

Méthodologies de Recherche sur l'Industrie du Futur...

Pourquoi ? - Comment ?

S.smart»

Nouveau nom d'AIP-PRIMECA

Systems, Manufacturing, Academics, Resources, Technologies

28 JANVIER 2021

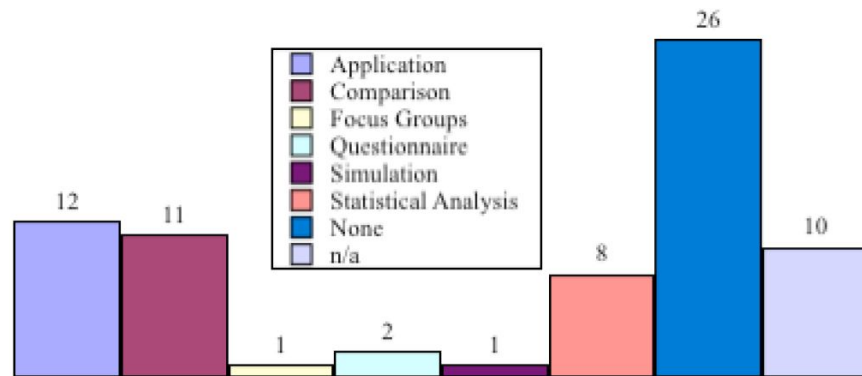
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Pourquoi ?



10'

Ce que disent nos pairs, en France...



“L’étude que nous avons menée en **2011**, a montré que **plus de 35% des articles en conception dans une des meilleures revues du domaine n’étaient pas validés** [Barth et al., 2011b]. Dans cette communication, nous avons analysé les **articles parus dans le journal international « Research in Engineering Design » entre novembre 2005 et novembre 2009**. Si 12% des propositions sont validées par une application, 11% par des comparaisons, on retrouve à droite de la que **26% des propositions ne sont pas validées ou qu’aucune validation ne semble possible**. La majorité des **validations est subjective**. « **ça marche alors pourquoi valider ?** ». Pourtant, cette faiblesse de la validation **fragilise les résultats et la communauté** scientifique. **46% des articles ne montraient pas de validation industrielle**. Est-ce important ? Si une application industrielle ne contribue pas obligatoirement à l’excellence scientifique, elle est essentielle quant à son application.” [Caillaud, E. et al. 2015]

Ce que disent nos pairs, à l'étranger...

"A lack of common terminology, **benchmarked research methods**, and above all, a common research methodology are the most outstanding problems in the field" [Blessing and Chakrabarti, 2009]

"We often observe that PhD students present their work describing what they are doing or planning to do, but fail to state the research questions and hypotheses behind their work. when **research questions are often very vague, too encompassing to be answered within one PhD project.**" [Blessing & Chakrabarti, 2009]

"There is this concern that design research does not live up to the standards of science: it is creating in a sense **too many theories and models, which jeopardises the coherence of the discipline** and which indicates that design research does not yet have the means to test and refute design theories and models." [Vermaas, 2014]

"**37% of the articles reviewed did not have any validation.** There needs to be more validation in the field of research in engineering design." [Barth, A. et al. 2011]

"There is in design research a general concern about the quality of the testing of design theories and models. In work reflecting on the results that design research has produced, **it is complained that generally accepted and effective research methods for testing design theories and models are lacking in design research, and that the discipline is fragmented in separate research strands**" (Vermaas, 2014)

Pourquoi améliorer la validation de nos recherches ?

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- Vision des autres sur notre communauté, compétitions financements (ANR, EU, Industriel...). Mieux montrer que l'on apporte quelque chose de nouveau, démontrer qu'on ne réinvente pas la roue.
- Pouvoir développer des briques validées sur lesquelles s'appuyer pour l'ensemble de la communauté.



Objet d'étude de la communauté S.mart

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Conception, mais pas que... beaucoup d'autres sujets au sein de S.mart

- Méthodes, méthodologies, modèles, outils, algorithmes, heuristiques...
- En conception, production, maintenance...
- dans le but de spécifier, prédire, évaluer un système

Des validations différentes selon l'objet?
Mise en commun de nos bonnes pratiques respectives



Comment ?



15'

Quelques éléments de réponse en conception...



Comment les informaticiens font-ils ?

master 1 branch 6 tags

Go to file Add file Code

7c9f16e on Aug 3 50 commits

hriener Update README.md 2 years ago

arithmetic	Benchmark files.	4 months ago
best_results	Update README.md	2 years ago
random_control	Benchmark files.	2 years ago
LICENSE	Initial commit	8 months ago
README.md	Update README.md	

README.md

The EPFL Combinational Benchmark Suite

The EPFL Combinational Benchmark Suite was introduced in 2015 with the aim of defining a new **comparative standard for the logic optimization and synthesis community**. It originally consisted of 23 combinational circuits designed to challenge modern logic optimization tools. The benchmark suite is divided into arithmetic, random/control and MtM circuits, and each circuit is distributed in Verilog, VHDL, BLIF and AIGER formats.

Logique combinatoire

ICLR Reproducibility Challenge

Second Edition, 2019

Signup Form | Search for Paper claims on Github

Welcome to the 2nd edition of ICLR reproducibility challenge! One of the challenges in machine learning research is to **ensure that published results are reliable and reproducible**. In support of this, the goal of this challenge is to investigate reproducibility of empirical results submitted to the **2019 International Conference on Learning Representations**. We are choosing ICLR for this challenge because the timing is right for course-based participants (see below), and because papers submitted to the conference are automatically made available publicly on **Open Review**.

Reproductibilité en IA

Semantic Textual Similarity Wiki

Welcome to the Semantic Textual Similarity (STS) wiki page.
gonzalezaguirre at gmail).

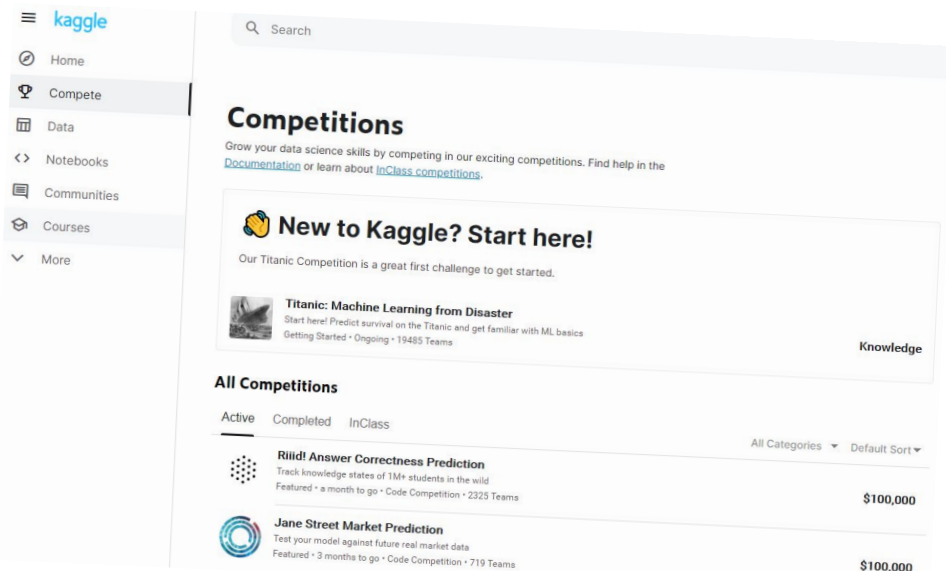
Refer to the datasets below for more information on specific:
Join the low-traffic [mail list](#) for updates on STS.

Contents [hide]

- 1 Semantic Textual Similarity Wiki
- 2 STS benchmark
- 3 Evaluation data
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- 5 Evaluation tasks
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- 9 Contact

Traitement du langage naturel

Comment les volontaires (Geeks ? 😊) font-ils ?



The screenshot shows the Kaggle homepage. On the left is a navigation menu with links: Home, Compete, Data, Notebooks, Communities, Courses, and More. The main content area is titled 'Competitions' and includes a search bar. Below the title, it says 'Grow your data science skills by competing in our exciting competitions. Find help in the [Documentation](#) or learn about [inClass competitions](#).' There is a section 'New to Kaggle? Start here!' with a link to the 'Titanic: Machine Learning from Disaster' competition. At the bottom, there is a table of 'All Competitions' with filters for 'Active', 'Completed', and 'InClass'. The table lists two competitions: 'Riiid! Answer Correctness Prediction' and 'Jane Street Market Prediction', both with a prize of \$100,000.

Competition	Prize
Riiid! Answer Correctness Prediction	\$100,000
Jane Street Market Prediction	\$100,000

Compétitions en Sciences des Données
E.g. [Kaggle](#) & [Challenge Data ENS](#)



The screenshot shows a website titled 'Tous les hackathons'. It lists three hackathons: 'Boost My Op' by Air Liquide and Total, 'Sparkathon' by IBM and Spark, and 'Génération AXA'. Each hackathon entry includes a description, a 'Hackathon en équipe' icon, an 'En attente des sélections' icon, and a 'Voir le hackathon' button.

Hackathon	Description	Team	Status
Boost My Op	Air Liquide et Total vous proposent d'imaginer l'opérateur du futur	Hackathon en équipe	En attente des sélections
Sparkathon	Mettez toute la puissance de Spark et la richesse de vos compétences au service de la connaissance augmentée du client dans le secteur Banque !	Hackathon en équipe	En attente des sélections
Génération AXA	Imagine comment le big data et les objets connectés peuvent améliorer l'assurance AXA pour les jeunes	Hackathon en équipe	En attente des sélections

[Hackathons](#)

Validation en **conception** ?

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Validation en conception ? Les "classiques" ...

Participant 1: This is XXXX again. I don't know how much of it was the format intended or how much was just the leader and spent time going through each of our experiences each week, and that encourage the group to get to know each other and to share their stories a little bit more. I found that really helpful to make it much more of a personal so it wasn't just the meditation exercises but it was much more of a support network she was really good at that.

Facilitator: Great. Okay. Unless there's anything else, we'll go on to the next question. What didn't work so well for you?

Participant 2: The technology I mean, I know it's part of it but ... Even just now, I try to be 20 minutes to early for this and I was 10 minutes late, just finding the email, getting in, getting the passwords to work. It's usually annoying and it was occasionally prohibitive. I know that's sort of the point, I mean, it's better than needing to drive somewhere or something like that but at the same time it's just like, "Oh, I'm at dinner." Because I was doing this while I was pregnant so it's like, we can be out at the bar having dinner with my husband. I still don't have a baby, we can be out at the bar having a nice time, and it's like, "Oh wait, I got to go right now and hustle to get to that thing," and then I go to the thing and it's not happening. That's super disappointing so the technology was sort of a drag.

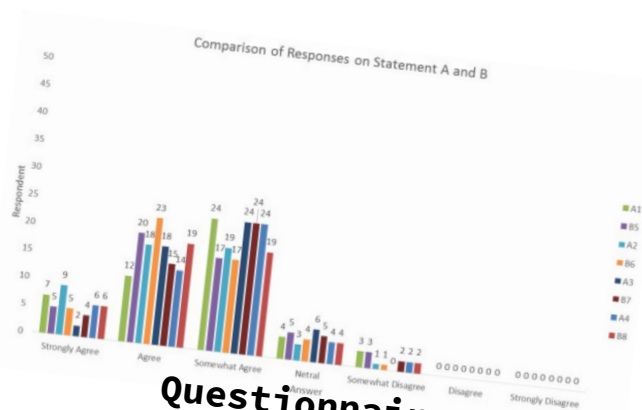
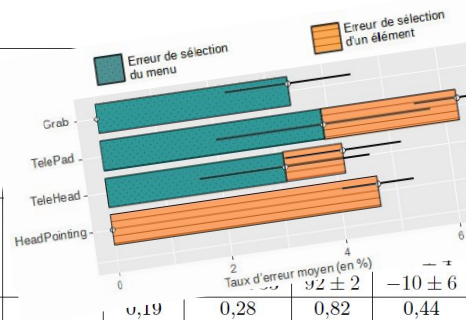
Then the woman who ran ours, I don't remember which person it was, I'm going to be frank, she just seemed like she was phoning it in. I mean, it just seems like "Oh okay, and then there's this breathing thing," and sometimes I don't know what somebody else in my group would think about this similarly but sometimes it's like, "Oh, there's a breathing thing, we're going to walk through it," and other times it's like, "Okay, so there's this breathing thing, you need to see how that would go. Okay, so moving on," often because we get a delayed start because of technology problems and we are catching up and everybody has places to be or sleep to be having and stuff like that. I feel bad saying that but I just felt like it was like going to a workshop where you don't get to try the software, that's how it

Interview coding

Profile	Groups	Conditions	Participants
Experienced	1	control condition = field of view: 106°; framerate: 70 FPS; interactivity device: gamepad; special feedback: minimap modified condition1 = field of view: 32°; framerate: 70 FPS; interactivity device: gamepad; special feedback: minimap	11
Experienced	2	control condition = field of view: 106°; framerate: 70 FPS; interactivity device: gamepad; special feedback: minimap modified condition2 = field of view: 106°; framerate: 30 FPS; interactivity device: gamepad; special feedback: minimap	11
Experienced	3	control condition = field of view: 106°; framerate: 70 FPS; interactivity device: gamepad; special feedback: minimap modified condition3 = field of view: 106°; framerate: 70 FPS; interactivity device: keyboard; special feedback: minimap	11
Experienced	4	control condition = field of view: 106°; framerate: 70 FPS; interactivity device: gamepad; special feedback: minimap modified condition4 = field of view: 106°; framerate: 70 FPS; interactivity device: gamepad; special feedback: no minimap	11
Experienced	5	control condition = field of view: 106°; framerate: 70 FPS; interactivity device: gamepad; special feedback: minimap	19
Non-experienced	6	control condition = field of view: 106°; framerate: 70 FPS; interactivity device: gamepad; special feedback: minimap	53

Expérimentations

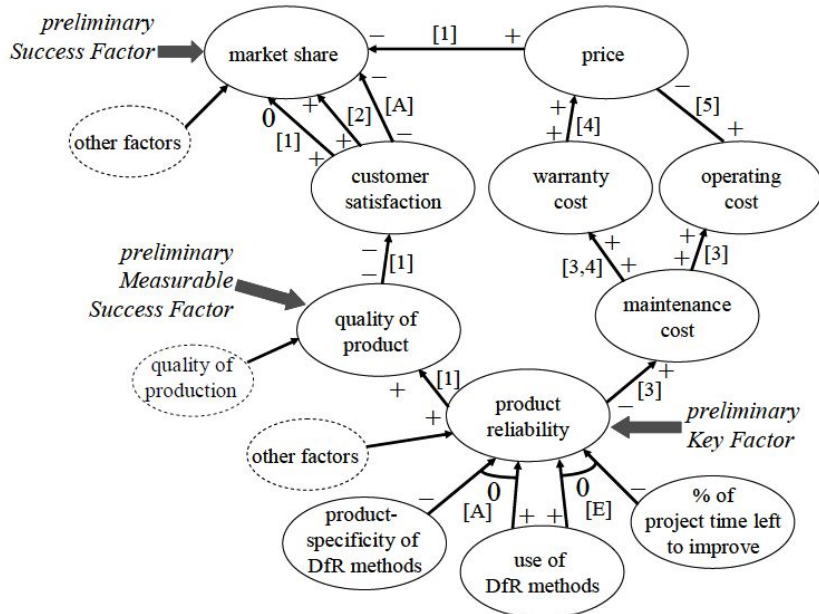
Facteurs		R.	E.P.
		1-7	1-7
Ci	p-val	0,11	0,67
	inactif	0,11	0,67
	actif	0,11	0,67
Cf	p-val	0,52	0,19
	inactif	0,11	0,67
	50%	0,11	0,67
	100%f	0,11	0,67
Ci.Cf	p-val	0,059	0,91



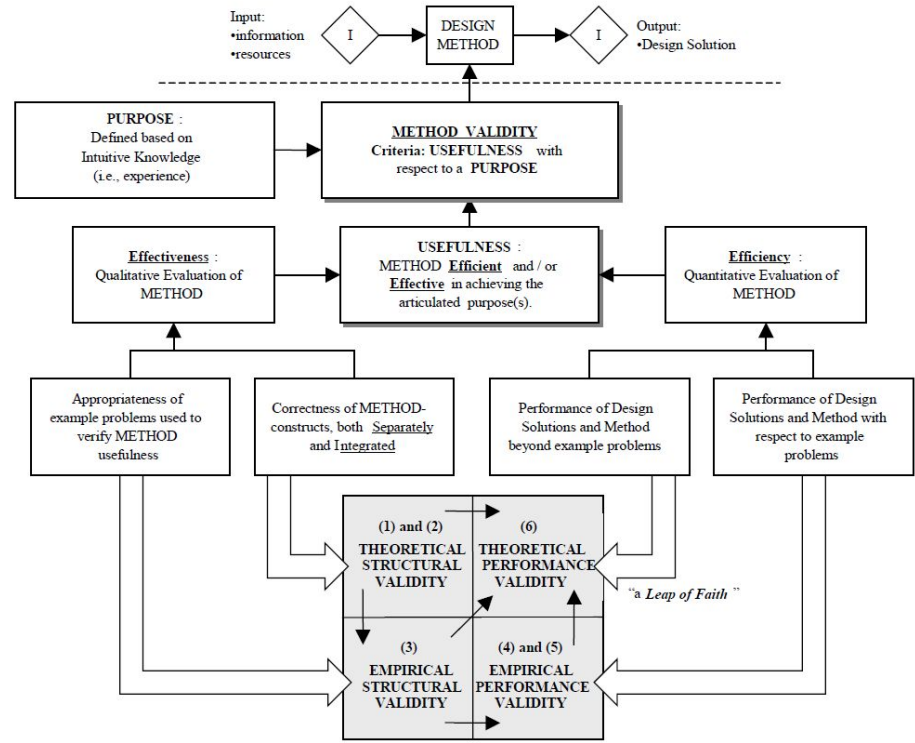
Questionnaires

Statistiques (ANOVA, Wilcoxon...)

Validation en conception ? Méthodes de Recherche...



Validation square [Bailey, R. et al.]



Influence and reference diagrams [Blessing and Chakrabarti, 2009]

Validation en conception ? Cartographie & Métriques...



MBSE Wiki

Trace: · methodology

[Click Here](#) to return to the main MBSE Wiki Page.

Methodology and Metrics

Purpose

The purpose of this MBSE activity in support of the [OMG Systems Engineering DSIG](#) and [INCOSE MBSE Initiative](#) is two fold. First, is to provide the international SE community with a current survey of some of the leading Model-Based Systems Engineering (MBSE) processes and methods used in industry today with specific emphasis on methodology and second, to develop useful *metrics* that can be used on MBSE-related programs and projects; more specifically, *tool metrics* and *process metrics*.

Measure of Success

SE practitioners utilize the information for tailoring one or more of the candidate MBSE methodologies into their own internal MBSE process architecture.

SE practitioners help define requirements for tool metrics and then share case studies how these metrics aided in their work and project reporting structure.

SE practitioners utilize process metrics defined as part of this activity during their MBSE-based programs and projects.

To help measure our success, go to the [MBSE Benchmarking Survey](#) below.

MBSE Benchmarking Survey

To help us collect project metrics relative to your experiences using MBSE please download and complete the following questionnaire [Voluntary MBSE Questionnaire](#) and forward your responses to Jason Kruska at Jason.Kruska-1@nasa.gov. Thank you!

Methodology and Metrics Reference Materials

- Regina M. Gonzales, [ORCA](#) - Completeness of Conceptual Models Developed using the ISCM Development Process

[OMG MBSE Wiki](#)

Validation en conception ? Cas Tests...

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Landing gear system

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Abstract. This document presents the landing system of an aircraft. It describes the system and provides some of its requirements. We propose this case study as a benchmark for techniques and tools dedicated to the verification of behavioral properties of systems.

1 Introduction

This document presents a landing system. It describes the system and provides some of its requirements. We propose this case study as a benchmark for techniques and tools dedicated to the verification of behavioral properties of systems.

The landing system is in charge of maneuvering landing gears and associated doors. The landing system is composed of 3 landing sets: front, left and right. Each landing set contains a door, a landing-gear and associated hydraulic cylinders. A simplified schema of a landing set is presented in Figure 1.

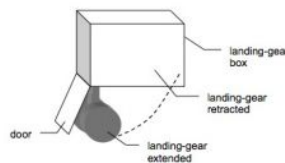


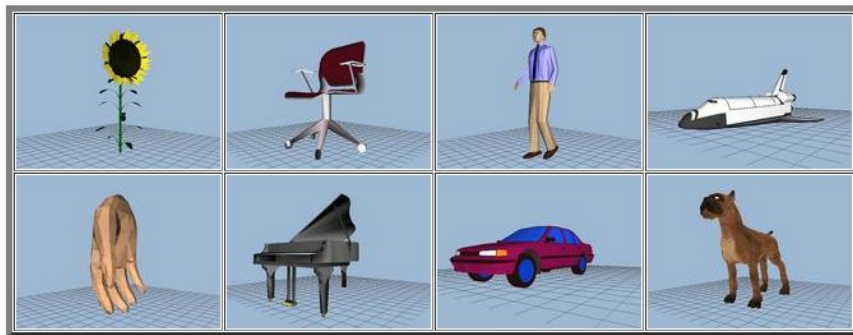
Fig. 1. Landing set

https://www.irit.fr/ABZ2014/landing_system.pdf

Validation en conception ? Données et Métriques...



The Princeton Shape Benchmark provides a repository of 3D models and software tools for evaluating shape-based retrieval and analysis algorithms. The motivation is to promote the use of standardized data sets and evaluation methods for research in matching, classification, clustering, and recognition of 3D models. Researchers are encouraged to use these resources to produce comparisons of competing algorithms in future publications.



3D Models

The benchmark contains a database of 3D polygonal models collected from the World Wide Web. For each 3D model, there is an [Object File Format \(.off\) file](#) with the polygonal geometry of the model, a [model information](#) file (e.g., the URL from where it came), and a JPEG image file with a thumbnail view of the model. Version 1 of the benchmark contains 1,814 models.

Validation en conception ? Compétitions...

PURDUE
UNIVERSITY

CDI
Computational Design and Innovation



Shape Retrieval Contest for CAD models 2008

Evaluations released [HERE](#)

Welcome to the Engineering track of [Shape Retrieval Contest 2008](#) (SHREC). We are excited to announce a dedicated track for CAD models in this year's SHREC and we would like to thank Dr. Remco Veltkamp for this opportunity. Please find below the details on how to participate in this track and we'll keep updating this page as details regarding this track evolve. If you have any questions or comments please don't hesitate to email us - shrec [at] purdue [dot] edu.

Why a CAD models track?

Engineering parts typically have high genus, rounding features (fillets, chamfers), presence of internal structure. They are closed watertight volumes. Engineering models can be parts or assemblies. A part is an atomic unit and many parts are assembled to make an assembly. For example a wheel can be a part where as a bike is an assembly. Moreover the engineering context is unique where in part families and parametric models, i.e. models differ by relative dimensions of various local geometries, are common. So this track focuses on engineering parts and the search tasks in an engineering context.

The Dataset

The engineering track uses the Purdue Engineering Shape Benchmark (ESB) [[Javanti et al. 2006](#)]. This established database consists of closed triangulated meshes of CAD parts in vendor neutral formats (.stl & .obj). The models are arranged into a file system with each folder representing a class of parts. This dataset is classified into a ground truth classification which has two levels of hierarchy. Overall there are three super-classes with sub-classes under them. This classification can be browsed at <http://purdue.edu/shapelab>. Please [register](#) to download the SHREC version of the database (~66MB).

To Participate

Please [REGISTER HERE](#) and download the dataset for this contest.

Contest Evaluation

A query set consisting of models that are not present in the ESB will be released. These models will be similar to the models in the ESB and will include parametric versions of randomly selected models from the database. Each participant is expected to submit results for tasks based on overall similarity and partial similarity. Submissions will then be measured using various performance criteria. Please refer [last year's evaluations](#) for a list of possible criteria.

Timeline

- **Benchmark Dataset:** [available](#) | Please [register](#) to download
- **Query Dataset:** [RELEASED](#) | [Proceed to download >>](#)
- **Results Submission:** [Deadline](#) Not later than March 17, 2008 11:59 pm UTC. Participants should also submit a two page summary. [Click here](#) for templates.
- [Final evaluations released](#)

*"The general objective of the **3D Shape Retrieval Contest** is to evaluate the effectiveness of **3D-shape retrieval algorithms**. SHREC2021 is the sixteenth edition of the contest. Like previous years, it is organized in conjunction with the **Eurographics 2021 Workshop** on 3D Object Retrieval. At least one author per track must register for the workshop, and present the results. We also cordially invite all participants of a track to register and attend the workshop."*

<https://www.shrec.net/>

<https://engineering.purdue.edu/PRECISE/shrec08>

Ce que j'en pense...

— — —

Comparer nos méthodes? “*Mué, c'est toujours (très) subjectif...!!!*” est une formule un peu trop définitive...

Oui, les méthodes d'ingénierie ont une dimension subjective puisqu'elles sont déroulées par des personnes et que l'habileté et les connaissances de ces personnes a un effet sur la qualité du résultat et sur la longueur du chemin (on peut toujours se fourvoyer sur les buts à atteindre et sur les moyens à employer pour les atteindre) mais toutes les méthodes de conception ne se valent pas.

Si on s'accorde sur le fait que les méthodes de conception sont supposées indiquer le chemin à suivre pour:

1. Définir les buts à atteindre (spécification)
2. S'assurer que les buts définis sont les bons (validation)
3. Définir les moyens permettant d'atteindre les buts définis (conception)
4. Vérifier que les moyens mis en oeuvre permettent d'atteindre les buts visés (vérification)

Alors on peut donc procéder à une double validation:

1. Conceptuelle : la méthode répond-elle aux 4 points précédents et comment?
2. Pratique : on l'essaye sur des cas d'études

*Bien sûr ça ne se fait pas en 1 jour et ça rentre en conflit avec l'impatience de nos modes de travail (qui voudraient que tout soit résolu, avant même d'avoir commencé à identifier le problème à résoudre). On peut néanmoins objectiver les choses et construire des benchmarks (conceptuels et expérimentaux) pour comparer des approches méthodologiques. **On ne pourra pas dire que ces benchis sont totalement dépourvus de biais subjectifs, mais c'est mieux que de s'adonner aux incantations magiques et invérifiables.***

Et vous, qu'en pensez-vous ?



*Actions à suivre :
acteur ou observateur ?*



Bibliographie

Barth, A., Caillaud, E., et Rose, B. (2011) “How to validate research in engineering design?”. ICED 2011

Caillaud, E., Rose, B. et Goepp, V. (2015) “Comment valider les recherches en génie industriel et en ingénierie système?”. CIGI 2015

Blessing, L.T.M, Chakrabarti, A. (2009) “DRM, a design research methodology”. Springer

Vermaas, P.E. (2014) “Design theories, models and their testing: on the scientific status of design research”.

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