OAV-VVT Expert
Integrated Verification and Validation Tool
For Knowledge Base System
"Based on OAV Representation Knowledge Technique"

ABDOLLAHZADEH-BARFOROUSH Ahmad DADKHAH Chitra

Amirkabir University of Technology
Computer Engineering Department
Tehran –Iran, Hafez Avenue
E-mail: (Ahmad, Dadkhah) @ce.aku.ac.ir

Abstract:
Verification and Validation (V&V) are the most important issues in building knowledge base systems. Researchers and practitioners in the field of AI applications generally all agreed that Knowledge Base in any intelligent systems must be adequatatly verified and validated. In this paper we present OAV-VVT as an verification and validation expert system for V&V during the implementation and maintenance phases of Knowledge Base system life cycle.
The approach, which has been chosen in OAV-VVT system, is based on knowledge representation and reasoning techniques. Object-Attribute-Value (OAV) Knowledge representation method has been used in OAV-VVT expert. All common issues of V&V such as consistency, completeness, semantic and logical contradiction and correctness of knowledge base have been considered in OAV-VVT expert. The designed system is application independent: it has several important advantages:
First, OAV-VVT itself is an expert system with reasoning and explanation mechanisms.
Second, OAV-VVT can be either used during the knowledge representation phase or refinement of knowledge base.
Third, OAV-VVT is application and knowledge base representation independent: so it can be used verifying and validating all AI systems based on different knowledge base representation technics (i.e.: logic, semantic network, frame, production rule, predicate logic).
Keyword: Verification and Validation, Knowledge base, Knowledge representation, OAV triple, Expert systems, AI systems.

1:Introduction
the lack of adequate and precise knowledge is a limiting factor to build an efficient AI application. When intelligent methods are used in real applications, it is an important factor to be able to check the consistency of knowledge and the correctness of the system's reasoning. As with any software system or application, attention to quality and safety must be paid throughout the development of knowledge base systems. The need for an integrated approach towards Verification and Validation (V&V) of Knowledge Base (KB) is quite obvious. In this paper we present OAV-VVT as an verification and validation expert system for V&V of KB. In order to built such an expert system tool, first of all, it is necessary to have a common definition of V&V. The table. 1 is indicateing an over-view of several researches and practitioners defined V&V of KB in several ways at different times.

Table. 1: The definitions of V&V by the researchers and practitioners.

Researcher's Name	Validation	Verification
BOEHM [Boe84]	Building the right system.	Building the system right.
IGNIZIO [Ign91]	. Justification for the employment of an expert system. . The verification of the overall performance of the expert system.	The validation of the consistency and completeness of the expert system's rule base.
MENSHOEL & DELAB [Del&Men93]	Addresses software system's usefulness with respect to some real-world task, regardless of its specification.	Concerns a software system's conformance to its specification.
KANDEL & SMITH [Smi&Kan93]	A test of whether the ES matches the design ideas, i.e., whether it matches the technical requirements and expectations.	Examine the technical aspects of an ES in order to determine whether the ES is built correctly.
WU & al [Wu&al94]	The correctness of inference without considering the Input/Output.	The correctness of systems outputs according to specific Inputs.
ROUSSET & al [Rou&al96]	The correctness of system's output depends on Test cases and Initial valid Fact Base.	Checking the logical and semantic contradiction of Rule Base.
CARDENOSA & ESCORIAL [Car&Esc99]	The set of activities in charge of checking that the system is adapted to the environment and user requirements.	The set of activities aiming at checking that the system is adapted to the system requirements.
KNAUF & al [Kna&al00]	Asks whether or not a system is considered to be the required one, something that somehow lies in the eyes of the beholder.	Provides a firm basis for the question of whether or not a system meets its specifications.

The approach, which has been chosen in OAV-VVT system, is based on knowledge representation and reasoning techniques. OAV-VVT system is able to V&V the knowledge of KB with the Object-Attribute-Value (OAV) knowledge representation technique. The existing KB will transfer to OAV knowledge representation technique (canonical KB). We will show that how the major techniques of knowledge representation (i.e. logic, semantic network, frames, production rule) could be transfered to OAV. OAV-VVT expert's reasoning validates and verifies the canonical KB. The dynamic process of V&V in OAV-VVT expert will modify all knowledge in case of any error and construct a new knowledge base. The result will recognize a valid KB. Figure .1 shows the process of incoming knowledge to OAV-VVT system.

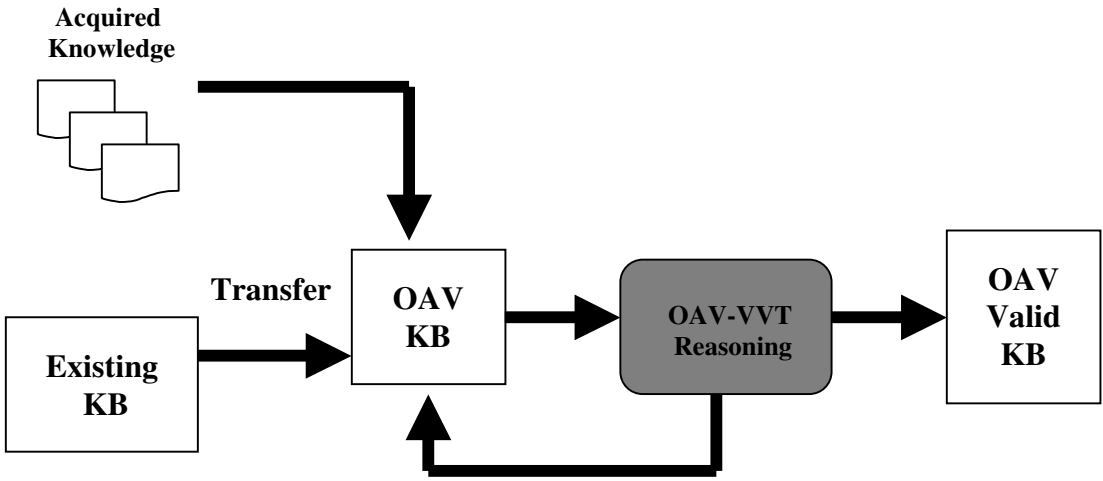

Figure. 1: the schema of V&V in OAV-VVT expert

We define "Validation" as the correctness and existence of system's output according to test cases that has been defined by expert and "Verification" as checking the consistency, completeness and semantic contradiction of KB. With these definition, OAV-VVT will cover all common issues in V&V. OAV-VVT can be either used during the knowledge representation phase or refinement of knowledge base.

Present work has aimed to present a design and implementation of the OAV-VVT expert to V&V of KB within the expert systems. We consider the expert system coach of Robocop applications as a Testbed.

The rest of the paper is organized as follow:

Section 2 describes OAV knowledge representation technique and present procedures to transfer the major knowledge representation techniques to OAV triplets.

Section 3 defines the issuesof V&V with the formal specification method.

Section 4 present the architecture and reasoning technique of OAV-VVT expert.

Section 5 demonstrates the implementation of OAV-VVT expert.

Section 6 proposes testing procedure for OAV-VVT system and finally section 7 offers conclusions.