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Ontology Semantic Based HS-Code Matches and Translation for Import/Export Management System

Sheeraz Shaikh[1], Yanfei Liu[1, *], Gui JiangSheng[1], Shi Tianbao[1], Ahmad Waheed[1], Syed Abdul Aleem[1].

[1]School of Information Science and Technology, Department of Computer Applied Technology, Faculty of Science, Zhejiang Sci-Tech University (ZSTU), Hangzhou, Zhejiang, China, 310018

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ABSTRACT

Widely use of HSCODE (Harmonise code system) in a dynamic environment all over the world are the core element for the integration of system and automation. HS-codes are standard and comprehensive reference for product used by custom authorities, to identify applicable policy for inspection and statistic regarding commodities in import/ export industry. Domain Ontology for import and export industry can be utilized to performs vital role among different countries where common understanding is crucial to attain the product's HS-code. This paper proposes HS-code Matches and Translation management system and service for recommending the relevant HS-code for a product name being searched and translation of recommended HS-code in different countries having a higher similarity, including information about source and destination countries based on import and export ontology domain, also prototype has been formed and published as a HS-web service using java-based platform.
KEYWORDS: HS (Harmonise System) Code, Ontology, Semantic reasoning, Knowledge Database.

1.INTRODUCTION.

Recently several countries have signed FTA (free trade Agreement) different countries as the policy diversification regarding FTA partnerships according to dynamically variation. In order to progress and profit in business according to effectuation of FTA, this requires intensive policy and information system to automate the processes of inspection efficiency about origin management. Some department in china developed a collaborative information system. The author has identified some main challenge facing regarding custom and importers and exporters. Such as (1) to automate the processing for intelligent decision making and monitoring the current policies. (2) producing accurate result for HS-code matchmaking (3) translation of HS-code regarding destination country. Several companies have launched commodities classification to help import and export business across the territory.

To obtain progressive tariff benefit in import / export scenario according to the effectuation of FTA, Harmonised commodity description and coding system HS-code is allotted to identify, verify, commodity inspection, origin of product and statistics and tariff determination etc, as HS-code refers a standard for classification of products based on HS convention assigned to the internationally traded goods. In this perspective classification of article about concerned product should be clearly descriptive to determining the correct origin of country. Now a days there is tendency of looking around by the native companies for consultants like custom brokers by internet or acquire official interpretation through the concerned authorities for assigning of HSCODE, as it is comprehensive information about origin determining origin to exporting items.

Currently diversification of FTAs is concluded as each FTA may vary according to the standard of determining the country of origin for the same article, due to dynamic association in trade relationships among countries, along with the customs policies and inspection must be versatile. Hence variation in policies must be published according to the corresponding HS-code for categorization of commodity. To approach and formulate import and export sector is the usage of domain ontology and such existing techniques for semantic matchmaking and translation, knowledge, and reasoning mechanisms to overcome above mentioned challenges. Domain ontology comprises of obvious, theoretical specification for selecting the element of the domain and principles of classification. It validates information system and human in the sector of import export to develop a stable understanding of concept with their relationships. Taking advantage from capabilities of semantic features spanned with domain ontology-based management system contributes for searching and identifying policies for the searched product widely to overcome the current challenges. As a result, knowledge management to get an appropriate HS-code for Harmonized System with the association of applied policy is quite plain and effortless. The essential point is the construction of domain ontology and its application.

The Harmonized System is a systematic, advanced, multipurpose classification system for international logistics and trade. Specified dynamic nature regarding trade relationship between countries, custom policies and

***Corresponding Author:** Yanfei Liu, School of Information Science and Technology, Department of Computer Applied Technology, Zhejiang Sci-Tech University (ZSTU), Hangzhou, Zhejiang, China, 310018.
Email: yliu@zstu.edu.cn, Cell: (+86)13957185669

inspection must be dynamic also. Variation in policies are published by corresponding HS-code commodity. Hence implementation of automated processing with HS-code, custom and inspection for import and export industry inspection will improve efficiency and reduce human impacts.

Logically the harmonized nomenclature is structured as per activity of economics. As a outcome, while constructing the domain ontology and product ontology can be basis resource for HS-coding specification and harmonized commodity description. For importing and exporting industry, unique concept with their relationship can be work out on the HS specification.

The HS-code is a systematically organised and multi-purposed directory of classification for distinguishing various product depend on their categories. To verify approved policy regarding product, concerned authorities inspect at entry and exit for export and import. The rule of origin with regard of HS-code for each FTA may be different. Hence for searching the HS-code by web surfing, it is very hard to prove that the whether the agent is authorized. with comprehensive and valid knowledge about the country of origin and all product has been assigned HS-code properly according to the product classification or not. Furthermore, procedure is too complicated with regard to checking the HS-code by custom broker. Although present website of custom service provider allows users to directly searching of HS-code. Hence import and export industry require dynamicity to produce recommendation of Matched HS-code for source country with its translated HS-code for the destination country regarding subjected input product.

The harmonized system is an systematic, progressive and multi-purpose classification system, created under the supervision of customs cooperation council for international logistic and trade. Basically, it is a six-digit commodity classification, accepted and approved by the majority of trading countries of world, as a elementary reference for trade statistic of import and export and monitoring. Each product specification in HS-directory is identified by 8-12-digit code based on diverse monitoring of policies of entry and exit. To exported products, based on harmonized commodity description and coding system (HS)-code is assigned internationally. Each country uses different product classification as china uses 8-digit, japan 9 digits, Korea 10 digits, among 6 digits are commonly used worldwide. In order to import and export article concerned authorities performs a product classification, to identify the qualities, state of corresponding article and its related article number for verification under which corresponding custom act and HS-classification product lie. The HS classification for products by origin, what they are, usage of them and are not as per to their level of fabrication.

The author has used the comprehensive knowledge for dynamic processing derived from HS-specification and vocabularies of static dictionaries and designing the integrated ontology in ongoing project. Ontology based Semantic reasoning engine implementation is java-based platform and deployed as HS-web service for public domain by integrating with information system. This service has a potential for International trader, authorities for import and export sector worldwide.

The rest of the paper has been enlighted as follows. **Section 2** explores relevant work on HS codes discovery process. **Section 3** is a survey on present technique for ontology construction, and structure of import and export ontology. **Section 4.** Implementation and reasoning scheme for HS-code based on ontology. **Section 5.** identifies deployment and query reasoning-based translation of HS-code and elaborate the description on development deployment and assessment, demonstrated by screenshots**, section 6.** conclude the work.

2. RELATED WORK.

In the perspective of application, the concept of semantic technique and studies regarding semantic analysis on semantic knowledge, researcher spent much time and efforts on semantic net [1][2], word sense disambiguation [3]. Various literature introduced notion of semantic schema [4][5], that is an abstract structure can be used to produce knowledge by proper interpretation. WordNet [6][7], Roget's Thesaurus [8], LDOCE [9] used existing lexical resources to automatically extract semantic knowledge. Now a days the technique such as machine learning, statistical and algebraic approach [10] proved achievements on approached based on semantic knowledge. Yusei Tsuboi and Zuwairie Ibrahim [11] proposed a molecular knowledge-based problem-solving method with DNA-typed semantic net to infer logical referenced object by algorithm of DNA computing. The information retrieval model based on ontology for semantic web [12] by translating and integrating domain ontologies was presented. Yang and Kyung-Ah,et al, [13] proposed Ontology based Semantic Blog Model (OSEM), Victor CODINA and Luigi CECCARONI [14] proposed a domain independent semantic recommendation approach.

As mentioned, studies did not deal with concern addressed service of HS-code, such as extensive-level text mining, classification of text-based and semantic reasoning is not a appropriate method for the reasonable product information for HS codes. Rather semantic analysis regarding HS-code service explores several words for product name/ title [15]. It is very difficult to automatically verify product name without HS-code for the current Information system of inspection and custom authorities. Several logistic firms do not offer HS-code while customs official are reported in many cases, then it is very tiresome job and difficult to identify relevant code for relevant product for the custom department. This create complication and inefficiency in processing of inspection. More over information system is not fully service oriented and unable to exploit the translation of

HS-code for destination countries. Generally human expert required to file the entries for HS-code. In the perspective providing the appropriate HS-code can be very time consuming and difficult. National logistics companies and carriers exporting products outside of their present skills or approach have a similar issue. It is necessary to exploit the advance matchmaking and translation technique, develop solutions and HS-management system to recognize intelligently HS-codes, based on simplified product name and its related information to resolve current problem.

This research program consisting on R&D team of TEGGs system to examine the current challenges and develop HS-code management system for matching and translation. The proposed approach has been employed and published as a HS-translation web service, provides HS-coding service to public department of inspection, custom department, logistic product carrier and international traders. current web service is developed on MySQL relational database using the methodology of knowledge base representation and data mining. Ontology makes obvious for affordable domain-based knowledge representation system devoted for a conceptualization of terms. Comprehensive conceptualization supports the development and maintenance more controlled to form an information management system Moreover, ontology supports reasoned and relational use of terms with strong justification, quality orientation with dynamic flavour, that's because ontology is more than a simple documentation.

On the basis of above observation, existing ontologies are combined, to achieve the unique requirement of matching and translation of HS-code in domain of import and export aspect. Discussed the structure, feature, representation of knowledge and ontology implementation.

3. TECHNIQUES FOR THE DOMAIN ONTOLOGY:

For domain ontology there are three important considerations are as under, ontology construction, ontology-based match making and translation, implementation of ontology.

3.1 Domain Ontology

The concept of ontology is derive from philosophical field, its description in the philosophy is as to describing the existence of objective systematically around the globe, and its interpretation is systematically or directives for the existence of objective, that are bound with core essence of the objective reality. The domain ontology explores the conceptualization and the relationship between concepts in particular domain, such as civil aviation, automotive manufacturing field, etc.

Definition 1: For two concepts *Ci* and *Cj*, in domain ontology, if *Ci* is states as the "equivalentClass" of *Cj*, then call the concept *Ci* and concept *Cj* is semantic equivalent, such as $Ci \equiv Cj$, For example, if *Cj* is states as the "subClassOf" *Ci*, then call concept *Ci* contains *Cj* semanticly, such as $Ci \supseteq Cj$.

3.2 Ontology construction Approaches.

Many applications regarding ontology have been publicized in the research domain. Honavar et al. describe when scientific discovery is sorted out with in a rich domain, there are many challenges in information extraction and acquisition of knowledge from heterogeneous, distributed, autonomously operated and dynamic data sources [16]. While searching based on keywords have very low outcome If different terminologies with low precision are used like homonymous or due to minimal possibilities to exhibit composite queries [17].

Numerous mechanisms to resolve issues regarding semantic for service description and some discovery have been suggested in the literature [18,19]. M. Paolucci et al. describe the usage about ontologies for matching service definition stand-on the sense of the query constraints instead of exact matching. It suggests also a method of sorting the matching services depend on the degree of matching [18]. Information retrieval prototype based on an ontology is suggested regarding semantic web in the literature [20]. The authors build an ontology by translation and aggregating domain ontologies. The terms stated in the ontology are used as metadata (data about data) to mark-ups to the Web content, these semantic mark-ups (supplement) are as semantic index terms (directory) for retrieval of information. The corresponding classes of semantic index terms are achieved using description logic reasoner.

although it is hard for a human, to retrieve some appropriate data referencing verses requirement based and integrate them accurately. H. Lin. et al., the suggested approach of implementing the methods of ontology to regulate the present application of information retrieval and digital archive [21].

Tijerino et al. recommends an approach (TANGO) to form an ontologies analysis based on tables [22]. TANGO intends to understand a structure of table and content conceptualization, reveal the constraints that exist between concepts extracted from the table, matching the recognised concepts with ones, whose specification is more generic to the relevant concepts, and aggregate the resulting structure along another relevant knowledge representations. The authors declare that TANGO is a formalised way of processing the structure (format) and table content that can assist to form a relevant reusable conceptual ontology continually.

A. Pick. El al proposes Frameworks TARTAR [23] for Transforming arbitrary tables into logical form as automatically generate an ontology from the metadata that contains the structure and characteristics of the domain data. There is no universal agreement upon a global ontology standard to be used by the engaged participant. The different participant uses different concept terms featured as heterogeneous semantics. The developed ontology needed to have a direct conceptualization of equivalent and integrated view for the import and export industry by using the different ontologies semantically. The concept of ontology includes both the linguistic and contextual considerations by inferring the new relationships amongst the ontological reasoning rules.

3.3 Structure of Import and Export Ontology:

We have improved the system requirement in importing and exporting industry with considerations referenced structure, such as common knowledge and abstract concept in law domain comprises on law ontology, standard knowledge about law, cause-result relationships and legal responsibilities. In the sense of supporting to enhance the concept and its relation in importing and exporting domain ontology need semantic reasoning system, i.e., function and structure of knowledge organization, semantics (discovery, indexing and integration). Consequently, domain knowledge regarding import and export is required with common knowledge for HS-ontology. The aggregative knowledge in import and export scenario is obvious, such as "1 litter is equals to 1000 ml" and "Stockfish is not a form of live fish", but it is not a part of fisheries livestock. This class or the type of fish is distinguished due to attributes or taste. The domain knowledge describes the concepts (terms) and their relationships, built on specified HS specification. HS specification consists of numerous parts, i.e., hierarchical categories, general rules for classification and annotations categorically, chapters, heading, subheading and sections. **The structure is divided into five zones, i.e., 21 categories, 98 chapters, 1241 sections, 5113 division and subdivision.** The relationships between names of goods, HS codes and pertinent tariff is implicit in structure, and the domain of HS ontology is based on this the structure. Although HS-ontology references to the WordNet [24] in construction of a structure, as a general linguistic ontology may prove insufficient when trying to establish the relation **(Fell Baum 1998)**. However, querying large corpora such as HS-ontology for extracting essential information may require resources specific to the domain to which the query belongs [25]. To organize the HS-ontology requires relationships based on 'synonymy', 'hyponymy/hypernymy', 'meronymy/holonomy','homoforms','homograph','polysemi', **and** by ignoring 'verb' and 'adverb' (part of the speech) are annotated as a relationship of 'exclusion'. English and Chinese can be equated as a single ontology in terms of being bilingual Import and export domain application of Chinese and English and the relationships between English and Chinese concepts can be derived.
Import and export ontology construction require integrated layout consistently between both common knowledge and domain knowledge. To abstract obtaining general concept from common ontologies is a solution. It is ever developing a process to integrate HS-ontology, importing and exporting ontology and database. In this research, the HSO is formed based on two types of knowledge resources, i.e., static knowledge as per HS-specification and semantic features and dictionaries.
While Constructing ontology, manual specification is utilized to explore the unique beginners and synonyms sets for HS-ontology, to acquire the related synonym, mapping, and learning process is used. To construct the HS-ontology followings steps are shown in table 1.

HS-code Tree			Products	Description of Product	Unit
0101			*Live horses, asses, mules and hinnies*	*Live horses, asses, mules and hinnies*	*Kg*
10	00		*Pure-bred breeding animals*	*Pure-bred breeding animals*	*Kg*
	90		*Other*	*Other*	*Kg*
		10	*Racing Horses*	*Horses for racing*	*Kg*
		90	*Other*	*Other*	*Kg*
0102			*Live bull*	*Live bovine animals*	*Kg*

3.4 Formalization of HS-specification with semantic feature.

The representation of entries in HS-specification are composed of (quantifier adjective +noun). The quantifier and adjective are attribute of noun. Mostly the language dictionaries are prepared for human reading. For the purpose of formalizing the electronic content machine readable, semantic translation approach is required, by Mark [26]. The disadvantage of this approach is not considering the semantic reasoning beyond transformation of format.
It is noted that HS-specification and HS-ontology are not comprehensively corresponding to each other. As a result, only semantically translation by the dictionaries is well approach to transform term and its related concept to make it machine readable. HS ontology neither use duplicate attributes nor support multiple inheritance and use object-oriented method of modelling.

Table 2. Semantic formalization of product with attributes

Key Name	POS, Attributes & Comments	Synonymy	Hypernymy & Hyponymy	Polysemy	Homograph & Homoform
Swine	*Noun & floppy ears animal, maize for human consumption.*	*Pig, jerk, hog, pork, snout*	*Animal /live pig*		
Apple	*Noun & An American company or a round shape fruit*	*Apple*	*Fruit*	*Fruit and computer company*	*Apple phone, apple fruit*
Bear	*Noun/verb & animal*	*Mammal, doglike, Ursidae*	*Animal*		*Short dense haird coat with long nail/tolerate*

3.5 Logical structure of HS-ontology:

The HS-ontology is comprised of entries of external dictionaries and entries of HS-specification. The representation of logical structure is as:

Synonym: *Synonym of noun is defined as if and only if attributes of two noun are same, and both nouns can be replaced by each other without changing of HS-code, such as (pig and live pig) are synonymy.*

Hypernym and hyponymy: *hyponymy can be defined as if an entity is a sub category of an entity, the hypernymy is propagatable, parallel and superordinate. Such as (carrot is hyponymy of vegetable and vegetable is hypernymy).*

Polysemy: *can be defined as having multiple concept (entities) of one word, such as sheet, that has two senses as (sheet of bed or sheet of paper).*

Homograph: *can be defined as concept (entities) having a same spelled with multiple meanings, e.g., Ring, is either related to use in hand or associated with the concept electronic bell.*

Attributes of concept: *Mostly the Attributes are quantifiers and adjective. To usage of Attribute is to identify the concept from another concept, for example (live attribute of the live horse). Most of them are nouns as (pearl of pearl chick) or (synonymy of big swine is large swine). HS ontology ignore the more subjective adjective, e.g., light or weight. Synonymy of weight can be represented as kilogram (1kg=1000g, 2 half kg). The synonymy of attribute is for translation to be understood by machine. t*

To represent the concept more precise, filtered and comprehensive, ontology requires continuously update, for properly processing of relevant term of concept and human-machine interaction and machine learning.

3.5. Storage structure of HS-ontology: can be defined as,

Concept Z: *Synonymy of Z…, Hyponymy of Z…, Hypernymy of Z, Attribute of Z…, Polysemy of Z, Meronymy of Z…, if Holynym of Z.*

3.6. Semantic discovery and matchmaking, One concept with heterogenous interpretations in the information system of HS specification is a traditional problem, i.e., a keyword 'apple', does it sense a fruit 'apple', or a company 'apple', the information system can be a capable of retrieve reasonable semantic concept regarding keyword within predefined domain concept and their relationships.

Pig*: synonymy (*swine, jerk, hog, pork, snout,*), Hypernymy(pig), hyponymy (porker, pokemon).*

Apple*: synonymy (*Apple*), Hyponymy (crab-apple, dessert apple), Hypernymy(fruit).*

Apple*: synonymy (*Apple*), hyponymy (apple phones, apple laptop, apple notebook pro)*

3.7 Semantic integration. As ontology is a intermediary language to describe the mutual terminologies that can be perceived by the mutually integrated system and import and export ontology make possible the information match and translation simply between information systems. The integrated system includes office automation systems, the monitoring system of exporting of another countries and systems of international trade organizations. Currently, without middle ontology data exchange among these systems are finite.

4. IMPLEMENTATION AND REASONING SCHEME FOR HS-CODE BASED ON ONTOLOGY.

The core objective of HS-ontology is to upgrade the processing and automation, capability and precision of Match and translation management system, using appropriate semantic integration, technique of discovery and reasoning. The advancement can be implemented using semantic matchmaking, translation among products and as per applicable policies. The semantic matchmaking and translation are three step activity, step one deals with obtaining of HS-code regarding product name. Step Second cope with picking up associated policies regarding obtained HS-code. Step Third deals with acquisition of translated HS-code of matched HS-code for the same product and its relevant policies in destination country.

The followings reasoning schemes are ontology-based query:

- **Synonymy query**. In the scenario of subjected product name is not mentioned in HS-specification. In this case appropriate synonymy of subjected product name required to be reason out using common knowledge.

- **Keyword matchmaking query:** Mostly in this type of query subjected product name matches with keyword mentioned in HS-specification. It is a simple query with no scenario of exclusion notation regarding any superordinate class of product.
- **Exclusion notation query:** This type of query follows the rules of HS ontology to reason out, that rules are formed according to the exclusion notation. In this scenario subjected product is also mentioned in HS-specification, however there is association of exclusion notation with superordinate categories of product.
- **Inclusion notation query:** This kind of query follow the rule-based ontology concept of inclusion, that if an object is A, then it is necessary the meaning of A must be included in the meaning of superordinate entity.
- **Indistinguishable/relational query:** In this case, if there are no applicable query suits for a product name, to determine a relevant product name, a relational or similar query process is required as input with the same HS-code. Mostly the subject product name may have many relations with official product name.

4.1 Method for ontology management:

Extraction of concept and core associated attribute of HS-ontology according to the class of domain ontology is managed by authorized professionals. When upgradation or modification in ontology requires as variation in external ontologies, request is conveyed to ontology manager for maintenance of management server.

- As the request is received, to upgrade the ontology, the ontology maintenance also updates the index and cache server according to the substitute concept.

4.2 Ontology management architecture of Match and Translation semantic reasoning.

For efficient reasoning and querying scheme, a reasoner is being developed as illustrated in fig1. The processes of involved management system are maintenance of ontology and semantic query reasoning. The Step for query reasoning is:

1. Subjected product name is inputted by user into windows client (HS-translator web portal) for querying a HS-code. (by selecting source country and destination country).
2. The request is pre-processed, and filtered out based on (key name or head word of simplified product information composed of limited number of words with its attributes). Accessory names are avoided (word without semantic taste) for querying the HS-code.
   - The organization of HS-management system to store a standard HS-specification to reduce the complexity and improve query performance. Maintaining all the legal key-names with its attribute for efficient and faster semantic reasoning regarding subjected HS-code.
3. After the previous step, item is checked using cache server, for determining whether the name is in access-list of history. If name exist and still valid, the user gets the query responses (HS-code) by the cache server. If not, the query is forwarded to query server.
4. Afterward query server lookup using the Database indexing, acquire relevant HS-code and respond to the client in predefined order.

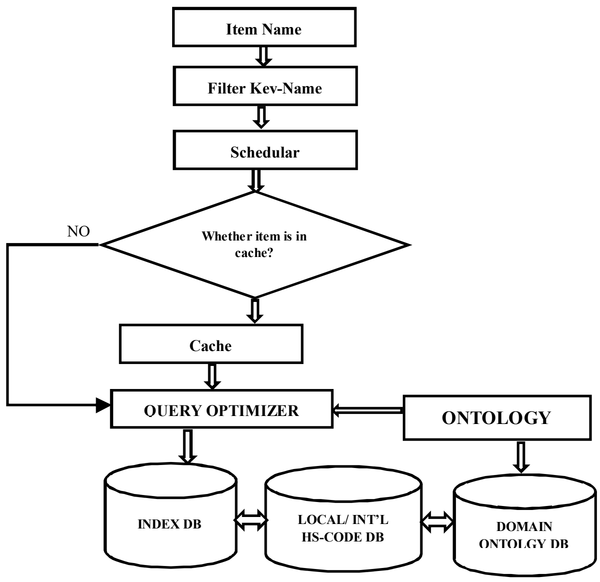

Fig 1. The architecture of reasoner

4.3 Implementation issues:

In HS-Matches and Translation Management system country wise updated HS-code database is constructed using MYSQL database, such that for china (local HS-code table) and for other countries of regions, Gulf countries, central Asia, European countries, American countries (international database) is created separately. As we know that each country update HS-code specification after some time according to their policy.

As shown in fig 3. Structure of tables of source country as china comprised of columns, HS-code, standard HS description, keywords with (simplified product information) composed of limited number of words by avoiding accessories (without semantic sense) according to the quantity of information required to execute HS-query, semantic roles and comments. To acquire the comprehensive HS-code of subjected input product name third column is compared to make searching appropriate for matching the key name with its associated attributes. Utilization of second column is used for showing the standard description regarding matched product for output. 1. **Key name:** provides significant information form standard description. We can verify sequence number of chapter class of an item from HS-specification using key name.

2. **Attributes:** Based on key name, attributes provide relevant and relevant information, such as ingredients, colour, size and purpose. Attributes helps to determine complete sequence number of class regarding article (goods) in HS-specification.

3. **Accessory word:** are senseless in semantic and querying, such as conjunctions and preposition of grammar.

4. **Semantic roles:** In our HS-management system, abundant definition of semantic roles according to the domain ontology, is stored and organized as HS-tree, to assesses the resemblance with synonyms for semantic reasoning. the raw data is filtered and words in generally usage are discovered and sorted out as information (filtered data) categorically.

As a result, key names and attributes commits for HS-querying. logically the representation of HS-specification is like HS-tree graph. Arrangement of structure in management system is joined HS-code, key-name and attributes. Searching for potential Hs-code in HS-tree structure improve query performance and reduces complexities. To make a final HS decision, similarity can be compared between HS-standard and user's subjected input.

- Two concerns regarding Semantic Query conduct for HS-code Matches and Translation.

1. Execution of query for matching the HS-code, such as, for given item name,

```
SELECT ALL
FROM HSCHINA_TABLE T
WHERE T. DESCRIPTION LIKE '%WINE%'
```

Following the formation and query and execution, "SELECT" all related key names as per condition in "WHERE CLAUSE…" with the association of "LIKE" keyword to assist the search specifically.

2. Execution of query for translation for the suggested HS-code after Matching in first step.

```
SELECT ALL
FROM HSUSA_TABLE T
WHERE T. HSCODE LIKE '102011%'
```

In this step, already suggested HS-code (for Matching), e.g., 'wine' is translated by executing the query from another international database like 'USA', to obtain the equivalent recommended HS-code for destination country. As SQL is data manipulation language supports high level query, requests for products are non-procedural (without reference) to access location. To access path for simple relation and complex queries such as joins stated a user specification of required data as a Boolean expression of predicates.

The assessment of similarity between the two concepts is depend upon their associated attributes. To obtain similarity oriented facts of their common attributes based on relativeness is used. The associated similar concept in ontology regarding (Matched and Translated) HS-code of similar concept and input concept are listed.

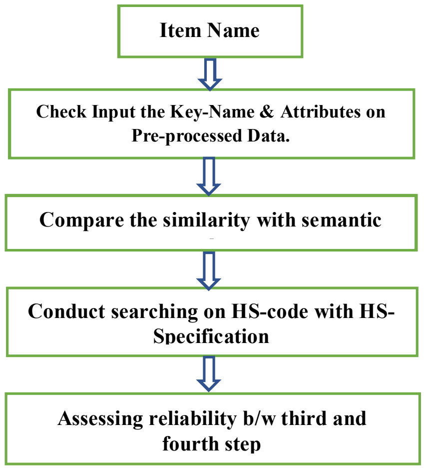

Fig 2. Process of semantic analyzation

As shown in Fig.3. The description of tables is built in HS-management system, i.e., HS-CODE_TBL represents the list of 98 chapters from CH01 to CH98 hierarchically such as chapter, heading, subheading with crucial standard description regarding specific HS-code. RELATIONAL_TBL represents the interaction between HS-CODE-TBL and SEMANTIC_ROLE_TBL, while SEMANTIC_ROLE_TBL represents the semiotic roles and product specific information for HS-code. However, HS-code and Smn-kn-a of HSCODE_TBL and SEMANTIC_ROLE_TBL used to map between semantic relation with the specified matched product.

HSCODE_TBL
HS CODE VARCHAR (100)
DESCRIPTION VARCHAR (300)

RELATION_TBL
HS CODE VARCHAR (100)
KEY-NAME VARCHAR (100)

SEMANTIC_ROLE_TBL
SMN-KN-A VARCHAR (100)
SMN-ROLES VARCHAR (100)
SMN-WORD VARCHAR (100)
COMMENTS ------------ ---------

Fig. 3 Table Structure of Management System.

Another function of HS management system is to acquire the translated HS-code, such as (HS-code of dry fruit in CHINA to HS-code of dry fruit in the USA, EUROPE, GERMANY), however some countries populate their updated HS-code database in their native language as well as in English also, to get the equivalent translation of HS-code between source and destination countries query executes either based on first 6-digits, as mention above in query example, first six digits are almost same among several countries, or by product name.

Let us follow an example of the result produced after translation. Such as for the country China query is submitted using a Chinese language for dry fruit, having a match result of HS-code (0802909040) as in fig.4., after obtaining the equivalent translated HS-code of product dry fruit for destination country (USA) is as 1002900000.

Let us follow an example of the result produced after translation. Such as for the country China query is submitted using a Chinese language for dry fruit, having a match result of HS-code (0802909040) as in fig.4., after obtaining the equivalent translated HS-code of product dry fruit for destination country (USA) is as 1002900000.

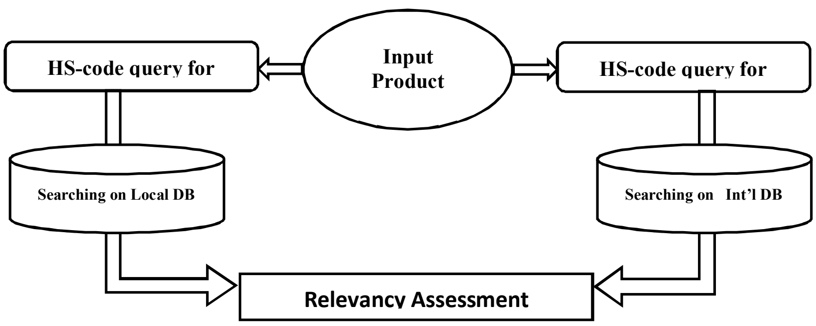

Fig.4.Translating HS-code query process

5. IMPLEMENTATION AND DEPLOYMENT:

With the collaboration of research team of TEGSS systems, prototype system has been implemented using Java/J2EE technology. numerous issues that required to be examined, such as faster query response, potential memory management, optimistic system configuration, extensible database management, integration with ontology database. This developed translation management system has been setup as web service. This web service supports by remotely invocation to custom department, international traders. As shown in Fig.3, the web portal to supply the Matching and translation of HS-code for the source and destination countries.

The techniques used to as the web service for match and translation management system on MYSQL relational database. Database pool connectivity built by apache DBCP component, for accessing database tables and views. The deployment server is Tomcat. JavaScript and CSS framework are used for responsive front-end to establish a Spring **MVC** model to support **JSP** technology for implicit system architecture. The ontology has used concept and its relationship in management system while being constructed. For the future work, to boost up the intelligent HS-coding (recall and precision) using semantic reasoning algorithms, logical reasoning algorithms based on machine learning tools will be applied for effective Matchmaking and translation in management system. However, translation application and ontology need to be refined with sophisticated processing regarding product data.

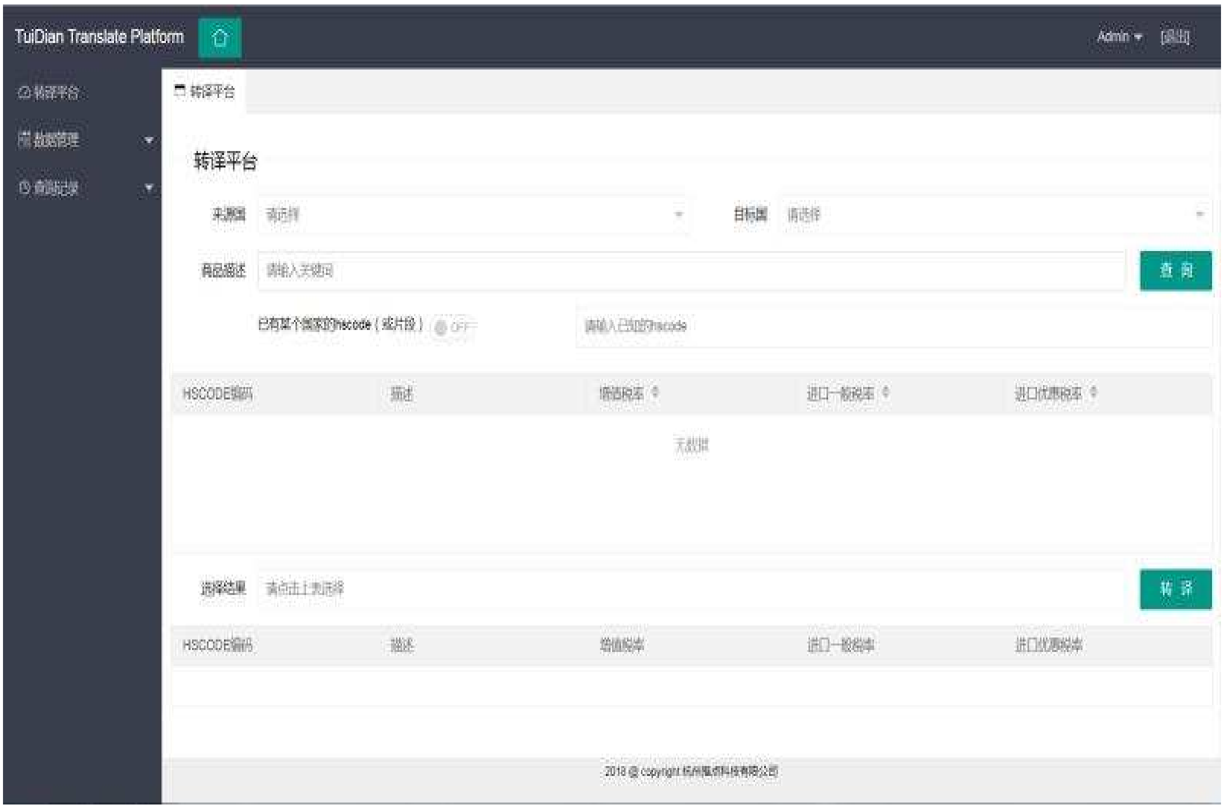

Fig.5 Snapshot of Web-portal of HS code management system

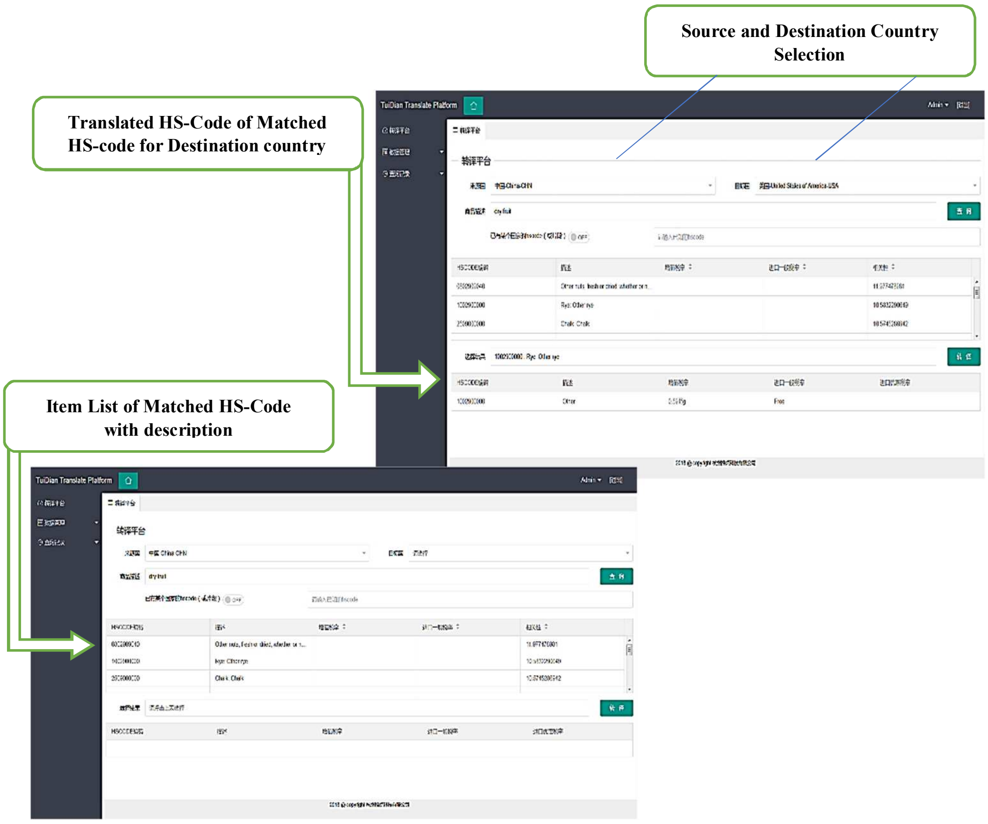

Fig.6 Snapshot of Match and translation HS-code

6. CONCLUSION:

The translation management system for harmonized commodity description and coding system include database for china as a source country and rest of the countries as a destination. The management system is integrated with ontology editor for arranging a HS-code ontology based on import and export articles. Key names with its corresponding attributes processing, references the HS-product specification in response of subjected input based on semantic features. As a result, one or more HS-code are extracted with its translated HS-code are recommended by comparing for source and destination country from database. In accordance with research, to determining the HS-code is essential information including as per policies regarding product in source and destination countries. Author believe that continuously improvement requires, exploration of raw data and query correctness. For the code classification and identification, approach used is applicable for other complicated products.

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