

An Indian-Australian research partnership

**Project Title:** **Realizing design decisions and traceability thereof**

**Project Number** **IMURA0311** *(will be inserted by The Academy)*



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## Research Academy Themes:

**Highlight which of the Academy's Theme(s) this project will address?**

*(Feel free to nominate more than one. For more information, see [www.iitbmonash.org](http://www.iitbmonash.org))*

1. **Advanced computational engineering, simulation and manufacture**
2. Infrastructure Engineering
3. Clean Energy
4. Water
5. Nanotechnology
6. Biotechnology and Stem Cell Research

## The research problem

Developing software is predominantly undertaken through use of various models. Models are used as a means to precisely communicate how a software system needs to be built. It is a well-accepted fact that a Model-based approach to Software Engineering (SE) improves productivity. While there exists many modeling techniques for instance OMG's Unified Modeling Language (UML) that provide documentation and automation, they do not cover all aspects of SE. This is especially true in case of design analysis when stakeholders requirements (both functional and non-functional) are understood and deliberated (in relation to engineering parameters) over possible solutions. The primary goal of design is to explicate the properties expected by the software solution, assumptions about the problem, and components involved in software solution. In order to achieve this the design models undergo continuous refinement through iterative decision making. During such iteration it is a common practice to document the design decisions. However they are not considered part of design artifacts. In other words, design decisions are not considered as first class artifacts. Though there exists explicit connection between these decisions and evolution of software system design it is usually in designers' mental model. Due lack of traceability between decision that caused changes to design models, it is hard to revisit previous decision. Such

glaring disconnect often lead to complex design making maintenance even more difficult. While designer's experience play a vital role in design decision making, automatic application of these decision on design models will help bridge the gap and hence introduce traceability. This can eventually help designers to focus on applying their expertise in understanding the stakeholders needs and sparing them from mundane activities like verifying if changes made to models. Such automatic application of design decision on models helps address a long standing traceability problem between design knowledge and models (in other words among design concern, rationale behind a specific solution and system's design models). This increase the overall quality of design models and will be a valuable knowledge during maintenance activities. To achieve this following questions are essential to be addressed (1) Which are typical design concerns? (2) How can design concerns and decisions be described and modeled? (3) How can previous experiences in dealing with a design concern be used in choosing design alternatives? and (4) How can design decision be translated into accurate changes to design models?

**Project aims**

*Define the aims of the project*

**Expected outcomes**

*Highlight the expected outcomes of the project*

**How will the project address the Goals of the above Themes?**

*Describe how the project will address the goals of one or more of the 6 Themes listed above.*

**Capabilities and Degrees Required**

*List the ideal set of capabilities that a student should have for this project. Feel free to be as specific or as general as you like. These capabilities will be input into the online application form and students who opt for this project will be required to show that they can demonstrate these capabilities.*