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AN XML-BASED USER DESCRIPTION SCHEME AND METHOD FOR RECOMMENDATION SERVICE

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ABSTRACT

ISO/IEC 21000-22 User Description is being developed by ISO/IEC JTC1/SC29/WG11 (MPEG: Moving Picture Experts Group) that aims to achieve interoperability among different applications and services in the context for enhancement of user satisfaction. In this paper, we analyze an ISO/IEC 21000-22 User Description including with current status and future application plans. To realize the proposed newly description, it performs the experiment of XML-based recommending service for visual communication (VC) using ISO/IEC 21000-22 User Description. Finally, it prove the XML-Based description for Recommendation service can be implemented and show the visual effectiveness.

Keywords: *ISO/IEC 21000-22 User Description, User, Context, Service, Recommendation, Description*

1. INTRODUCTION

Nowadays, big data, leading to a myriad of choices, surround us. To be able to make a good and easy decision in a reasonably short time, we need recommendations by automatic machine. A recommendation system can satisfy such user needs. Among all the choices that some given services offer, a recommendation system provides a set of recommendations, taking into account the user and context information [1].

The aim of ISO/IEC 21000-22 User Description, further referred to as ISO/IEC 21000-22 User Description, is to ensure interoperability among recommendation services, which take into account the user and its context when generating recommendations for the user.

Users are described in many different and non-interoperable ways. In order to achieve interoperability, we need a standard method to describe user. Users typically operate in context. Therefore, we also need a standard description of Context. User and Context descriptions are needed for Service Providers supplying recommendations that satisfy the needs of Users in given Context.

Therefore, we also need a standard description of recommendation Service. Applications are used to respond to user's request. They may be run by the user himself, or by service provider. Therefore, the application needs a standard way of representing recommendation description. The recommendation description (RD) is composed not only of subsets from User Description (UD), Context Description (CD), Service Description (SD), but also of additional logical relation and metadata related to the subsets [2].

After establishment of MPEG-21 User Description Ad hoc Group at the 98th MPEG meeting since November 2011, they have been gathered possible 22 use cases to clarify 21 User Description standards in the output document [3]. Related technologies have been developed several years and then international standard was published in November 2016.

In this paper, we have implemented the recommendation service technology in visual communication by applying the developed description on international standards.

The rest of the parts are organized as follows. Part 2 introduce the architecture of ISO/IEC 21000-

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22 User Description, part 3 propose data set for experiment, part 4 describes experiments of visual communication and part 5 draw conclusion and future works.

2. ARCHITECTURE OF ISO/IEC 21000-22 USER DESCRIPTION

MPEG-21 User Description standardizes the following four data formats, presented in Fig. 1: User Description (UD), Context Description (CD), Service Description (SD), and Recommendation Description (RD) [3].

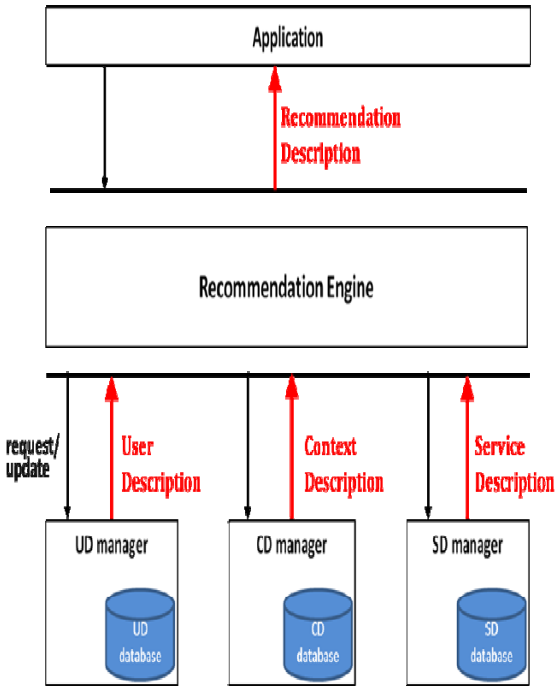

Figure 1. Conceptual Model of ISO/IEC 21000-22 User Description (red elements UD/CD/SD/RD indicate the fo rmats specified by ISO/IEC 21000-22 User Description)

2.1 User Description

A set of descriptions which may contain static and dynamic information about the user , including some other data like the history of the user's interactions, preferences, security settings regarding these information, etc.

2.2 Context Description

A set of descriptions that describe the environmental situation in which the user operates or is located, e.g., user's device in use, physical position, environmental variables (temperature, humidity, sound level, etc.), security settings regarding these information, etc.

2.3 Service Description

A set of descriptions containing pertinent information (including security settings) about the service (or a set of sub-services), that is offered to the end-user application, e.g. video on demand, maps, etc.

2.4 Recommendation Description

A set of Recommended Information elements provided to the applications, in a structured, efficient, and compact form, when a customer requests a service in a certain environment. RD may include information extracted from UD, CD, SD; additional logical relations among UD/CD/SD (or their subsets) and metadata may be also included into RD. The operation of producing the RD, performed by Recommendation Engines, may have various ranges of complexity and performance, depending on the Recommendation Engine. The RD may have a general format, independent of the application.

3. EXTRACTED DATA SET FROM ISO/IEC USER DESCRIPTION FOR PROPOSED EXPERIMENT

For our proposed experiment, it extracts several data types and elements from ISO/IEC 21000-22. As the ISO/IEC user description has too huge size to be processed, data set is being simplified. It also adds new definition to fill the shortages [5] and to implement proposed application. In Table I, extracted data sets for each description is reconstructed including User Description, Context Description, Service Description and Recommendation Description.

User description is describe the information of user itself, Context description is describe the specification and information of user's device and circumstance, Service description describe the information of order and service between user and store and Recommendation description contain the information for the optional selection related with service.

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4. EXPERIMENTS OF VISUAL COMMUNICATION

In this experiment, we present a simple scenario of recommending visual objects (VOs) with respect to a given VOs specified by the user in UD. This scenario is for the use case of visual communication [6]. According to Fig. 2, visual object can explain that how to go to the destination on the rough map.

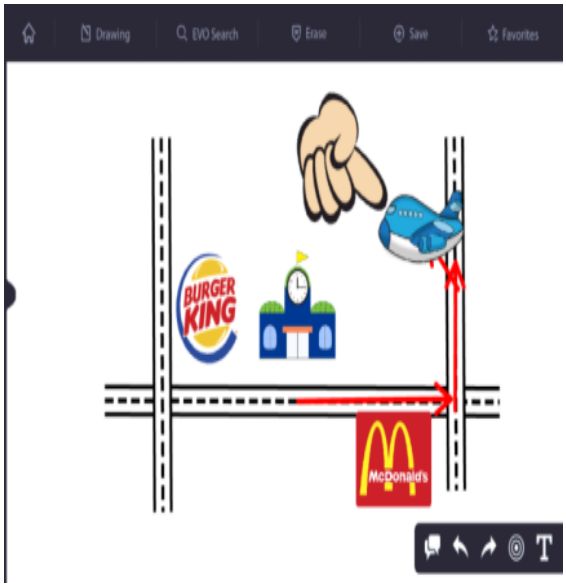

Figure 2. An example of visual communication

Visual objects can be used not only for visual communication messenger, but also in various SNS. Since these are used in mobile environments, the importance of UI more accessible to the visual objects increases.

In this background, recommendation service for visual objects that may be used next plays an important role. There are many different recommendation services developed for different purposes, and these recommendation services can be used in different services such as SNS, messenger, etc.

With ISO/IEC 21000-22 User Description standard, these recommendation services can serve the user for their different needs.

From Fig. 3 to Fig. 6 shows the UD, CD, SD and RD schema used in proposed visual communication.

A. Scenario

- Step 1: A user requests in Visual Communication Application for visual objects associated to McDonald. McDonald is also given in the form of visual objects. This request is described in UD through the VC application.
- Step 2: As a list of visual objects associated to McDonald, VC Service Provider transfers visual objects for Starbucks, KFC, Burger King, Lotteria, Cola and Hamburger to the recommendation engine.
- Step 3: From CD, the recommendation engine takes the geographic location information specified by the user.
- Step 4: Among the visual objects associated to McDonald given by the VC service provider, the recommendation engine selects those that are in the neighborhood of the user-specified geographic location in CD. The selected ones are described in RD, the output of the recommendation engine.
- Step 5: VC Application shows the list of recommendations in RD to the user.

B. Validation of Elements

- UD: User ID, User Profile, Intention, Device Profile
- CD: User ID, Device Characteristics, Location, Network Information
- SD: Service Profile, Service Object
- RD: Recommendation ID, Object Information, Recommendation Information

C. Experimental Results

Using intention element of UD, service provider offers a list of recommended visual objects in SD. With the Location element of CD, the recommendation engine recommends three visual objects for the shops close to the location as below Fig. 7.

The recommendation is produced in the Service objects element of RD and the schemas are validated in the demonstration.

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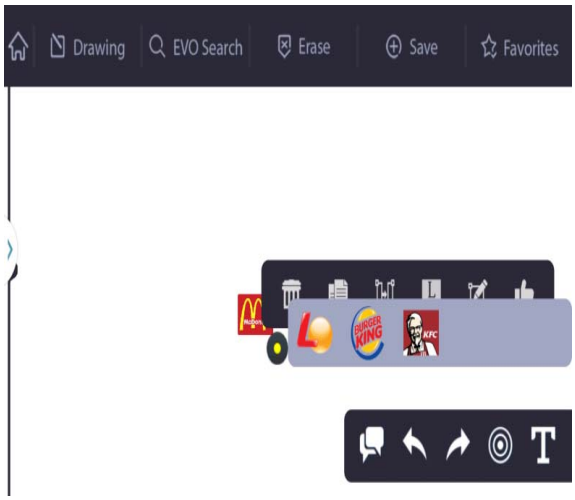

Fig. 7. An example of recommending VOs associated with McDonald

It randomly generates user's locations with service object's location and according to that information and calculates nearest 5 service objects through Euclidean distance measures. Table Ⅱ represent recommended service objects list.

Table 1: Recommended List

User ID	Latitude	Longitude	Altitude	-
UID 20	45.62	-72.90	262.50	-
Object ID	**Latitude**	**Longitude**	**Altitude**	**Euclidean Distance**
ID 20	-39.17	-124.59	272.30	0.332624
ID 14	18.87	-30.01	175.30	0.335972
ID 13	-1.84	-113.16	181.65	0.340105
ID 21	61.91	-104.11	164.13	0.348263
ID 22	104.15	10.48	202.06	0.394836

Geological location based recommending service by proposed recommending system including data set of UD, CD, SD and RD is as below Fig. 8.

Especially, Fig 8.a shows the result of randomly generated users having different location information. It prove that randomly selected user which is far away from recommendation purpose will be filtered out. specially, Fig 8.b shows the tree structure of randomly generated user by the order of Euclidean distance for the purpose of recommendation. By clicking the User ID, it can provide detail information included in the each description.

5. CONCLUSION AND FUTURE WORKS

In this paper, simplified description is proposed to make recommendation engine satisfy the ISO/IEC 21000-22 User Description and we demonstrated a scenario of visual communication, using the simplified description. To verify the result of proposed recommendation system, we get the Euclidean distance by calculating user's geometric information. By applying the developed technology, it is expected that it will be widely used in all fields where visual understanding recommendation such as artificial intelligence, route recommendation, and automation order is used. Also in the future, standards and technology development for solving privacy problems should be consistently improved together.

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REFRENCES:

[1] T.S. Bhatti, R.C. Bansal, and D.P. Kothari, "Reactive Power Control of Isolated Hybrid Power Systems", *Proceedings of International Conference on Computer Application in Electrical Engineering Recent Advances (CERA)*, Indian Institute of Technology Roorkee (India), February 21-23, 2002, pp. 626-632.

[1] Joo Sanghyun, Lee Jiwon, Cheong Jae-Sook and Byun Hyung-Gi, "Schema Based Visual Object Transmission Complying with MPEG User Description", Sensor Letters, Volume 12, Numbers 6-7, June 2014, pp. 1165-1167(3)

[2] Joo Sanghyun, Lee Jiwon, Cheong Jae-Sook and Byun Hyung-Gi, "Schema Based Visual Object Transmission Complying with MPEG User Description", Sensor Letters, Volume 12, Numbers 6-7, June 2014, pp. 1165-1167(3)

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[3] ISO/IEC JTC1/SC29/WG11/N13880, "Use Cases for MPEG User Description", August, 2013, Vienna, Austria

[4] ISO/IEC JTC1/SC29/WG11/N14882, "Working Draft for MPEG User Description (Ver. 4.0)", October, 2014, Strasbourg, France

[5] Si-Hwan Jang, Sanghyun Joo, Kyoung-Ill Kim, Jiwon Lee, Dasom Kim and YongSoo Choi, "Simplified Description for Recommendation Engine Based on MPEG-UD", International Conference on Green and Human Information Technology(ICGHIT) 2015, February, 2015, pp. 70-71

[6] International Organization for Standardization, "ISO/IEC 21000-22 User Description", November, 2016

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Table I. Extracted Data Set Of Description

Description	Type	Class	Name
User Description	Person Profile Type	Attribute	User ID
		Element	Gender
			Birth Date
			First Name
			Middle Name
			Last Name
			Nick Name
			Nationality
			Language
			Affiliation
			Phone Number
			Address
			E-mail
	Health Condition Type	Attribute	User ID
		Element	Height
			Weight
			Blood Type
			Blood pressure
			Pulse
			Respiration
	Social Type	Attribute	User ID
		Element	Relationship
			Permission
	Preference Type	Attribute	Service ID
			Content ID
		Element	Priority
	History Type	Attribute	Service ID
			Content ID
		Element	Time
	Intention Type	Element	Intention
	DeviceProfile Type	Attribute	Device ID
Context Description	Device Type	Attribute	Device ID
		Element	Mobile
			Laptop
			Desktop
	Situation Type	Attribute	Situation ID
		Element	User ID
			Device Characteristics
			Event
			Absolute Location
			Semantic Location
			Absolute Time
			Semantic Time
			Season
			Weather
			Traffic
			NetworkInfor

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Service Description	Service Profile Type	Attribute	Service ID
		Element	Category
			Name
			URL
			Phone Number
			Address
			E-mail
	Content Type	Attribute	Content ID
		Element	Category
			Name
	ServiceObject Type	Attribute	ServiceObject ID
		Element	ServiceObject Name
			ServiceObject Location
			ServiceObject URI
Recommendation Description	Recommendation Type	Attribute	Recommendation ID
		Element	ObjectInformation
			Recommendation Information

```
<?xml version="1.0" encoding="UTF-8"?>
- <UD>
    <UserID>UID_20</UserID>
  - <UserProfile DeviceID="ID_5">
    - <Language>
        <Name>Korean</Name>
        <LanguageRegion value="South Korean"/>
        <ReadingLevel value="high"/>
        <WritingLevel value="high"/>
      </Language>
      <Specialty>Computer programming activities</Specialty>
    - <Device>
      - <Display>
        - <DisplayCapability>
            <ScreenSize horizontal="360" vertical="640"/>
          </DisplayCapability>
        </Display>
      </Device>
      <DeviceCategory>Smartphone</DeviceCategory>
    </UserProfile>
  - <Intention IntentionAction="Call the object">
      <ObjectID>ID_295</ObjectID>
    - <IntentionObjectFormat ObjectFormat="Image">
        <ObjectName>McDonald</ObjectName>
      </IntentionObjectFormat>
    </Intention>
</UD>
```

Fig. 3. User Meta-Data generated using UD Schema

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```
<?xml version="1.0" encoding="UTF-8"?>
<SD serviceID="ID_11">
  <ServiceGeneralInformation>
    <ServiceName>Visual Communication Services</ServiceName>
    <ServiceProviderName>ETRI_VC</ServiceProviderName>
    <Description>Communication system with visual objects</Description>
    <ServiceURI>http://example.myservice.com</ServiceURI>
    <ServiceCategory/>
    <SupportedFormat/>
  </ServiceGeneralInformation>
  <ServiceObjectsInformation>
    <ServiceObject ID="ID 1">
      <ObjectName>Lotteria</ObjectName>
      <ObjectFormat>Audio</ObjectFormat>
    </ServiceObject>
    <ServiceObject ID="ID 2">
    <ServiceObject ID="ID 3">
    <ServiceObject ID="ID 4">
    <ServiceObject ID="ID 5">
    <ServiceObject ID="ID 6">
    <ServiceObject ID="ID 7">
    <ServiceObject ID="ID 8">
    <ServiceObject ID="ID 9">
    <ServiceObject ID="ID 10">
    <ServiceObject ID="ID 11">
    <ServiceObject ID="ID 12">
    <ServiceObject ID="ID 13">
    <ServiceObject ID="ID 14">
    <ServiceObject ID="ID 15">
    <ServiceObject ID="ID 16">
    <ServiceObject ID="ID 17">
    <ServiceObject ID="ID 18">
    <ServiceObject ID="ID 19">
    <ServiceObject ID="ID 20">
    <ServiceObject ID="ID 21">
    <ServiceObject ID="ID 22">
    <ServiceObject ID="ID 23">
    <ServiceObject ID="ID 24">
    <ServiceObject ID="ID 25">
  </ServiceObjectsInformation>
</SD>
```

Fig. 4. Service Meta-Data generated using SD Schema

```
<?xml version="1.0" encoding="UTF-8"?>
<CD>
  <UserID>UID_20</UserID>
  <DeviceCharacteristics availablity="true" deviceID="ID_5" inUse="true">
    <DeviceCapability>
      <Display>
        <DisplayCapability>
          <Mode>
            <Resolution horizontal="720" vertical="480"/>
          </Mode>
        </DisplayCapability>
      </Display>
    </DeviceCapability>
  </DeviceCharacteristics>
  <Location>
    <Name>Street</Name>
    <GeographicPosition datum="itrf">
      <Point latitude="45.62" longitude="-72.90" altitude="262.50"/>
    </GeographicPosition>
    <AdministrativeUnit type="city"/>
    <PostalAddress>
      <AddressLine/>
      <PostingIdentifier/>
    </PostalAddress>
    <InternalCoordinates/>
    <SemanticLocation/>
  </Location>
  <NetworkInfo networkID="NID_11" InUse="TRUE">
    <NetworkCapability minGuaranteed="32000" maxCapacity="384000"/>
    <NetworkCondition duration="PT330N1000F">
      <AvailableBandwidth average="80000" maximum="256000"/>
      <Delay packetTwoWay="330" delayVariation="66"/>
      <Error packetLossRate="0.05"/>
    </NetworkCondition>
  </NetworkInfo>
</CD>
```

Fig. 5. Context Meta-Data generated using CD Schema

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```
<?xml version="1.0" encoding="UTF-8"?>
- <RD RecommendationID="ID_001">
  - <ObjectInformation>
    - <RecommendedObjectInformation>
        <RecommendedObjectID>ID 20</RecommendedObjectID>
        <RecommendedObjectIType>Text</RecommendedObjectIType>
        <RecommendedObjectName>Popeyes</RecommendedObjectName>
      </RecommendedObjectInformation>
    - <RecommendedObjectInformation>
        <RecommendedObjectID>ID 14</RecommendedObjectID>
        <RecommendedObjectIType>Text</RecommendedObjectIType>
        <RecommendedObjectName>Angelinus</RecommendedObjectName>
      </RecommendedObjectInformation>
    - <RecommendedObjectInformation>
        <RecommendedObjectID>ID 13</RecommendedObjectID>
        <RecommendedObjectIType>Video</RecommendedObjectIType>
        <RecommendedObjectName>Lotteria</RecommendedObjectName>
      </RecommendedObjectInformation>
    - <RecommendedObjectInformation>
        <RecommendedObjectID>ID 21</RecommendedObjectID>
        <RecommendedObjectIType>Visual Object</RecommendedObjectIType>
        <RecommendedObjectName>Popeyes</RecommendedObjectName>
      </RecommendedObjectInformation>
    - <RecommendedObjectInformation>
        <RecommendedObjectID>ID 22</RecommendedObjectID>
        <RecommendedObjectIType>Image</RecommendedObjectIType>
        <RecommendedObjectName>KFC</RecommendedObjectName>
      </RecommendedObjectInformation>
      <RecommendedRepresentationFormats/>
      <LevelOfDetailOfRecommendedObject/>
    </ObjectInformation>
  - <RecommendationInformation>
      <Priority/>
      <RecommendationCategory/>
    </RecommendationInformation>
</RD>
```

Fig. 6. Recommendation Meta-Data generated using RD Schema

Data Pattern — Random(Data Pattern)

ObjectID	ServiceCategory	ObjectName	ObjectFormat	latitude	longitude	altitude
ID 1	fast-food restaurant	Lotteria	Audio	-28.18	140.75	187.21
ID 2	coffee shop	Angelinus	Video	-82.40	127.53	287.34
ID 3	fast-food restaurant	Popeyes	Image	-107.18	146.87	59.05
ID 4	fast-food restaurant	Popeyes	Text	67.72	-108.08	43.24
ID 5	fast-food restaurant	Burger King	Image	-3.05	129.36	264.39
ID 6	fast-food restaurant	KFC	Image	84.96	38.11	122.23
ID 7	fast-food restaurant	KFC	Visual Object	25.22	3.03	138.96
ID 8	fast-food restaurant	coffeebean	Video	128.80	50.50	101.34
ID 9	fast-food restaurant	Mcdonald	Text	-95.84	118.89	281.62
ID 10	fast-food restaurant	KFC	Video	37.67	-105.53	10.96
ID 11	fast-food restaurant	Mcdonald	Text	-74.86	28.96	251.81
ID 12	fast-food restaurant	Lotteria	Text	59.25	-138.70	93.45
ID 13	fast-food restaurant	Lotteria	Video	-1.84	-113.16	181.65
ID 14	coffee shop	Angelinus	Text	18.87	-30.01	175.30
ID 15	fast-food restaurant	Popeyes	Text	107.61	-22.94	98.21
ID 16	fast-food restaurant	KFC	Visual Object	-37.16	91.91	30.38
ID 17	fast-food restaurant	Popeyes	Audio	99.23	-140.04	71.37
ID 18	fast-food restaurant	Mcdonald	Image	-9.32	-69.86	113.20
ID 19	coffee shop	Starbucks	Audio	-109.00	-70.60	70.11
ID 20	fast-food restaurant	Popeyes	Text	-39.17	-124.59	272.30
ID 21	fast-food restaurant	Popeyes	Visual Object	61.91	-104.11	164.13
ID 22	fast-food restaurant	KFC	Image	104.15	10.48	202.06
ID 23	coffee shop	Starbucks	Visual Object	-29.74	115.79	184.35
ID 24	fast-food restaurant	Popeyes	Video	-3.63	-115.41	144.01
ID 25	fast-food restaurant	coffeebean	Visual Object	-76.18	74.00	94.51

Latitude: 45.62 Longitud: -72.90 Altitude: 262.50 Random(GPS) Run RD Engine

Fig. 8-a.. Randomly generated user IDs having different location information

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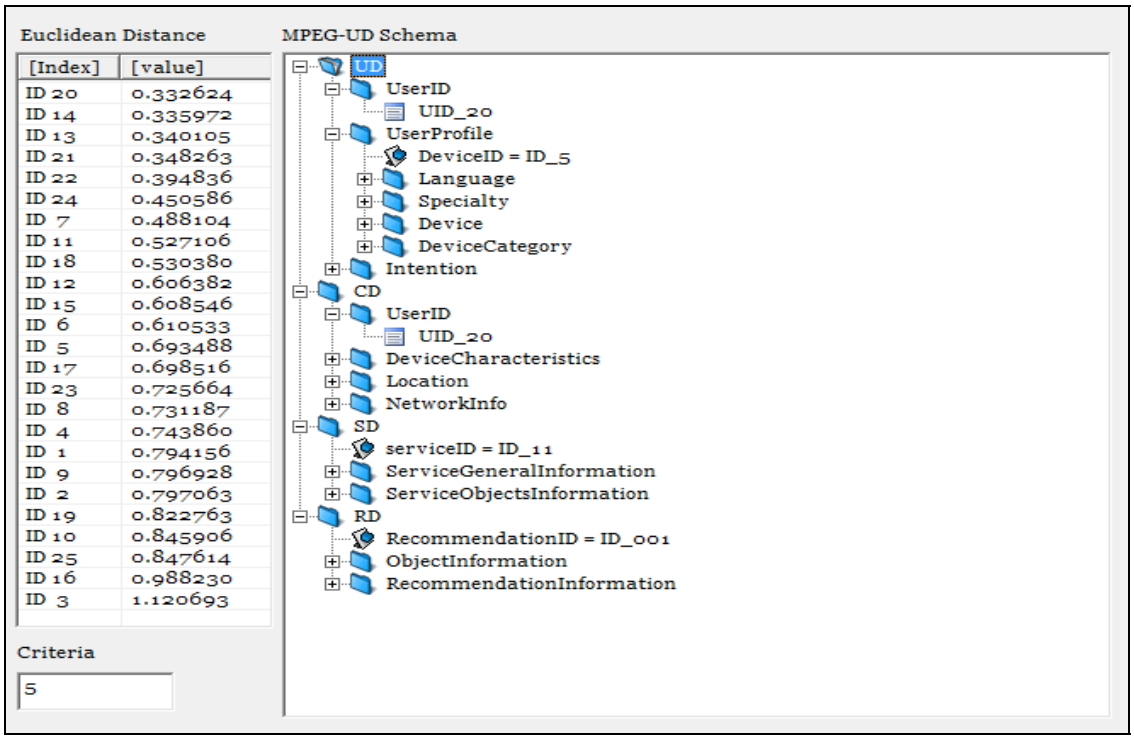

Fig. 8-b.. Recommending Service System based on location information including latitude, longitude and altitude