension .owl, whereas the requirement of the web interface is an RDF file. Therefore, an external element has to stand between the produced ontology and the web interface before it could be assessed by the users. This brings in the need for the OWL APIIRDF integrator. The integrator is responsible for converting the produced ontology in .owl extension to the web accessible format .rdf.

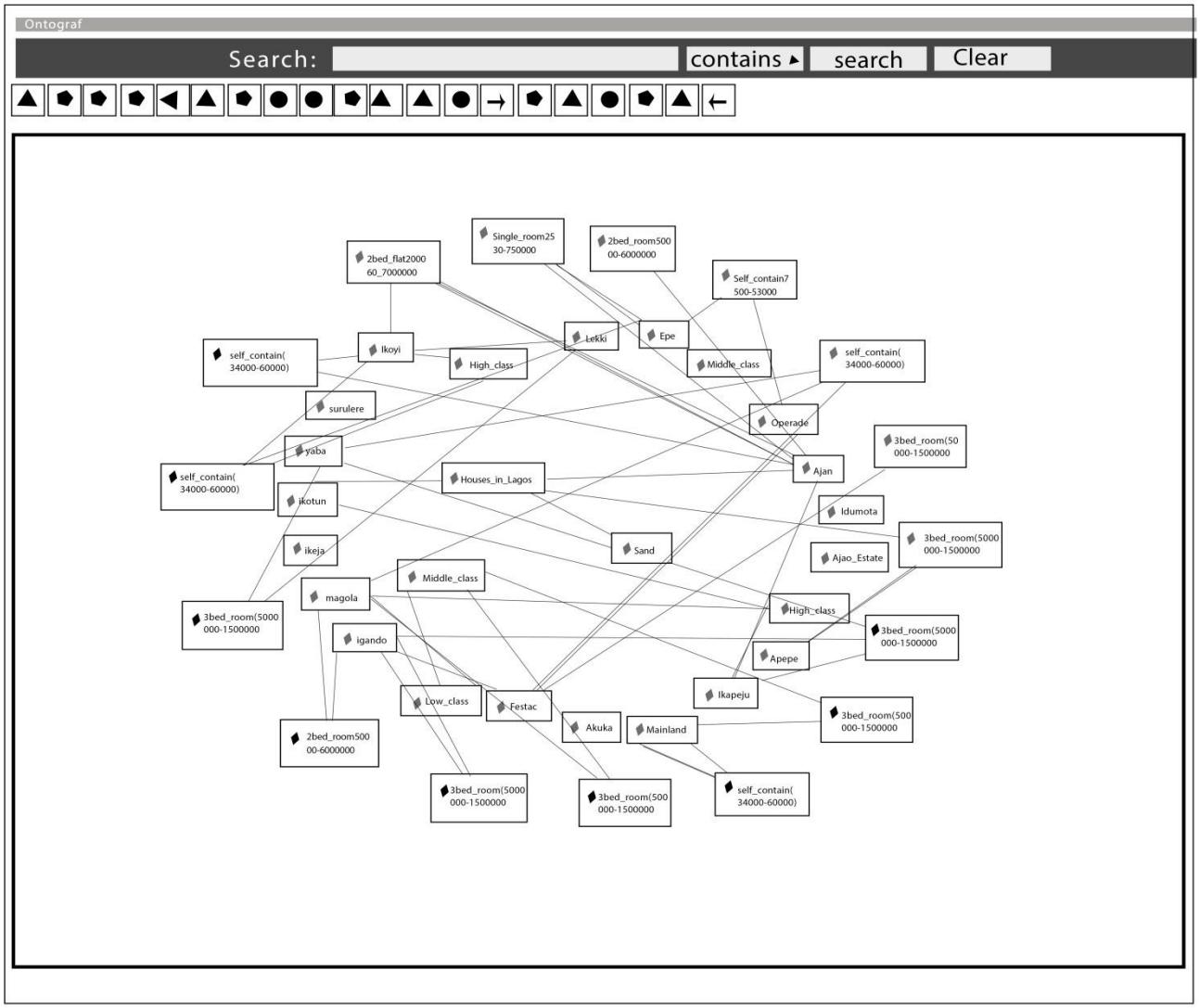

Fig3.8: Radial representation of class houses in Lagos, its subclasses and their individual

Figure 5: Radial representation class, subclasses and their individuals

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<rdf:type rdf:resource="http://www.semanticweb.org/muinat/ontologiesl2014
lhrntit"
5#Akoka"/>
<rdf:type rdf:resource="http://www.semanticweb.org/muinat/ontologies/20 14 l/un
5#Igando"l>
<rdf:type rdf: resource="http://www.semanticweb.org/mui nat/ontologies/20 14/1
lunti tled-cttalkr3i
5#Ikotun"l>
</owl:Namedlndividual>
<! -- http://www .semanticweb.org/muinat/ontologies/20 1411 /untitled-
ontology- 5#3 bed _ flat( ~ 00
15000000) -->
<owl :NamedI ndi vidual rdf:about="http://www
.semanticweb.org/muinat/ontologies/20 14/ I /untitled-
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5#Ikoyi"l>
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/untitled-ontology-
5#Lekki"l>
</owl: amedlndividual>
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flat(600000-
1500000) -->
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/unti tled-ontology-
5#Ikeja"/>
```

Figure 6: Owl/RDF generated segment of the Accommodation ontology

3.3 Web Interface Design: Knowledge represented in ontology is of no use to the larger society except when interfaced with a medium through which the public can assess it. This developed ontology therefore requires a web based interface to assess the knowledge represented in it. As the result of this requirement, we therefore employ the use of PHP MSQL and Dreamweaver environment of the web development due to its ease of integration. Figure 7 shows the Property search interface. It helps clients interested in securing accommodation in the website. The search order is by type, location, minimum and maximum prices.

Figure 8 show the Estate Agent Registration and uploading interface, herein he or she is expected to complete the registration and uploading available accommodation in his care. Some of the fields include Image, Location, Type, Description and Price. This happens after login in to the system. The Estate agents data are captured from their city Association Chapter's database. This is done to authenticate real Estate agents on the developed platform and their contacts. Figure 9 depicts an estate agent website for contacts, for which clients are to fill for immediate response and interaction.

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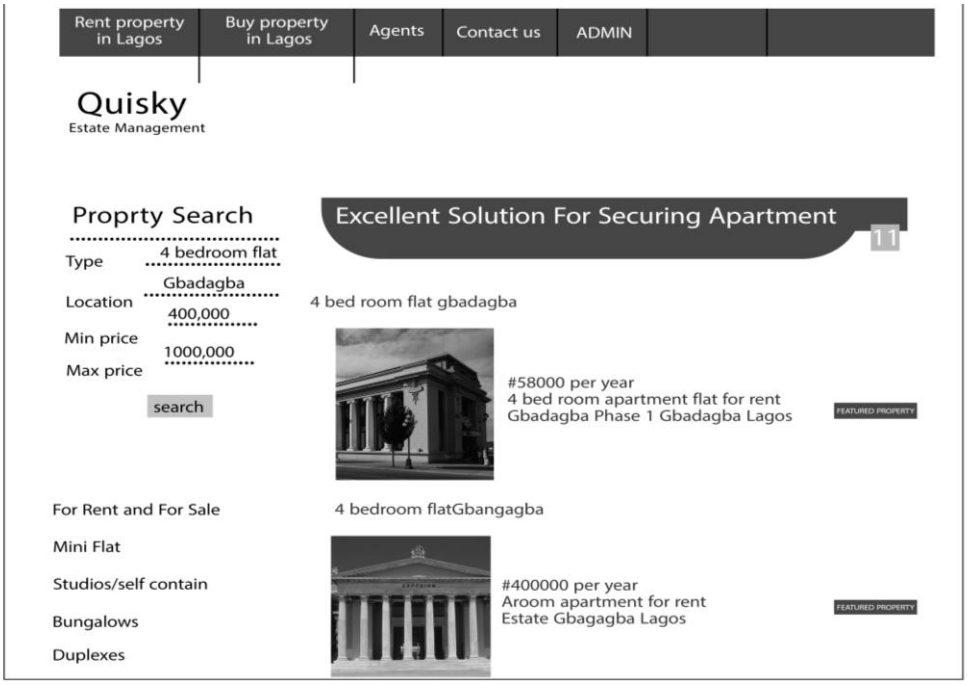

Figure 7: Property search interface

Figure 8: Estate Agent Property Registration Page

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Figure 9: Estate Agents' website

3.4 Program Flowchart- A flowchart diagram is a type of diagram that represents an algorithm, workflow or process, showing the steps in boxes. The Flow chat diagram in figure 10 illustrates how the Web developed application interface functions effectively. The web interface is designed for easy accessibility, reading and understanding as reveled in the flowchart.

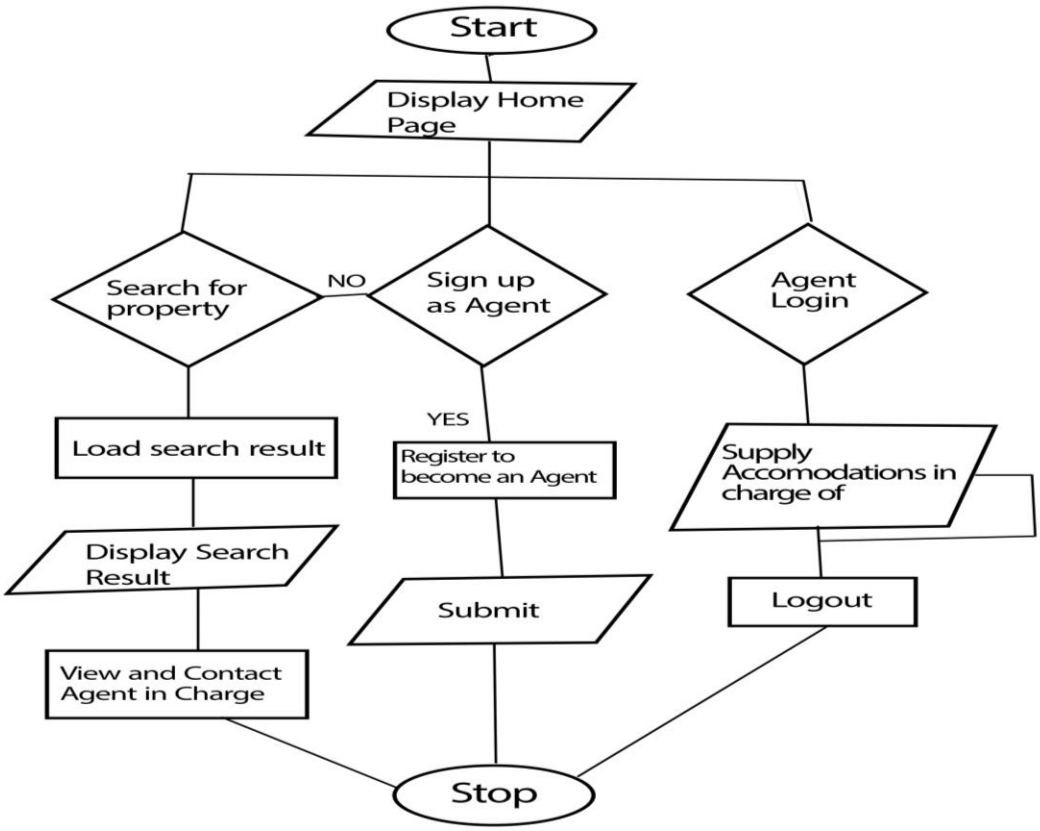

Figure 10: Program Flowchart

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4. CONCLUSION

This work has been able to provide solution to the problem of clients falling into hands of fake and dubious estate agents and also promote quick intervention, by easing the stress involved in securing desired accommodation. The web application is accessible all categories of clients steps.

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