Consideration of a Smart Concierge System for Housing

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Abstract: In this paper we propose a smart concierge system for housing and discuss the feasibility of use value visualization using a result of basic experiment.
Gap between market value and use value is big issue in choosing a house. In case of Japan, market value of house is depend on distance from station, age, room layout, convenience, etc. But use value is not only market value elements but also insulation, noise, vibration, chemistry between neighborhood, etc.
We propose a smart concierge system for housing that system can recommend a suitable house considering use value. Proposed system uses a sensor data of house and behavior data of a passed resident, neighbors to visualize a use value of house.
We conduct a basic experiment of insulation. Experimental result shows that we can visualize an insulation of house from temperature sensor data.

1. Introduction

Using a property search service is a common way to search a housing. It is easy to find an acceptable property. But satisfaction level of residence is low in Japan. According to a study by Cabinet Office, Government of Japan, 67% of user feel a far from satisfactory[1]. “Room layout is hard to use”, “facilities are hard to use”, “poorly ventilated” are the top reason of unsatisfaction from same questionnaire. It shows unsatisfaction causes from gap between market value and use value. In case of Japan, market value of house is depend on distance from station, age, room layout, convenience, etc. But use value is not only market value elements but also insulation, noise, vibration, chemistry between neighborhood, etc. “Room layout is hard to use”, “facilities are hard to use”, “poorly ventilated” are categorized to use value and feel only after living. It means choosing a house in Japan is gamble.

We propose a smart concierge system for housing that system can recommend a suitable house considering use value. Proposed system uses a behavior data of a passed resident to visualize a use value of house. We conduct a basic experiment for visualize a use value. In this experiment, we study an insulation for use value and discuss the feasibility of smart concierge system for housing.

Section 2 describes current situation of house-hunt in Japan. In section 3, we describe a related work of property search service and make requirements clear. We introduce a smart concierge system for housing in section 4. Section 5 shows basic experiment of insulation. Section 6 describes discussion and conclude in section 7.

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2. house-hunt in Japan

Figure1 shows basic flow of house-hunt in Japan.

Many property search service shows place/area of property, price, floor space, floor layout, how far from station/bus stop, age, inside/outside photo. User pick up an area and property from those information. But property search service do not show a real time information. Sometime properties are already sold out but still appears on property search service.

You need to visit to real estate agent in person to know a current status of property. Real estate agent knows latest property information including property that is not shown on property search service yet. Agent will recommend a candidate property from recommendation and requests from user. But Agent do not have an experience of living a candidate property. It means agent will recommend a property without use value.

User can visit and see a candidate property that user is really interested in living. But user can only get a small part of use value from tour. Because tour do not show a difference between day time and night time, season, weekday and holiday. User will stay long time in house after get a property. Sometime user will feel unsatisfaction from difference. For example, user do not like noisy place and decide a quiet place in week day at day time. But some time environment will change. Kids are playing baseball at park in front of house from early morning in holiday, street vendor set up a booth in night time and customer disturbing until midnight.

It means house-hunt in Japan by basic flow is a kind of gambling. If user fails a gamble, user will feel unsatisfaction to property.

Fig. 1 Basic flow of house-hunt in Japan

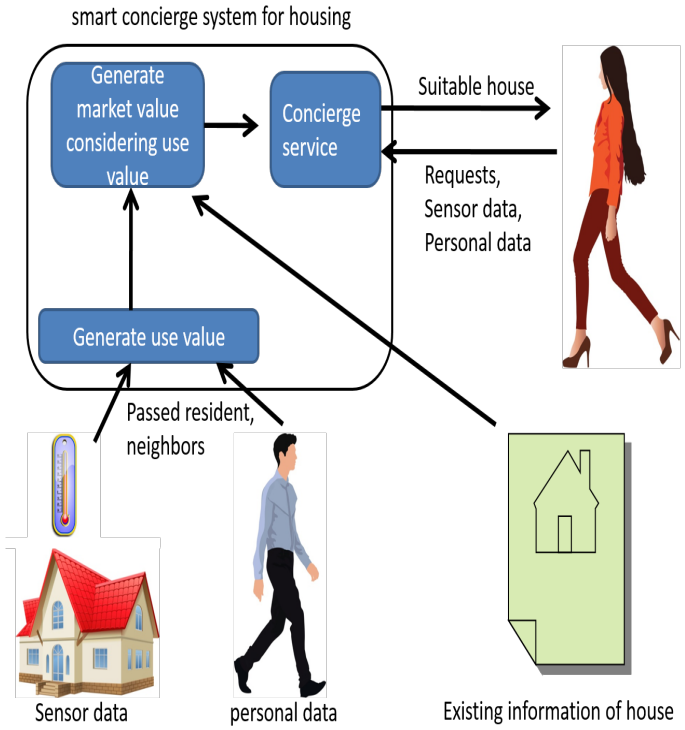

Fig. 2 Overview of smart concierge system

3. related works

New types of property search services are providing a information other than place/area of property, price, floor space, floor layout, how far from station/bus stop, age, inside/outside photo. Property search services TOKYO REAL ESTATE by SPEAC[2] is providing a feature of property from a different perspectives. For example, there is a property that has a big window than other property and it can see a beautiful sunset from big window. Also sunset will color room beautiful orange[3]. They describes a negative point of property. That is one more interesting point of this service. "Room become very hot at sunset because of big window" is the negative point of this property. But it is not coming from living experience.

Existing study shows a way to take data from home by sensors and platform for sensor data[4], [5]. Application using sensor data from home are developed. Most of study describes assist system for human behavior[6], [7] or relation between sensor data behavior and human behavior[8], [9].

This paper describes relation between sensor data and use value of housing.

4. smart concierge system for housing

4.1 Over view of smart concierge system for housing

Figure 2 shows a smart concierge system for housing that system can recommend a suitable house considering use value.

Property information shows thermal insulation performance based on building material. But performance is greatly affected by external factor. It means real thermal insulation performance is unknown until start living.

Proposed system uses a sensor data of house and personal data of neighbors and passed resident. System analyze a sensor data of house and personal data of neighbors and passed resident to generate a use value of house. After generating a use value, system can generate a market value considering use value and existing information of house. Concierge module in system will compare requests from house seeker with generated market value and recommend a suitable candidate houses.

4.2 How to generate use value of house

Use value of house can generate from a sensor data of house and personal data of neighbors and passed resident.

Passed resident knows real performance of house. Home seeker can know real performance from passed sensor data. But it is difficult to know in new house because no one knows real performance of house. Figure 3 shows an idea to get real performance of new house. If system knows a difference between similar house, system can predict real performance after someone lives.

You can know chemistry between neighbors from personal data of neighbors. For example, you can know that neighbor is working in day time or night time. Some time it makes a trouble between neighbors because of activity time difference.

5. Basic experiment of insulation

We conduct a basic experiment to study a feasibility of visualize use value of house from sensor data.

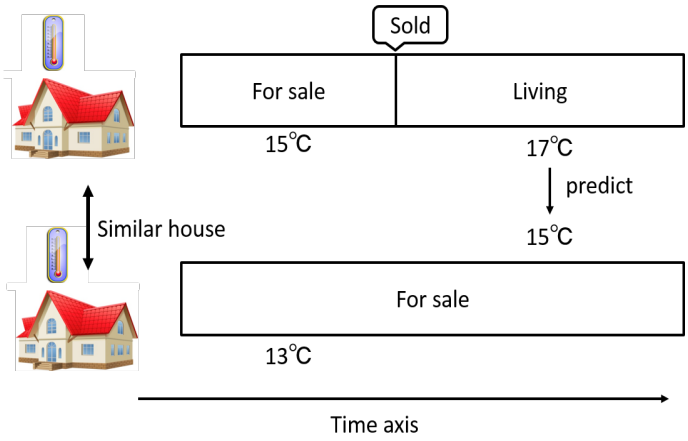

Fig. 3 Use value of new house

Fig. 4 Air temperature sensor in room

Fig. 5 Air temperature sensor in balcony

5.1 Experimental environment

We select a two similar house, residence 1 and residence 2. Distance between residence 1 and residence 2 is about 3km. Both house are three-story wooden house. First floor has one room and it uses for clothes closet. Second floor is living room and dining room. Third floor is bed room. Residence 1 facing south and residence 2 facing north. Residence 1 built 3 years ago and residence 2 is new. Both house using a same building material. We install a NETATMO weather sensor[10] to each floor and outside. Figure 4 shows sensor in room and figure 5 shows sensor in balcony. We take a temperature for 3 days in November. Figure 6 shows outside temperature of residence 1 and residence 2. Temperature shows a big difference in noon. Maximum difference is 3.6 degrees. This difference comes from direct daylight because of balcony in residence 1 facing to south. There is no big difference without direct daylight in Residence 1 and residence 2. Coefficient of correlation between Residence 1 and residence 2 is 0.98.

Resident mainly stay in second floor and third floor. We studied that second floor and third floor has many external factors for air temperature. For example, cooking, home electrical appliance, fluorescent. We also find that first floor is very stable environment because resident do not enter often.

We use sensor data in first floor for this basic experiment. Figure 7 and figure 8 shows a room layout of downstairs in residence 1 and residence 2. Both room are almost same size. Sensor in first floor is located inside of a room.

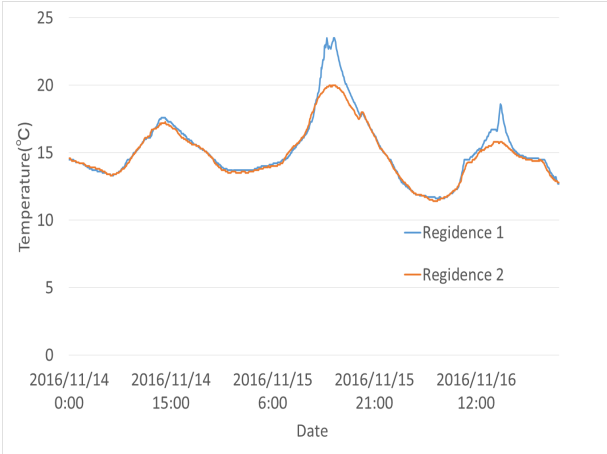

Fig. 6 Outside air temperature

5.2 Result

Figure 9 shows a result of experiment. Average difference between residence 1 and residence 2 in first floor is 2.96 degrees. Both room do not use any heater during experiment. Coefficient of correlation between Residence 1 and residence 2 in first floor is 0.85.

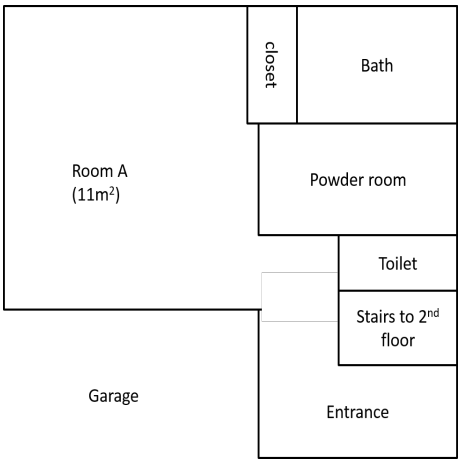

Fig. 7 Room layout of downstairs in residence 1

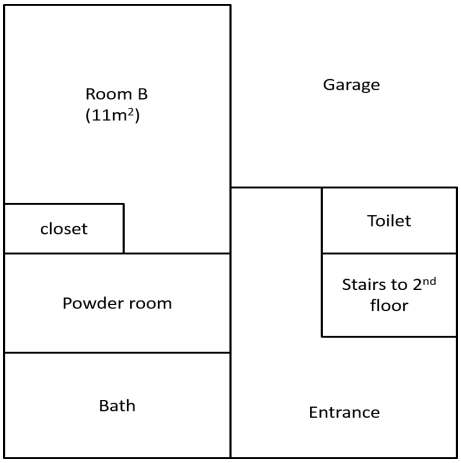

Fig. 8 Room layout of downstairs in residence 2

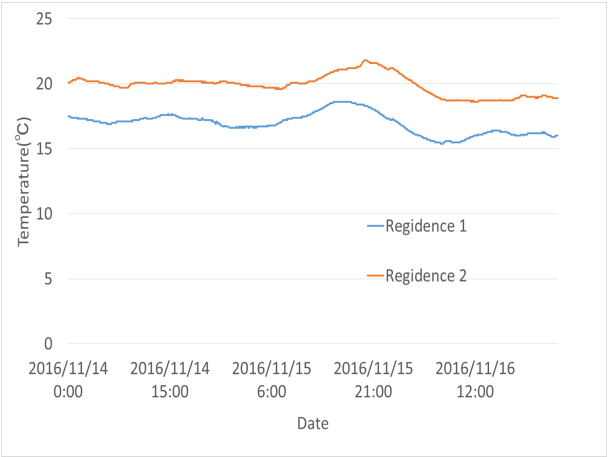

Fig. 9 Inside air temperature

6. Discussion

6.1 Can we visualize use value of house from sensor data?

We can say that we can visualize an insulation of house from temperature sensor data. Because residence 1 correlate highly with residence 2. If some resident behavior influences room temperature, it will be weak correlation. Because resident behavior is not same in each house. In other words, most of temperature difference between residence 1 and residence 2 comes from difference of insulation.

6.2 How can we visualize use value?

We studied that we can get a use value. But how can we appeal this positive point to customer? If we directly show a data as "This house is 3 degrees warmer than other house" to customer, most of customer cannot understand this meaning. We need to consider expression of use value to understand easier such as convert to electricity expense, show a dress difference.

7. Conclusion

In this paper we propose a smart concierge system for housing and discuss the feasibility of use value visualization using a result of basic experiment.

Gap between market value and use value is big issue in choosing a house. In case of Japan, market value of house is depend on distance from station, age, room layout, convenience, etc. But use value is not only market value elements but also insulation, noise, vibration, chemistry between neighborhood, etc.

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We conduct a basic experiment of insulation. Experimental result shows that we can visualize an insulation of house from temperature sensor data.

We need to consider expression of use value for future tasks.

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[3] Be stained orange. `http://www.realtokyoestate.co.jp/estate.php?n=12540`.
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