Chapter 7

Summary and Conclusions

In this chapter, I present the summary and conclusions related to the Service discovery, selection and composition of Heterogeneous Web services. Section 7.1 discusses the summary of Heterogeneous Web services discovery, selection and composition; Section 7.2 presents conclusions and future work of the proposed work.

7.1 Summary

Web services play a key role in the emerging technologies, such as Cloud computing and Internet of Things (IOT). Over the time, researchers have proposed approaches and solutions related to Web service discovery, service selection and service composition problems by considering them as key challenges of Web service research. I have discussed my relevant contribution in the related work section. Literature related to Web services, such as SOAP-based Web services, RESTful Web services and emerging Web services on Cloud (Cloud services) as Heterogeneous Web services are discussed. Existing work has not covered key research challenges collectively for the Heterogeneous services. I have presented the contribution in the form of proposed framework and approaches related to Web service discovery, service selection and service composition by incorporating Semantic Web and non-functional characteristics. For the performance measurement and demonstration, standard as well as open data sets have been used in the experimental work. Based on the proposed work, prototypes related to Public domain and Healthcare domain have been developed with appropriate comparison with relevant work. Analysis of the achieved re-
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Results shows that proposed work performs well in demonstrated environment. Concluding remarks and future directions are described in the following section.

7.2 Conclusions and Future Work

This sections presents the conclusions derived from the proposed work and future directions for further investigation.

7.2.1 SOAP-based Web services

As a proposed work, I have presented an integrated approach on the support of runtime Web service discovery, selection and composition based on Semantic Web and non-functional characteristics to facilitate the end user to search, select and compose the services with increased satisfaction. We have proposed a framework to show the inter-relationship among the discovery, selection and composition tasks. Various Most of the frameworks proposed for the service discovery, selection and composition have considered these tasks on individual basis. The proposed framework has considered these service tasks collectively. Based on the proposed framework, I have presented the approaches for service discovery, selection and composition by incorporating ontology as knowledge base and non-functional characteristics. I have developed a prototype for the Healthcare Information System to offer the healthcare services to end user for performing the routing task such as to make the appointment and treatment from the nearest Healthcare centers. I have performed the experiments on the proposed approach using standard datasets such as WSC2009 to evaluate the performance and comparison with existing work. We conclude that runtime service discovery, selection and composition using non-functional characteristics can be achieved. However, with this work I demonstrated that end user has to play an important role to generate the efficient composition solution. I have evaluated the proposed work using real life scenario to show the evidence of its usability. I have made comparison of proposed approach with existing approaches to demonstrate the effectiveness of the proposed work.

As a future work, it could be possible to extend the proposed system through integration of hand-held devices to get the advantage of pervasiveness. Cloud-based platform could also be incorporated to provide services to large scale level from local access to
remote area where healthcare facility is not easily accessible.

### 7.2.2 RESTful Web services

I have presented the efficient and effective approaches for automated service discovery, selection and composition using Linked Open Data and RESTful Web services as well as to describe services in the form of RDF data to link them with Linked Data Cloud. As a part of the proposed work, various data sources are transformed into RDF triple store and interlinked them into the LOD cloud. RDF provides uniform data model which describes data semantically as well as avoids the issue of data heterogeneity. To demonstrate the performance of the proposed work, a prototype for Population Information System using US Census dataset is developed which allows end user to retrieve population related information from the publicly available data by providing the input parameters. A prototype for Healthcare Recommendation System based on Linked Open Data Cloud is also implemented which facilitate end user to get recommendation for epidemiology i.e. H1N1 as per the user query. I have used proposed approach for two different kinds of datasets. From these two prototypes, I have analysed that proposed approach is more beneficial for Healthcare sector, where limited datasets and features are restricting end user to access the resources effectively. The results achieved through experimental work and prototype development demonstrates the better performance of the proposed work which is also compared with the existing approaches concerned with Linked Data based RESTful Services. In this way, an attempt has been made by me to integrate and automate the discovery, selection and composition tasks of the RESTful services using Linked Open Data.

As a future work, I can extend the proposed work by incorporating emerging concepts like Internet of Things, which use RDF data and REST principles to make it more effective and beneficial to the end users work.

### 7.2.3 Cloud Services

A framework and approaches for the cloud service discovery, selection and composition by considering the QoS parameters of SLA, user preferences and domain ontology have been proposed. Experimental results show that the proposed work performs well in comparison
with existing work for the matchmaking process. A prototype for Decision Making Healthcare System has been developed by using the proposed work, where I have considered the basic health centre scenario to facilitate the end user for the diagnose and decision making facility.

As a future work, nonlinear evolutionary techniques could be incorporated for optimization requirement. Several cloud related issues, i.e. scalability, interoperability can be considered to improve the proposed approach.