

Design Intent

Is this paper suitable for JMD?

This is the very first question I strive to answer every time I look at a new submission to JMD. It is also a question that many authors ponder, even seasoned ones, facing a plethora of publication venues, ever-increasing “robo-invitations,” and the like. Editors and authors use overlapping but not identical sets of criteria to answer the question. As editor of JMD, apart from the obvious criteria of quality and research content, I try to decide if the submission “fits” within JMD. Given our breadth of topics covered, the fit criterion is not always easy to apply. A particular aspect of fit I have tried to use since I assumed my editorial duties is the paper’s *design intent*. It was in that spirit that I wrote the *Design Analysis and Synthesis* editorial, back in March 2008 (http://asmejmd.org/show_editorial.php?id=6), emphasizing JMD’s interest in more design synthesis. Then, what about this “design intent” as a criterion of fit?

In a simple way perhaps, what I think as presence of design intent in a paper is whether the writer really cares about design or not. After all, JMD is about design. Of course, things are never quite that simple. How can I tell what you care for? Well, for starters, you should tell me that you do care. True, if you write a paper about some particular analysis of an engineered artifact or system, it should be obvious to me that you are doing it because you care about its design. After all, ours is an analysis-based design process, right? Yes, but implying is not the same as stating. A great example is the use of the term “design intent” among professional designers.

Design intent is used widely in the architectural and geometric modeling community to make the point that even when you have a full geometric description of an object you may not know why something is designed to be like it is. For architects, design intent is “a detailed explanation of the ideas, concepts, and criteria that are defined by the Owner to be important” (*ASHRAE Guideline 1—1996, The HVAC Commissioning Process*). An explanation for engineering and product designers goes like this: “XXX is a parametric modeler. That means that features can be related to one another in a number of different ways. These relationships govern how the model will behave when changed. Design intent is the careful control of these relationships so that they correctly govern the intended behavior of the model. With good design intent, models can be updated almost effortlessly. Changes made to one aspect of a model propagate appropriately through the model, assembly, and drawing. With poor design intent, features may update inappropriately, or fail” (http://en.wikibooks.org/wiki/Pro_Engineer/Design_Intent).

This concept of design intent becomes clear when you consider reverse engineering (or reverse design, as I call it):

“Reverse engineering creates a CAD model of an object from 3D measurements obtained, e.g., by a 3D laser scanner. Such models do not contain any information about their design intent: intended regularities, such as symmetries, congruencies between sub-parts or a construction sequence for the model, etc. are not explicitly recorded. Furthermore, such models are approximate due to measurement errors and approximation and numerical errors from the reconstruction process. Similarly, for data exchange, transferring a model from one CAD system into another usually does not transfer design intent and may also result in approximate models due to different model representations and tolerance systems. This makes it hard for engineers to meaningfully modify or analyse such models.” (*Detecting Design Intent in Complex Approximate Geometric Models*, by F. C. Langbein, <http://www.langbein.org/research/solids/did/>)

In the context of a JMD Research Paper, analysis is analogous to the geometric model above. The intent of analysis is to design; without design intent the analysis would seem to have no purpose. In fact, the wikibook above states that “Design intent builds intelligence into the model,” which I can paraphrase as “Design intent builds intelligence into the analysis.” In practical terms, this means that as an author, at a minimum, you would have to state explicitly (in the title, abstract, introduction, conclusions, ...) the design intent of your analysis. Your readers will hopefully understand your purpose for what you are offering, and be able to use your work to create better designs or design processes.

There is another twist to all this, a concept taken from D. Lockton et al. (<http://architectures.danlockton.co.uk/what-is-design-with-intent/>):

“...Our everyday lives are full of examples of products, systems and environments which have been designed to shape, guide or control—*influence*—our behaviour, using a wide range of techniques: technological, physical or psychological. ... The common factor to all of this is *intent* on the part of the designer/engineer/planner or his or her corporate/political masters. This is *Design with Intent*: strategic design that’s intended to influence or result in certain user behaviour.”

A good example of design with intent is the composition of this editorial. I am looking forward to your (design-) intended submissions.

Panos Y. Papalambros
Editor