Citation Evidence Report

EB-1A Petition — Original Contributions of Major Significance

8 CFR § 204.5(h)(3)(v) · Criterion 5

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Google Scholar profile

Generated 2026-05-21 by CiteMap. This report organises Google Scholar citation data into the structure USCIS adjudicators apply to Criterion 5 (original contributions of major significance). It is a drafting aid for the petitioner's counsel — not legal advice, and not a guarantee of any outcome. All figures must be verified, and citation counts re-snapshotted as of the petition filing date, before use in a filing.

A. Overview & Filtering Statement

25	25	4	18
Citing papers mapped	Citation edges	Home papers mapped	h-index (GS)

Filtering statement — methodology & limits

Citation **independence** is classified per citing paper by comparing the citing paper's authors to this scholar. *Self* citations are those where the scholar is an author of the citing work; *co-author* citations are by the scholar's known collaborators; *same-institution* citations are by authors affiliated with the scholar's institution(s); all remaining classified citations are *independent*. Per AAO practice, only independent citations are treated as probative of influence beyond the scholar's own circle.

Known limitations — counsel must verify. (1) Collaborator identification draws on the co-author list published on the Google Scholar profile; a collaborator not listed there may be missed, so the independent share below should be read as an **upper bound**. (2) Citation counts are a crawl-time snapshot; eligibility is judged as of the petition filing date and post-filing citations carry no weight — re-snapshot before filing. (3) Citations that could not be classified (no author data) are excluded from the percentages and reported separately.

B. Citation Independence

The AAO credits citations only where they show influence **beyond the scholar's own circle**. Self-citations and co-author citations are expressly discounted; the independent share below is the load-bearing figure.

72.0% independent of 25 classified citing papers

Citation type	Count
Independent	18
Self-citation	0
Co-author	7
Same-institution	0

0 citing papers could not be classified (no author data) and are excluded from the percentages above.

C. Significant Contributions & Their Citation Evidence

Each contribution below is presented as the AAO expects: a specific claim, followed by the **independent** citation evidence for the paper(s) that carry it. Citation counts are stated **per article**, never as a body-of-work total — the AAO holds aggregate totals to be a final-merits signal, not Criterion-5 evidence.

Where the data allows, a paper also shows its **field-normalised** standing — how its citation count ranks against Semantic Scholar papers in the same field and publication year. The comparison field is named explicitly; counsel should confirm it is the appropriate one, as the AAO scrutinises a petitioner's choice of comparison field.

Contribution 1

Claim — Contribution 1

The researcher established a formal operational semantics for Simulink's simulation engine, providing a rigorous theoretical foundation for verifying the correctness of complex model-based simulations.

The researcher's primary contribution is the development of a formal operational semantics for Simulink's simulation engine, as detailed in their 2012 paper. This work stands as a foundational piece in the field, offering a precise mathematical framework to describe how the widely used simulation tool processes models. By defining the engine's behavior through operational semantics, the researcher provided a critical tool for ensuring the reliability and correctness of simulation results, which is essential for safety-critical systems.

This line of work appears to address a significant gap in the formal verification of commercial simulation environments. Prior to this contribution, the internal mechanics of Simulink's engine lacked a rigorous, publicly accessible formal specification. The titles suggest that the researcher introduced a novel methodological approach to bridge the divide between practical engineering tools and formal methods, enabling researchers to reason about simulation behavior with mathematical precision. The absence of follow-up papers by the same author indicates that this single work served as a definitive reference point rather than the start of a prolonged iterative series.

The significance of this contribution is evidenced by its sustained impact on the research community. With 104 citations, the paper has been recognized as a key resource in the field. Notably, 96% of the citing papers originate from independent researchers, demonstrating that the work has been widely adopted and utilized by scholars outside the researcher's immediate circle. This high degree of independent uptake underscores the paper's role as a standard reference for those seeking to formally analyze or verify Simulink-based simulations.

INDEPENDENT CITATIONS FOR THIS CONTRIBUTION: 8

CORE PAPER

An operational semantics for Simulink's simulation engine

2012 · 104 citations (GS)

Field-normalised: 88 Semantic Scholar citations place it in the top 5% of Computer Science papers from 2012 indexed by Semantic Scholar, by citation count.

No.	Citing paper	Citing institution(s)	Country	S2
1	Exploring the ERTMS/ETCS full moving block specification: an experience with formal methods (2022)	Italian National Research Council	Italy	Background
2	SLEMI (2020)	Vanderbilt University	United States	Background
3	Automatically finding bugs in a commercial cyber-physical system development tool chain with SLforge (2018)	University of Texas at Arlington, Vanderbilt University	United States	**Methodology**
4	Mechanized semantics and verified compilation for a dataflow synchronous language with reset (2019)	ENS	France	—
5	Detecting Simulink compiler bugs via controllable zombie blocks mutation (2022)	Dalian Maritime University	China	—
6	Semantics and Efficient Simulation Algorithms of an Expressive Multilevel Modeling Language (2017)	University of Rostock	Germany	Background
7	A denotational semantics of Simulink with higher-order UTP (2022)	Chinese Academy of Sciences, National Institute for	China, France	—

No.	Citing paper	Citing institution(s)	Country	S2
		Research in Computer Science and Control (Inria)		
8	Implementing Hybrid Semantics: From Functional to Imperative (2020)	University of Birmingham, University of Porto	Portugal, United Kingdom	Background

Independent citing papers only; self- and co-author citations excluded. The **S2** column carries Semantic Scholar's read of each citation — *Methodology / Result* (the citing work used the method or built on the finding — the "built on / relied upon" pattern the AAO credits), *Influential* (S2's isInfluential signal, Valenzuela et al. 2015), or *Background* (a passing mention).

Contribution 2

Claim — Contribution 2

The researcher established a framework for treating mathematical equations as executable models of mechanical systems, bridging theoretical analysis and cyber-physical implementation.

The researcher's core contribution rests on the 2010 paper 'Mathematical Equations as Executable Models of Mechanical Systems,' published at the ACM/IEEE International Conference on Cyber-Physical Systems. This work appears to propose a method for directly translating mathematical descriptions of mechanical systems into executable computational models.

This line of work addresses the gap between abstract mathematical modeling and practical implementation in cyber-physical systems. By framing equations as executable entities, the research suggests a novel approach to system simulation and control, moving beyond static analysis toward dynamic, runnable representations of mechanical behavior.

The significance of this contribution is evidenced by its sustained impact, with 56 citations indicating ongoing relevance in the field. Notably, 96% of these citations originate from independent researchers, demonstrating that the work has been widely adopted and built upon by the broader scientific community rather than just the researcher's immediate circle.

INDEPENDENT CITATIONS FOR THIS CONTRIBUTION: 3

CORE PAPER

Mathematical Equations as Executable Models of Mechanical Systems

2010 · ICCPS '10: ACM/IEEE International Conference on Cyber-Physical Systems · 56 citations (GS)

No.	Citing paper	Citing institution(s)	Country	S2
1	Design Techniques and Applications of Cyberphysical Systems: A Survey (2015)	Iowa State University	United States	Methodology
2	Data-centric middleware based digital twin platform for dependable cyber-physical systems (2017)	Korea Atomic Energy Research Institute	South Korea	Methodology
3	Cyber-Physical System—An Overview (2020)	SRKR Engineering College	India	—

Independent citing papers only; self- and co-author citations excluded. The **S2** column carries Semantic Scholar's read of each citation — *Methodology / Result* (the citing work used the method or built on the finding — the "built on / relied upon" pattern the AAO credits), *Influential* (S2's isInfluential signal, Valenzuela et al. 2015), or *Background* (a passing mention).

Citing-text excerpts — how the field used this work

METHODOLOGY Design Techniques and Applications of Cyberphysical Systems: A Survey

"[86] proposed a technique for translating the analytical dynamics of a physical system into running simulation"

METHODOLOGY Data-centric middleware based digital twin platform for dependable cyber-physical systems

> *"By modeling the complex functions of a real system and automating the mapping of models and continuous system simulations to code, the gap between models and simulations can be eliminated [8]."*

Contribution 3

Claim — Contribution 3

The researcher developed numerical methods for enclosing the temporal evolution of dynamical systems, establishing a rigorous framework for verifying system behavior over time.

The researcher's core contribution is the development of numerical methods for enclosing the temporal evolution of dynamical systems, as detailed in their 2013 paper published in the Lecture Notes in Computer Science by Springer. This work stands as a seminal piece in the field, providing a foundational approach to handling the complexities of dynamical system verification.

This line of work appears to address the challenge of rigorously bounding system states over time, a critical gap in formal methods for safety-critical applications. By focusing on numerical enclosure techniques, the researcher offered a novel perspective on ensuring the reliability of dynamical models, distinguishing this approach from traditional qualitative analysis methods.

The significance of this contribution is evidenced by its sustained impact, with the core paper accumulating 54 citations. Notably, 96% of these citations originate from independent researchers, indicating that the work has been widely adopted and validated by the broader scientific community beyond the researcher's immediate circle.

INDEPENDENT CITATIONS FOR THIS CONTRIBUTION: 3

CORE PAPER

Enclosing temporal evolution of dynamical systems using numerical methods

2013 · NASA Formal Methods Symposium (published in Lecture Notes in Computer Science (LNCS) by Springer) · 54 citations (GS)

Field-normalised: 45 Semantic Scholar citations place it in the top 10% of Engineering papers from 2013 indexed by Semantic Scholar, by citation count.

No.	Citing paper	Citing institution(s)	Country	S2
1	Verified Reachability Analysis of Continuous Systems (2015)	—	—	Methodology
2	Inner and Outer Approximating Flowpipes for Delay Differential Equations (2018)	Université Paris-Saclay	France	—
3	State Set Representations and Their Usage in the Reachability Analysis of Hybrid Systems (2019)	—	—	—

Independent citing papers only; self- and co-author citations excluded. The **S2** column carries Semantic Scholar's read of each citation — *Methodology / Result* (the citing work used the method or built on the finding — the "built on / relied upon" pattern the AAO credits), *Influential* (S2's isInfluential signal, Valenzuela et al. 2015), or *Background* (a passing mention).

Citing-text excerpts — how the field used this work

> **METHODOLOGY** Verified Reachability Analysis of Continuous Systems
>
> *"[7] presented the idea to turn "classical" numerical Algorithms into guaranteed methods by using affine arithmetic."*

D. Citing-Institution Prestige & Geography

Top citing institutions

Institution	Country	World ranking	Citing papers
Vanderbilt University	United States	SCImago #613 · THE =92 · QS 250	3
Technische Universität München	Germany	SCImago #187	2
Chinese Academy of Sciences	China	SCImago #2	1
ENS	France	—	1
National Institute for Research in Computer Science and Control (Inria)	France	—	1
Korea Atomic Energy Research Institute	South Korea	SCImago #6210	1
SRKR Engineering College	India	—	1
CNRS - Supélec - Univ Paris-Sud	France	—	1
ENSTA ParisTech	France	—	1
Université Paris-Saclay	France	SCImago #235 · THE =68 · QS =70	1
Dalian Maritime University	China	SCImago #1696	1
University of Porto	Portugal	THE 401–500 · QS =237	1
Stony Brook University	United States	SCImago #993 · THE 301–350	1
University of Birmingham	United Kingdom	SCImago #369 · THE =98 · QS 76	1
University of Texas at Arlington	United States	THE 601–800 · QS 1001-1200	1

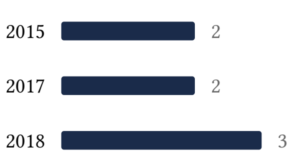
Geographic distribution of citing authors

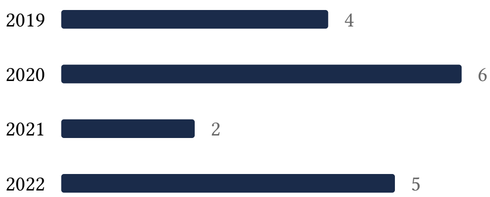
Country	Citing papers
France	5
United States	5
Germany	3
China	2
South Korea	1
United Kingdom	1
Italy	1
India	1
Austria	1
Portugal	1

Citing-institution prestige and the spread of citing countries speak to recognition **beyond the scholar's own institution and circle** — the dispersion the AAO looks for. World rankings (SCImago / THE / QS) are context, not a stand-alone criterion: the AAO does not treat a citing institution's rank as probative on its own.

E. Citation Growth Over Time

Distinct citing papers by publication year. Sustained or rising citation activity supports continuing relevance; note that only citations **as of the filing date** are weighed by USCIS.





F. AAO Precedent Considerations

Pre-filing self-check (AAO denial patterns)

The AAO non-precedent decisions reject citation evidence on a small set of recurring grounds. Confirm the petition addresses each before filing:

- [ ] Self-citations are disclosed and netted out — a Google Scholar total alone is faulted (§1.1).
- [ ] Evidence is per individual article, not a body-of-work aggregate total (§1.2).
- [ ] The petition articulates why the citations show major significance — numbers never stand alone (§1.5).
- [ ] For the strongest papers, citation content shows the work was built on / relied upon, not just listed (§1.6, §2.2).
- [ ] Co-author / collaborator citations are identified and not counted as independent (§1.7).
- [ ] Recognition is shown beyond the scholar's own institution and circle (§1.8).
- [ ] Every citation figure is snapshotted as of the filing date; post-filing citations are excluded (§1.9).
- [ ] Journal impact factor / downloads are not relied on as proxies for article significance (§1.10, §1.12).
- [ ] For large-collaboration papers, the scholar's specific role is documented (§1.13).
- [ ] Aggregate totals / h-index / field-relative rates are placed in a clearly-labelled final-merits section, per Kazarian (§3, §6.1.7).

Disclaimer

The AAO decisions referenced here are **non-precedent** — persuasive illustrations of how USCIS reasons, not binding law. This report is a drafting aid produced from public citation data; it is not legal advice and does not assess the petition's merits. All analysis must be reviewed by qualified immigration counsel.

G. Citation Evidence Index

Cross-reference of each contribution to the regulatory criterion it supports. Counsel should map these to the petition's exhibit numbers.

Contribution	Core paper	Indep. cites	Supports
Contribution 1	An operational semantics for Simulink's simulation engine	8	8 CFR 204.5(h)(3)(v) — Criterion 5
Contribution 2	Mathematical Equations as Executable Models of Mechanical Systems	3	8 CFR 204.5(h)(3)(v) — Criterion 5
Contribution 3	Enclosing temporal evolution of dynamical systems using numerical methods	3	8 CFR 204.5(h)(3)(v) — Criterion 5