International Journal of Electrical, Electronics and Mechanical Controls

ISSN (Online) : 2319-7501

Volume 4 Issue 2 May 2015

Manuscript ID : ISSN23197501-V4I2M20-052015

FASTER IMPLEMENTATION OF ENGINEERING DESIGN MODIFICATION

Satbeer Singh
Department of Mechanical Engineering
Shree Siddhivinayak Group of Institutions
Shahpur-Bilaspur, Distt. Yamuna Nagar

Arvind Singh
Department of Mechanical Engineering
Shree Siddhivinayak Group of Institutions
Shahpur-Bilaspur, Distt. Yamuna Nagar

ABSTRACT

The designing configuration process or plotting setup technique is a definite blueprint of steps that originators use in making down to earth things and frameworks. The strides have a tendency to get verbalized, subdivided, and/or addresses in a mix of grouped ways but then regardless, they by and large mirror sure inside standards concerning the covered musings and their particular movement and interrelationship. In the expansion perspectives the proposed methodology is amazingly iterative - i.e. parts of the technique as a rule should be rehashed for the most part before generation of a thing can start - however the part(s) that get iterated and the measure of such cycles in any given try can be especially variable. Building up design necessities is a champion amongst the most basic portions in the outline approach, and this assignment is ordinarily performed in the interim as the probability examination. The outline necessities control the game plan of the try all through the building system process. Some course of action necessities merge equipment and programming parameters, sound judgment, testability and openness. The inception and additionally arranging and contraption diagram is simply planning how to mass-make the try and which mechanical gatherings ought to be utilized as a bit of the hoarding of the part. Assignments to finish in this stride join selecting the material, determination of the creation shapes, determination of the movement of operations, and choice of mechanical gatherings, for occurrence, moves, tooling and foundation. This errand in like way consolidates testing a working model to guarantee the made part meets capacity gages. In the proposed exploration work, a metaheuristic methodology reenacted strengthening should be utilized. SA is one of the unmistakable metaheuristic methodologies that are utilized for procedure improvement

Keywords – Engineering Design Modification, Optimization, Global Optima in Engineering

INTRODUCTION

Designing configuration is one of the procedures ordinarily connected with the whole business or undertaking, from receipt of the request or item thought, to support of the item, and all stages in the middle. A designing configuration includes both a procedure and an item. A procedure is a progression of constant activities finishing in a specific result. An item is anything delivered as an aftereffect of some procedure. Design is an amazingly critical piece of the building configuration process, which utilizes illustrations as an apparatus to envision conceivable arrangements and to report the outline for interchanges purposes.

Customary designing configuration is a straight approach partitioned into various steps. Case in point, a six-stage procedure may be partitioned into: issue ID, preparatory thoughts, refinement, investigation, documentation, and execution. The outline procedure travels through every progression in a successive way; then again, if issues are experienced, the procedure may come back to a past step. This monotonous activity is called emphasis or circling.

Simultaneous building is a nonlinear group way to deal with outline that unites the data, procedures, and yield components important to create an item.

The simultaneous designing model shows how every territory in an undertaking is connected, and the CAD database is the ongoing concept of data between every region.

The building configuration procedure comprises of three covering zones: ideation, refinement, and usage which all have the same CAD database.

Synergistic designing has advanced from simultaneous building into a genuine venture wide incorporated item advancement process. It makes an authoritative situation where groups can viably work together with shared item data databases. Community building is in view of engaged, cross-practical groups and low-level choice making.

LITERATURE REVIEW

Bingham, G., Southee, D., & Page, T. (2013) - This paper examines the traditional engineering-based provision delivered to Product Design and Technology (BSc) undergraduates at the Loughborough Design School and questions it relevancy against the increasing expectations of industry. The paper reviews final year design project to understand the transference of engineering-based knowledge into design practice and highlights areas of opportunity for improved teaching and learning. The paper discusses the development and implementation of an integrated approach to the teaching of Mechanics and Electronics that formalises and reinforces the key learning process of transference within the design context. The paper concludes with observations from the delivery of this integrated teaching and offers insights from student and academic perspectives for the further improvement of engineering-based teaching and learning in a design context.

A rock classification to meet the requirements of rock mechanics is concerned with both the rock as a material and the rock in the mass. In particular an essential ingredient is information on physical and mechanical properties, and parameters of use in engineering design. After a review of the development of ideas in classification and characterization, in which the need for cheap index tests to supplement expensive and elaborate engineering design tests as a means of characterizing large areas for design purposes, work carried out on all these aspects in the United Kingdom is discussed.

Acknowledgement of the significance of geological processes in determining how rock masses achieved their present condition highlights the importance of understanding all aspects of the geology of a particular engineering site as a prerequisite of engineering-geological classification and characterization of rock. The engineering-geological approach has high powers of discrimination, and is invaluable in the relatively inexpensive assessment of rock-mass properties of large areas and volumes of *in situ* rock.

After briefly reviewing early work, a geological classification of rock material simple enough for engineering application, but nonetheless comprehensive, is given. The classification table may be used as an aid to identification with minimal geological knowledge. Provision of a rock name, combined with selected quantified descriptive terms and engineering properties is proposed as a basis for the engineering-geological description of *in situ* rock and rock material.

Examples are given of the application of engineering-geological characterization of rock in British engineering practice and research.

Fung, C. K., Kwong, C. K., Chan, K. Y., & Jiang, H. (2014). A guided search genetic algorithm using mined rules for optimal affective product design. *Engineering Optimization*, *46*(8), 1094-1108 - Affective design is an important aspect of new product development, especially for consumer products, to achieve a competitive edge in the marketplace. It can help companies to develop new products that can better satisfy the emotional needs of customers. However, product designers usually encounter difficulties in determining the optimal settings of the design attributes for affective design. In this article, a novel guided search genetic algorithm (GA) approach is proposed to determine the optimal design attribute settings for affective design. The optimization model formulated based on the proposed approach applied constraints and guided search operators, which were formulated based on mined rules, to guide the GA search and to achieve desirable solutions. A case study on the affective design of mobile phones was conducted to illustrate the proposed approach and validate its effectiveness. Validation tests were conducted, and the results show that the guided search GA approach outperforms the GA approach without the guided search strategy in terms of GA

convergence and computational time. In addition, the guided search optimization model is capable of improving GA to generate good solutions for affective design.

Safari, R., Huang, J., Mutlu, U., & Glanville, J. (2014, August). 3D Analysis and Engineering Design of Pulsed Fracturing in Shale Gas Reservoirs. In *48th US Rock Mechanics/Geomechanics Symposium*. American Rock Mechanics Association - Ability to induce complex, highly connected fracture networks, that can remain open during production, is the key to unlock permeability challenged shale gas plays. Within the time and pressure scale of hydraulic fracturing operations, it is difficult to create fracture complexity in ductile shales. However, when subjected to a high rate/pulse loading, rock might exhibit a brittle to ductile transition and a complex fracture network might be created. Along these lines, the concept of pulsed fracturing, that customizes the pressure-time behavior of a pulse source to create multiple fractures, is introduced. In this paper, an integrated 3D model that quantifies fracture initiation, growth, and coalescence due to initial and post-peak pulse loading is presented. The simulation involves a numerical algorithm that couples tensile/shear/compactive failure algorithms with dynamic fracture propagation and pore fluid pressure. Geomechanical modeling approach makes it possible to optimize pulsed fracturing for different shale plays. After constitutive model description and presentation of key aspects of the model, the model is employed to a reservoir dataset to evaluate pulsed fracturing as an alternative fracturing technique. The results show that, if designed accurately, pulsed fracturing could help trigger a ductile to brittle transition and can generate complex fracture networks.

Arastoopour, G., Chesler, N. C., & Shaffer, D. W. (2014). Epistemic persistence: A simulation-based approach to increasing participation of women in engineering. *Journal of Women and Minorities in Science and Engineering*, *20*(3) - Educational institutions

have historically struggled with retaining women in engineering. A significant drop occurs in the first year of undergraduate studies. In response, some universities have modified first-year curricula to include more teamwork and collaboration. Using epistemic frame theory, we hypothesize that more women would remain in the field if they had authentic experiences of the engineering profession early in their undergraduate career. To test this hypothesis, we designed and implemented an epistemic game, Nephrotex, in which students engage in authentic engineering design in teams. We collected two sources of data from students in Nephrotex (experimental condition): (1) students' pre- and post-survey responses about attitudes toward engineering and (2) students' online discourse. We collected pre- and post-surveys from the comparison group (control condition), students who participated in a non-design-based introductory engineering course in which they researched global engineering problems and solutions in teams. We conducted a principal components analysis on the survey data and an epistemic network analysis on the discourse data. Our controlled study suggests that (1) women in the experimental condition had a greater increase in confidence in and commitment to engineering than women in the control condition, and (2) students in the experimental condition who focused mostly on engineering design instead of collaboration were more committed to engineering. While the sample sizes are not large for this experiment and the gender distribution is not equal between groups (experimental, 63 female 75 male; control, 35 female 95 male), our results suggest that an authentic engineering simulation can increase women's motivation to persist in engineering. Interestingly, this was not the finding for men. Of the male and female students who participated in Nephrotex, those who focused on engineering design talk in collaborative discussions reported that they were more committed and confident afterward, suggesting that design is a motivating element in authentic engineering simulations for both men and women.

International Journal of Electrical, Electronics and Mechanical Controls

ISSN (Online) : 2319-7501

Volume 4 Issue 2 May 2015

Manuscript ID : ISSN23197501-V4I2M20-052015

The engineering design process is a methodical series of steps that engineers use in creating functional products and processes. The process is highly iterative - parts of the process often need to be repeated many times before production phase can be entered - though the part(s) that get iterated and the number of such cycles in any given project can be highly variable. It is a decision making process (often iterative) in which the basic sciences, mathematics, and engineering sciences are applied to convert resources optimally to meet a stated objective. Among the fundamental elements of the design process are the establishment of objectives and criteria, synthesis, analysis, construction, testing and evaluation

—ABET

PROBLEM FORMULATION

The engineering design process is one of the rigorous tasks for upcoming manufacturing / production as well as quality phases. If the task is handled with utmost importance, the upcoming issues can be resolved very easily without any complexity and overhead.

METHODOLOGY

Capable and impeccable response for the combinatorial change issues in various streams have been a district of investigation from long time. Outlining, Industrial, Economical and Scientific issues, for instance, Transportation, Bioinformatics, Logistics, Scheduling, Timetabling, Vehicle Routing, Resource Allocation and various other are taken care of with distinctive philosophies, for instance, Simulated Annealing, Tabu Search, Genetic Algorithms, Ant Colony Optimization, Harmony Search, Scatter Search or Iterated Local Search. These systems alluded to as metaheuristics presents itself as extremely reassuring choice for practically perfect courses of action in sensible time where watchful techniques are not material due to amazingly colossal running times or diverse confinements. Metaheuristic is an inconceivable system that helpers and changes distinctive heuristics to make courses of action past those that are conventionally created in a trip for adjacent optimality. This work highlights the viability of a metaheuristic philosophy, Simulated Annealing, which is being used by the examiners now days in a couple Engineering, Scientific, Business and Industrial applications.

Metaheuristics are used to handle Combinatorial Optimization Problems, like Bin Packing, Network Routing, Network Design, Assignment Problem, Scheduling, or Time-Tabling Problems, Continuous Parameter Optimization Problems, or Optimization of Non-Linear Structures like Neural Networks or Tree Structures as they consistently appear in Computational Intelligence.

Metaheuristics are generally associated with issues for which there is no alluring issue specific count or heuristic; or when it is not practical to complete such a procedure. Most frequently used Metaheuristics are focused to combinatorial change issues, however plainly can manage any issue that can be recast in that edge, for instance, lighting up Boolean examinations.

Heuristic implies "find". A Heuristic is used when

1. Exact framework are not on any help, due to execution time
2. There are slips by in information data or is conflicting
3. Improvement in the execution of cautious methods is required
4. There is need of an answer after a confined time of time.
5. We need to pick between keeping an eye on a more sensible model and give an inferred course of action instead of a less demanding, unlikely model that we can exhibit that can grasp to optimality.

There is need of good starting stages for an exact framework.

- In various cases, union is all things considered guaranteed

International Journal of Electrical, Electronics and Mechanical Controls

ISSN (Online) : 2319-7501

Volume 4 Issue 2 May 2015

Manuscript ID : ISSN23197501-V4I2M20-052015

- Optimality may be achieved yet it is not illustrated
- In various cases, they will in all likelihood be not able to deliver an achievable game plan.

RESULTS

– Solution space

– Cost capacity

- Determines how "great" a specific arrangement is
  - – Perturbation rules (Changing an answer for another one)
  - – Simulated Annealing motor
- A variable T, comparable to temperature
- An starting temperature (T0 = 40,000)
- A solidifying temperature ($Temp_{freezing}$ = 0.1)
- A cooling timetable (T = 0.95 * T)

Another variation of Simulated Annealing additionally exists with the name Adaptive mimicked tempering (ASA), in which the calculation parameters that control temperature timetable and irregular step choice are consequently balanced with the progression of calculation. It makes the calculation more proficient and less delicate to client characterized parameters than accepted Si

initialize h
$ctr \leftarrow 0$
$T \leftarrow T_0$
while $T > T_{min}$
for $ctr \leftarrow 1$ to ctr_{max}
$h' \leftarrow h$
for each kinetic parameter p of h'
$p \leftarrow p + k \cdot \ln(\sqrt{E} + 1) \cdot \mathrm{N}(\bar{x}, \sigma)$
$\Delta E \leftarrow$ Error(h') - Error(h)
if $\Delta E \leq 0$
$h \leftarrow h'$
else
$h \leftarrow h'$ with probability $e^{\frac{-\Delta E}{T}}$
end for
lower T
end while

Table 1 – Classical and Improved Approach

Existing Base Work	Proposed Approach
50	70

International Journal of Electrical, Electronics and Mechanical Controls

ISSN (Online) : 2319-7501

Volume 4 Issue 2 May 2015

Manuscript ID : ISSN23197501-V4I2M20-052015

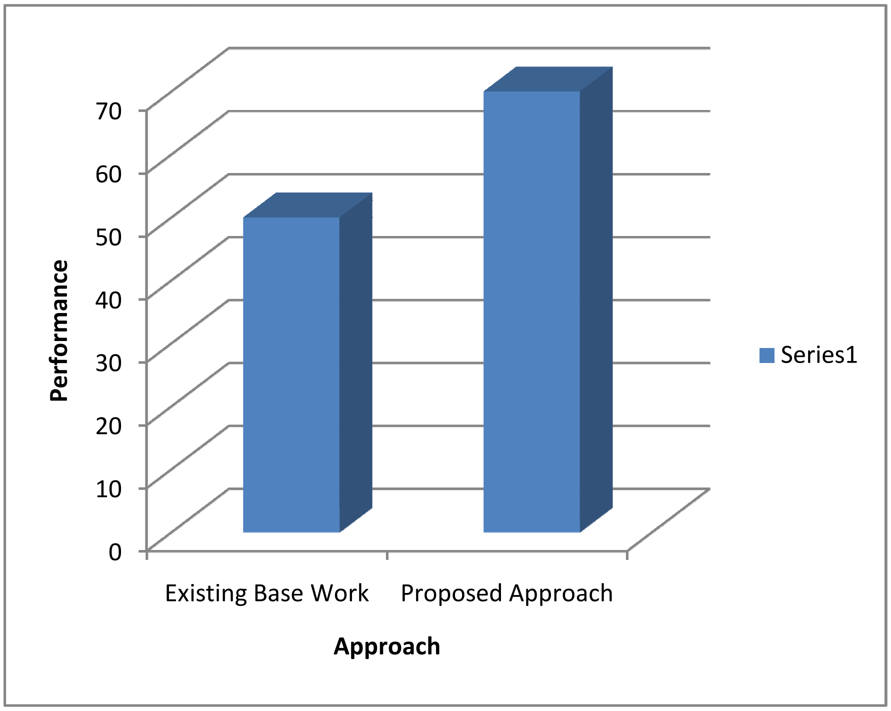

Figure 2 – Classical and Proposed approach

Table 2 - Classical and Improved Approach

Existing Base Work	Proposed Approach
90	60

International Journal of Electrical, Electronics and Mechanical Controls

ISSN (Online) : 2319-7501

Volume 4 Issue 2 May 2015

Manuscript ID : ISSN23197501-V4I2M20-052015

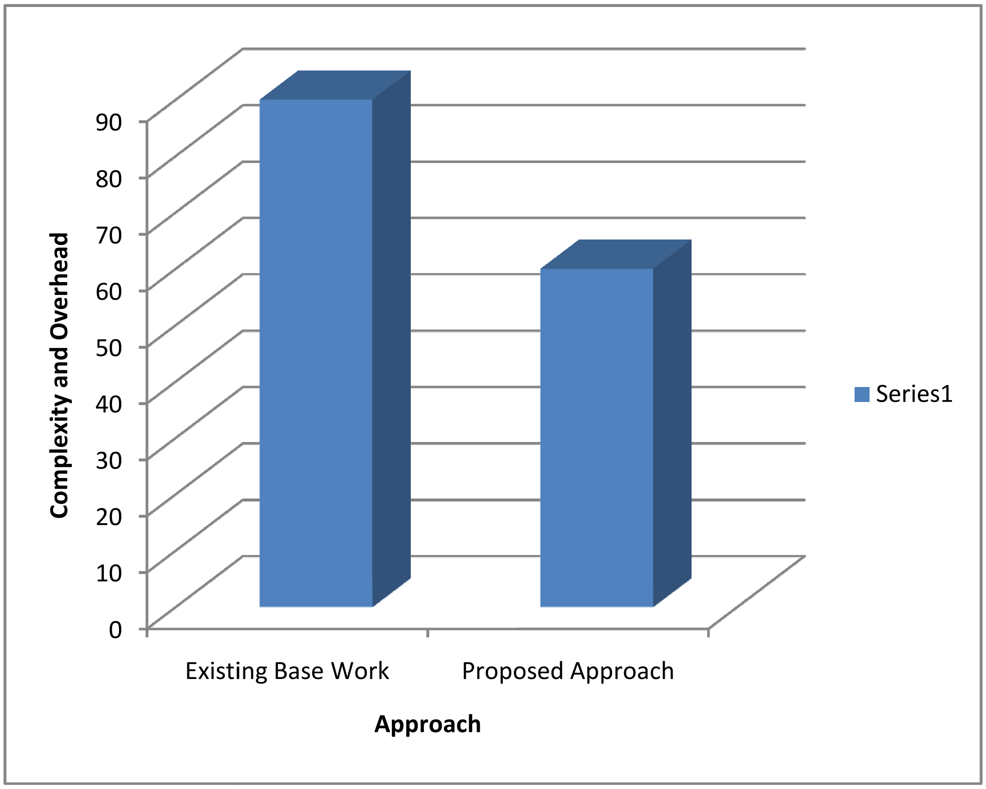

Figure 3 – Comparison of Classical and Proposed approach

Table 3 – Difference between Classical and Improved Approach

Existing Base Work (Overall Effectiveness)	Proposed Approach (Overall Effectiveness)
50	60
60	88
70	89
50	69

International Journal of Electrical, Electronics and Mechanical Controls

ISSN (Online) : 2319-7501

Volume 4 Issue 2 May 2015

Manuscript ID : ISSN23197501-V4I2M20-052015

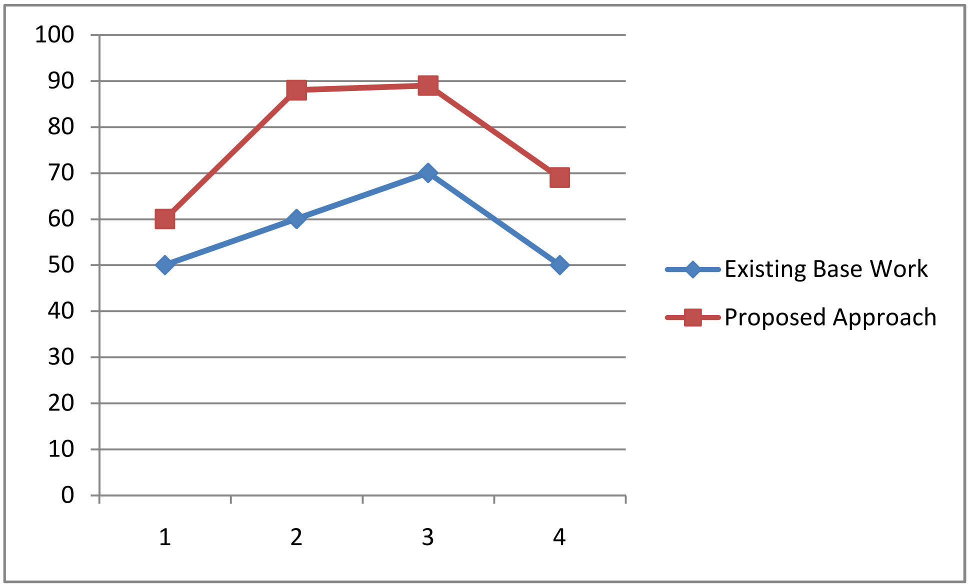

Figure 4 – Effective Comparison of Classical and Proposed Algorithm

CONCLUSION AND FUTURE SCOPE

The present frameworks for building design conformities are not beneficial and should be taken care of using specific estimations of metaheuristic methods. Metaheuristics are used to deal with Combinatorial Optimization Problems, like Bin Packing, Network Routing, Network Design, Assignment Problem, Scheduling, or Industrial Manufacturing Problems, Continuous Parameter Optimization Problems, or Optimization of Non-Linear Structures like Neural Networks or Tree Structures as they routinely appear in Computational Intelligence.

Metaheuristics are generally joined with issues for which there is no satisfactory issue specific count or heuristic; or when it is not helpful to execute such a framework. Most by and large used Metaheuristics are focused to combinatorial improvement issues, however unmistakably can manage any issue that can be recast in that casing, for instance, understanding Boolean correlations.

Reproduced Annealing is normally said to be the most prepared among the metaheuristics and certainly one of the first estimations that had an unequivocal methodology to stay far from neighborhood minima. The pivotal believed is to allow moves realizing courses of action of more unfortunate quality than the present plan (extreme moves) remembering the final objective to escape from close-by minima. The probability of doing such a move is reduced in the midst of the interest.

An extensive measure of movements are being looked for after by the pros in finding exact responses for the combinatorial streamlining issues using methodology, for instance, entire number programming, component programming, cutting planes, and branch and cut systems. Still there are various hard combinatorial issues which are unsolved and needs incredible heuristic schedules. The game plans got as "Perfect Solutions" is all around are not as indicated by the necessities. The target and focus of using a metaheuristics system is to convey beneficial courses of action.

The metaheuristics, for instance, Simulated Annealing is a champion amongst the most standard approaches to manage examine in the field of streamlining and it will pass on supernatural occurrence to the universe of estimations in future.For future scope of the work, following techniques can be used in hybrid approach to better and efficient results

- Particle Swarm Optimization
- HoneyBee Algorithm
- Simulated Annealing
- Genetic Algorithmic Approaches

International Journal of Electrical, Electronics and Mechanical Controls

ISSN (Online) : 2319-7501

Volume 4 Issue 2 May 2015

Manuscript ID : ISSN23197501-V4I2M20-052015

REFERENCES

[1] Chan, J., & Schunn, C. (2015). The impact of analogies on creative concept generation: lessons from an in vivo study in engineering design. *Cognitive science*, *39*(1), 126-155.

[2] Jahan, A., & Edwards, K. L. (2015). A state-of-the-art survey on the influence of normalization techniques in ranking: Improving the materials selection process in engineering design. *Materials & Design*, *65*, 335-342.

[3] Asimakopoulou, E. K., Kolaitis, D. I., & Founti, M. A. (2015, June). Evaluation of fire engineering design correlations for Externally venting Flames using a medium-scale compartment-façade fire experiment. In *9th Mediterranean Combustion Symposium, Rhodes, Greece* (pp. 7-11).

[4] Xia, Y. Q., & Zhang, J. (2015, January). Reverse Engineering Design of Vehicle Rear Axle Based on CATIA. In *Applied Mechanics and Materials* (Vol. 697, pp. 298-301).

[5] Meen, T. H., Prior, S. D., Hsu, K. S., & Lam, A. D. K. T. (2015). Mathematical and Computational Topics in Design Studies. *Mathematical Problems in Engineering*, *501*, 296029.

[6] Fenton, C., & Kernohan, J. (2015). Characterisation of Surface Fault Rupture for Civil Engineering Design. In *Engineering Geology for Society and Territory-Volume 5* (pp. 1003-1008). Springer International Publishing.

[7] Tripathi, A., Sharma, T. K., & Singh, V. (2015). Bespoke Shuffled Frog Leaping Algorithm and its Engineering Applications.

[8] Scott, M. A., Hughes, T. J. R., Sederberg, T. W., & Sederberg, M. T. (2014). An integrated approach to engineering design and analysis using the Autodesk T-spline plugin for Rhino3d. ICES REPORT 14–33. *The Institute for Computational Engineering and Sciences, The University of Texas at Austin*.

[9] Ma, J., Martin, K. H., Dayton, P. A., & Jiang, X. (2014). A preliminary engineering design of intravascular dual-frequency transducers for contrast-enhanced acoustic angiography and molecular imaging. *Ultrasonics, Ferroelectrics and Frequency Control, IEEE Transactions on*, *61*(5), 870-880.

[10] Jonathan, P., Ewans, K., & Flynn, J. (2014). On the estimation of ocean engineering design contours. *Journal of Offshore Mechanics and Arctic Engineering*, *136*(4), 041101.

[11] Tee, T. W., Chowdhury, A., Maranas, C. D., & Shanks, J. V. (2014). Systems metabolic engineering design: Fatty acid production as an emerging case study. *Biotechnology and bioengineering*, *111*(5), 849-857.

[12] Ma, J., Martin, K. H., Dayton, P., & Jiang, X. (2014). A preliminary engineering design of intravascular dual-frequency transducers for contrast-enhanced acoustic angiography and molecular imaging. *Ultrasonics, Ferroelectrics, and Frequency Control, IEEE Transactions on*, *61*(5), 870-880.

[13] Ashby, M. F., & Jones, D. R. H. (2014). *Engineering materials 2: an introduction to microstructures, processing and design*. Elsevier.

[14] Pahl, G., & Beitz, W. (2013). *Engineering design: a systematic approach*. Springer Science & Business Media.

[15] Bingham, G., Southee, D., & Page, T. (2013). An integrated approach for the teaching of mechanics and electronics in a design context. In *DS 76: Proceedings of E&PDE 2013, the 15th International Conference on Engineering and Product Design Education, Dublin, Ireland, 05-06.09. 2013*.

[16] Deb, K. (2012). *Optimization for engineering design: Algorithms and examples*. PHI Learning Pvt. Ltd..

[17] Hubka, V., & Eder, W. E. (2012). *Theory of technical systems: a total concept theory for engineering design*. Springer Science & Business Media.

[18] Hubka, V., & Eder, W. E. (2012). *Design science: introduction to the needs, scope and organization of engineering design knowledge*. Springer Science & Business Media.

[19] Buede, D. M. (2011). *The engineering design of systems: models and methods* (Vol. 55). John Wiley & Sons.

[20] Kashan, A. H. (2011). An efficient algorithm for constrained global optimization and application to mechanical engineering design: League championship algorithm (LCA). *Computer-Aided Design*, *43*(12), 1769-1792.

[21] dos Santos Coelho, L. (2010). Gaussian quantum-behaved particle swarm optimization approaches for constrained engineering design problems. *Expert Systems with Applications*, *37*(2), 1676-1683.

[22] Linsey, J. S., Tseng, I., Fu, K., Cagan, J., Wood, K. L., & Schunn, C. (2010). A study of design fixation, its mitigation and perception in engineering design faculty. *Journal of Mechanical Design*, *132*(4), 041003.

[23] Sinnott, R. K. (2009). *Chemical engineering design: SI Edition*. Elsevier.

[24] Improving Simulated Annealing-based FPGA placement with directed moves, K. Vorwerk, A. Kennings, J. W. Greene IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems, Volume 28, Issue 2, pp. 179-192, February 2009