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RT-Gaia: Extending Gaia Methodology to Employ Requirement Traceability

Abstract

Requirement traceability is used to trace relationships that exist between software artifacts created during software development process. This evolution of relationship between requirements and the artifacts to which they are allocated provides insight into the system. Requirement traceability is thus considered to be an important pre-requisite for high quality software.

Unfortunately agent-oriented development methodologies often do not address this critical issue. In order to be able to deal with the complexity of requirement traceability that arises during the development of agent-oriented software, there is need to improve the existing methodologies so that these can support the critical issue of requirement traceability. Failure of addressing this issue results in higher costs, and longer corrective actions.

This thesis extends the Gaia methodology, which is one of the agent-oriented development methodology and named as RT-Gaia, to incorporate the feature of requirement traceability.

This extension proposes a general framework to address the critical issue of requirement traceability to ensure continued alignment between requirements and other artifacts.

As the development of multiagent system is a new and complex concept which is different from traditional software development techniques including structured and object-oriented ones. Due to this enhanced complexity, it becomes very important to maintain the traces between requirements and artifacts. This thesis provides a framework for establishing, maintaining and viewing relationships between requirements and artifacts during agent-oriented development process. This trace information helps in coverage analysis in a way that all requirements have been traced to higher level requirements and hence it can be verified that all requirements are satisfied. RT-Gaia creates relationships among various models of Gaia as well as define a new model. These relationships are created by defining various identifiers for references. Maintenance of these relationship enables RT-Gaia to generate various traceability matrices which in turn help in requirement traceability. This trace information also helps in change management. Understanding the scope of a change on any level enables to make judicious decisions about how to change the design at that level. When regarding the maintenance of a system, this framework provides effective system maintenance and consistent change integration as all requirements are mapped and traced in a systematic manner.

This developed extension of RT-Gaia supports requirement traceability. This is demonstrated with the help of a case study and the development of a prototype which generates various traceability matrices.

The prototype uses MS-Access to keep the relationships and definitions and it provides back-end support for the database. Front-end which generates traceability matrices is developed in Visual Basic 6.0.

The focus of this thesis is only on addressing the requirement traceability issues at macro level and other issues like non-functional requirements, security, etc. are not included in the scope of this thesis.