

# MAS based Selection and Composition Process of SWS's for Medical Health Care Planning System

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## ABSTRACT

The need of semantic web is growing day by day. Users request fulfillment becomes an important assignment. Agent enables approach becomes key milestone in field of semantic web services selection and composition process. Agent who is a self described and managed software component is used on the basis of its capabilities for users request fulfillment. On the basis of domain ontology agent and SW is used for intelligent access of medical information. This paper focuses on how agent based system opens a new range for health care system that include both patient and provider of health care. This paper also focuses to show an interactive health planner for MEDICAL HEALTH CARE PLANNING SYSTEM (MHPS). Here selection, decomposition and composition process of semantic web services is shown on the basis of various cognitive parameters, preferences and conditions for medical health care planning system.

## General Terms

Semantic web services, Agent, Ontology, Medical healthcare planning.

## Keywords

Health Care System, Health Planner, Medical Health care planning (MHP )Domain Ontology, Agent, Semantic Web.

## 1. INTRODUCTION

Semantic web can be treated as web with more capabilities and features which have intelligence also where things are not only seems to be linked pages but a huge collection of database with information. The growing use of XML over internet, network and in other forms emphasis on the use of XML based indexing as querying language to make web semantic. In medical health care system this semantic feature can also be used for not only retrieving information over net but also it can be utilized for observation and diagnosis process in health care system. Here in healthcare planning system the aim is to provide complete compiled information to patient about disease, related hospitals, doctors, available hospital, quality of services for both doctor and hospital, city of service, fees/changes etc at patients location.

It is known that semantic web provides a platform for data integration, sharing and reusing from various sources. Here domain knowledge is represented in form of ontology's which have complete knowledge about that domain. Power of semantic web [1] with capabilities and abilities of agent technology [2, 3] is used to facilitate medical healthcare planning domain. Various researches are made on SWS composition [4]. In current web information is stored in variety of languages and at various sources over internet or

individual but for semantic web we provide a unique XML based web description language known as RDF [6] that is Resource Description Framework. RDF and OWL [7] are mainly used for description of resources and how they are related on web. These paper focuses on combine approach of agent system and SWS's for facilitate health care system.

Lot of researches are going on over agent technology from past 30 years and clearly observation gained that is agent can be viewed as a self-defined autonomous software component which are capable of selection, discovery, decomposition, composition and monitoring of web services. Various researches are going on and have been made on medical domain [5]. The joint situation of agent and SWS's can be capitalized in various fields like medical health care, education planning, production fields etc. figure 1 shows how users (patients) request is proceed and how domain knowledge is used by agent for fulfillment of users request.

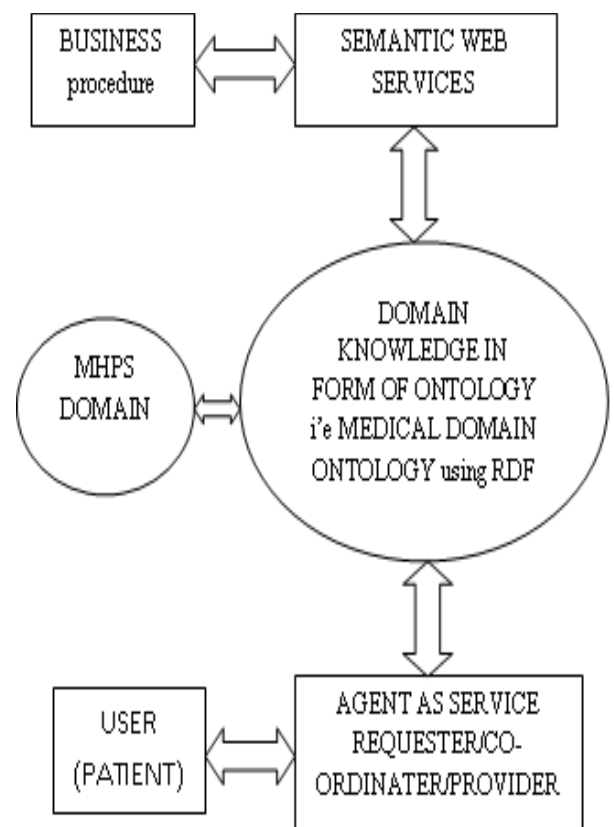


Fig 1: Ontology Based System Design for MHP Domain

Figure 1 clearly shows how knowledge is extracted from ontology using agent. Information is spread over internet in

various forms for reusing them it is mandatory to convert these existing knowledge in required specified form of web ontology language i.e OWL and only then the integrated knowledge/information can be easily accessed using querying languages like SQL or XQuery etc.

## 2. SELECTION OF AGENTS ON THE BASIS OF VARIOUS COGNITIVE PARAMETERS

Selection of agents is an important task which involves selection of both coordinator as well as service facilitator agents. This selection process is done on the basis of cognitive parameters. These parameters are user's preferences, quality factors and preconditions. In medical health care planning domain there is certain parameters like doctors quality of service, hospital quality of service, cost factors, distance availability timing on doctors etc. Firstly the input request of patient is fetched then verification and validation for that input request is done. Then performance of coordinate agents is evaluated by computing its semantic valve on the basis on

above mentioned cognitive parameters. Agent having best semantic value is selected as coordinate agent. Selection of facilitator agents is based on decomposition process. When large or say complex input request which is not possible to fulfilled by using single agent then that request is decomposed in various less dependent sub-tasks and for each sub-task a service provider or say facilitator agent is selected. Selection of semantic value can be formulize as patients satisfaction ratio. Semantic value of agent is proportional to doctors and hospitals quality of service, service charge and inverse proportional to distance.

$$\text{Semantic value} \propto Q_d * Q_h * C / D$$

Where  $Q_d$  = quality of service for doctor

$Q_h$  = quality of service for hospital

$C$  = charge of service

$D$  = hospital distance

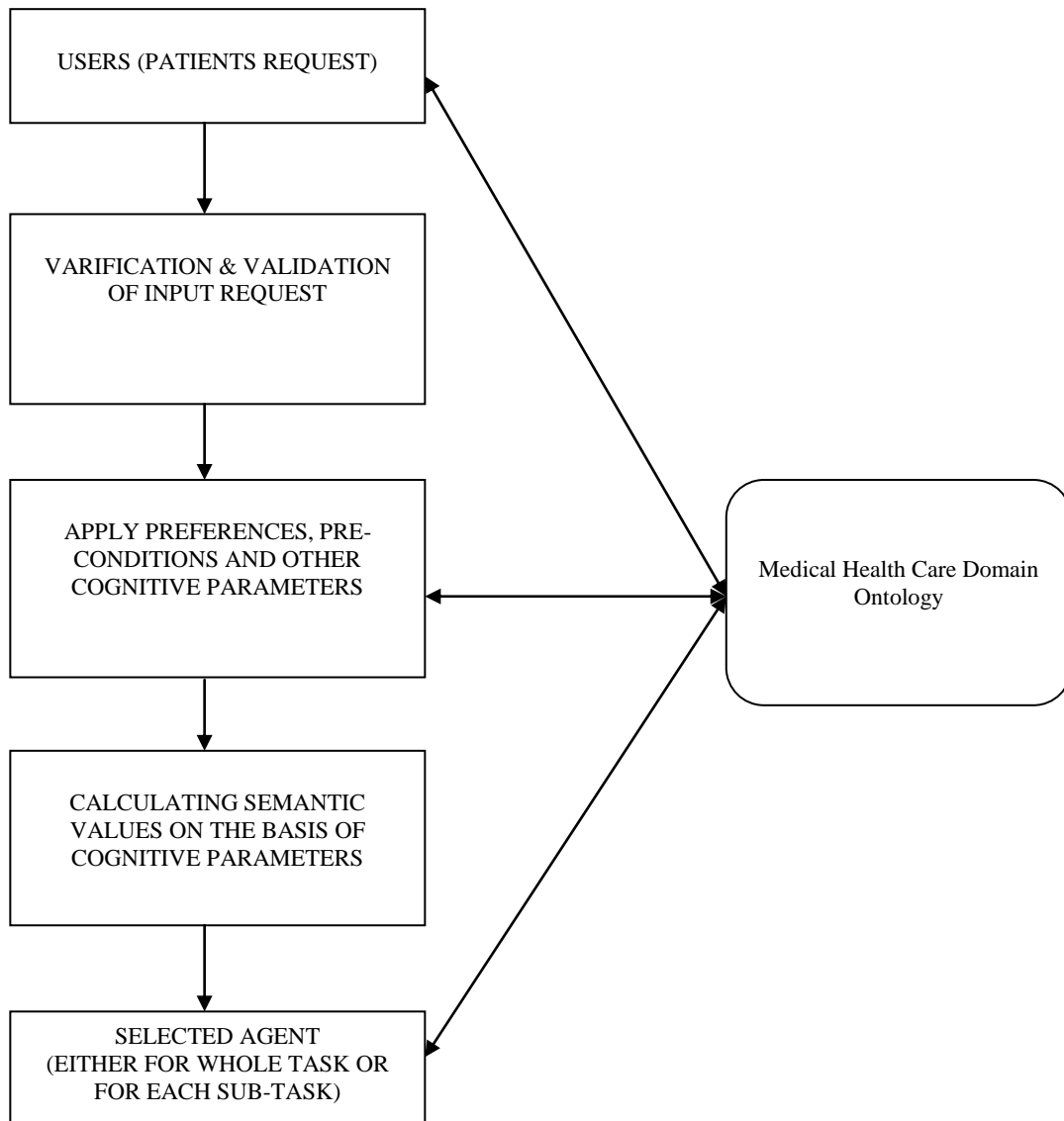


Fig 2: Selection Process of Agents

Intelligent Web Tools like Protégé [8] is used for developing profile in languages like RDF/RDF-S [6] or OWL [7]. For Medical Healthcare system we use Protégé [8] to create domain ontology. The ontological graph for that is shown in figure 3. That graph shows relation between subject and object on the

basis of class hierarchy. The ontological graph contains complete information /knowledge about that domain. HasDisease, isDiseaseof, hasSpecialist, isSpecialistof, hasQualityofservice etc are various object properties which are created between objects and subjects.

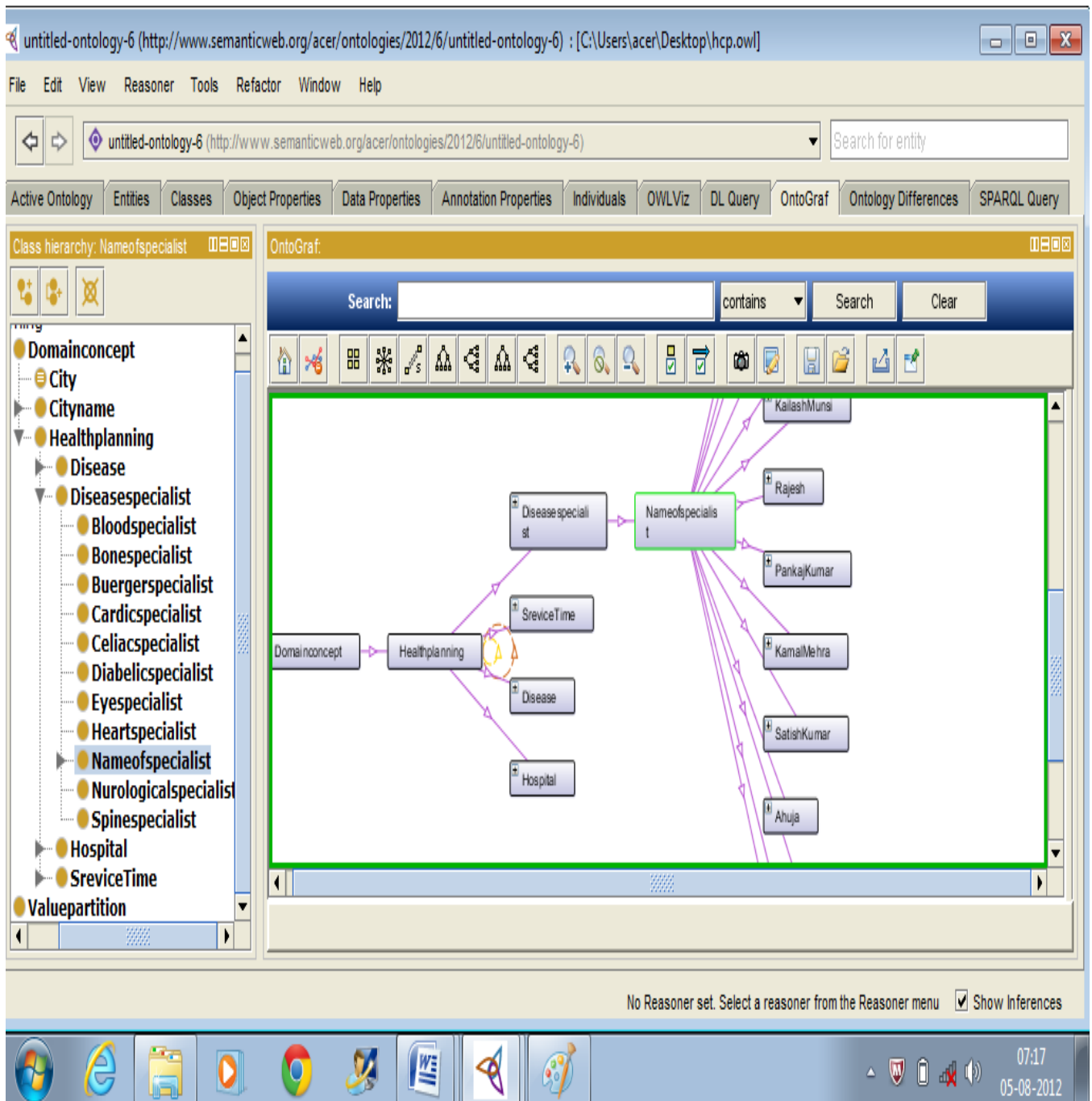


Fig 3: Onto-Graph of MHPS

### 3. DECOMPOSITION & COMPOSITION OF SWS'S

Task decomposition is an important aspect and involves decomposition of any complex task in various sub-tasks. These sub-task can be treated as fully or say partially independent tasks. In case of dependencies agents communicate to each

other. Co-ordinator agent provides service facilitates agent for each specific sub-task. For each decomposed task service is selected on the basis of preconditions and preferences. These preconditions and preferences specified by user are applied on identified solution and then user approved solution. All this becomes possible due to the sociable properties of agents which provide it capabilities to communicate, co-ordinate and collaborate with each other.

The decomposition of tasks for medical health care planning system is shown in figure 4. This will show how patients request is proceed by service caller agent and then service

facilitator agent work on it in order to find appropriate solution of that complex problem.

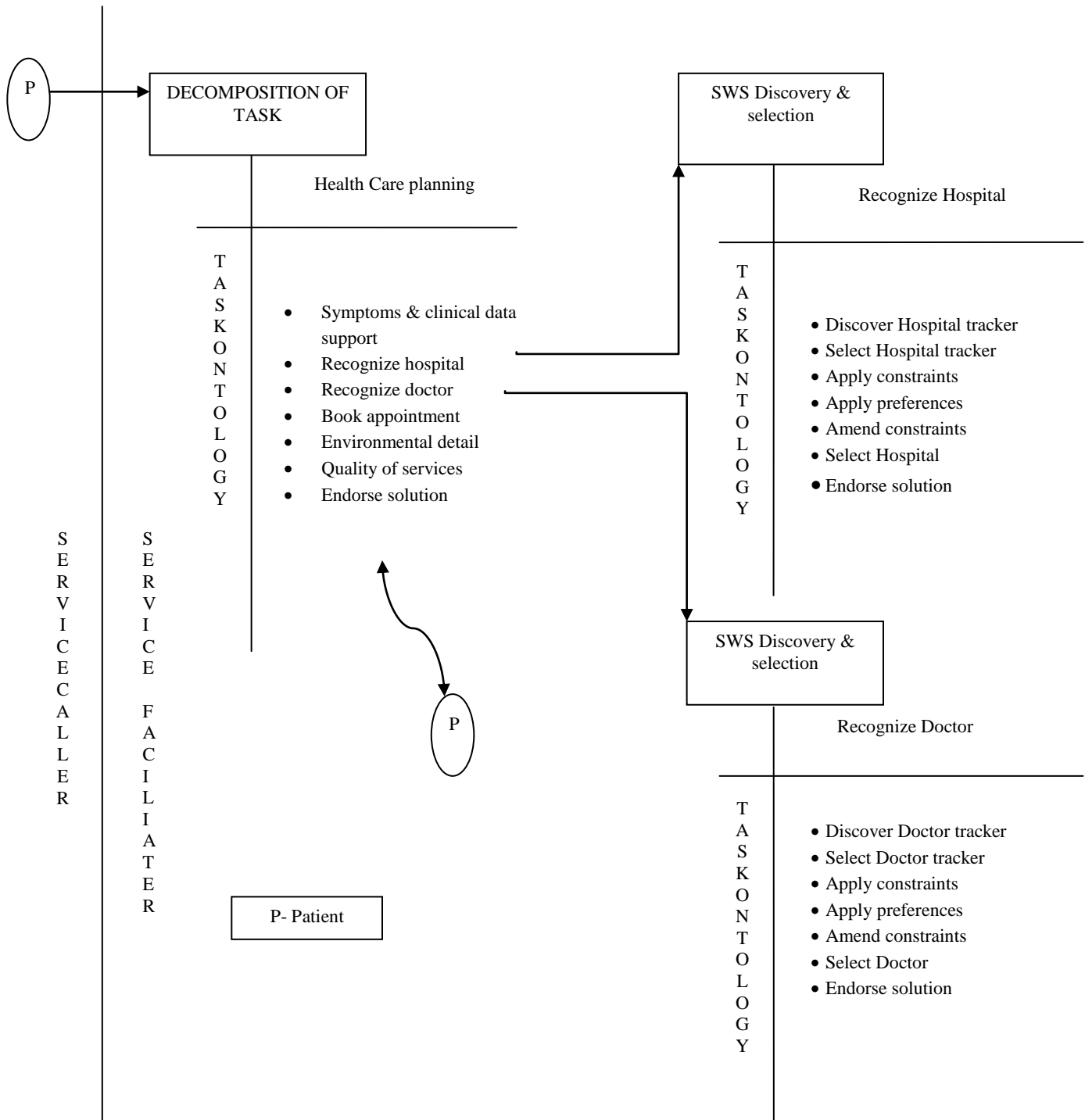


Fig 4: Semantic Web Service composition for MHPS

Figure 4 shows the decomposition and selection process. When all input sub-tasks solution is endorsed that is approved then composition process take place to composite all these web services in order to produce a combined and final solution according to users constraints and preferences. Thus composition of semantic services become an important aspect

as well as need of today to have solution of user's complex problem or say request. Selected services for each sub-task is required to have a composite service and the final composite service which is aggregate of all sub services based on preferences and constraints needs user's final endorse that is final approval.

#### **4. CONCLUSION**

The Entire Paper is based on semantic web service composition for medical health care domain for providing used more dynamic data and using the web as retriever rather than locator of resources. Ontologies are used as domain knowledge and protégé is seems to be an important semantic web development tool. Multi-agent system is used as distributed problem solving for semantic web service composition. This paper presented model how agent capability is used to have composite web service to provide a patient full information about disease, specialist, quality of service for both doctor and hospital, service charge and use this parameter to provide patient suitable information about best suitable hospital and doctor available at patient location. In future this system focuses more on diagnosis process which will involve semantic technology with more intelligent computing and monitoring of patient.

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