USPTO Filing Guide — LUCID

USPTO PROVISIONAL PATENT FILING GUIDE

System and Method for Iterative Formal Verification of AI-Generated Code Using a Hallucination-Verification Loop

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1. Overview

A **provisional patent application** establishes a priority date for the invention and provides a 12-month window to file a non-provisional (full) patent application. It is faster, cheaper, and simpler than a full patent filing. It is not examined and does not itself become a patent — it secures the date from which prior art is evaluated.

Why file now (before publishing the benchmark report): - Establishes priority date *before* any public disclosure of implementation details - The architecture paper and benchmark results, once published, become prior art against any future patent filing - 12-month window provides time to refine claims, gather additional evidence, and decide on full patent strategy - Relatively low cost (~$1,700-3,500 depending on entity status)

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2. Entity Status: Micro-Entity vs. Small Entity

Micro-Entity Qualification (37 CFR 1.29)

To qualify as a micro-entity, ALL of the following must be true:

Requirement	Assessment
Qualifies as small entity (fewer than 500 employees)	YES — individual inventor / small startup
Not named as inventor on more than 4 previously filed US patent applications	Likely YES — verify with Ty Wells
Did not have gross income exceeding 3x median household income (~$225,000) in the calendar year preceding filing	Verify with Ty Wells
Has not assigned, granted, or conveyed (and is not obligated to do so) a license or ownership interest in the application to an entity that exceeds the income limit	Likely YES — no assignment to large entity

Fee Comparison (2026 Estimates)

Fee	Micro-Entity	Small Entity	Large Entity
Provisional filing fee	~$160	~$320	~$1,600
Provisional surcharge (late filing of formal papers)	$0	$0	$0
Total provisional filing	**~$160**	**~$320**	**~$1,600**

Recommendation: File as micro-entity if qualified. Saves ~$160 vs. small entity.

Patent Attorney Fees (Estimate)

Service	Estimated Cost
Review and polish provisional specification	$1,500-2,500
Prepare formal claims (review our draft claims)	Included above
Prepare formal drawings (from our mermaid flowcharts)	$300-500
File via EFS-Web	$200-400
Total with attorney	**$2,000-3,400**
Total self-filing (no attorney)	**$160-320**

Recommendation: Use a patent attorney for best protection. The specification and claims drafts in this package provide a strong starting point that will reduce attorney time.

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3. Required Documents

3.1 Documents Included in This Package

Document	File	Status
Specification	`provisional-specification.md`	Complete draft
Claims	`claims.md`	Complete draft (20 claims)
Flowchart descriptions	`flowcharts.md`	Complete (7 figures with mermaid)
Filing guide	`filing-guide.md`	This document

3.2 Additional Documents Needed for Filing

Document	Description	Status
Cover sheet (SB/16)	USPTO form identifying the application as provisional	To prepare
Formal drawings	Patent drawings rendered from our mermaid flowcharts (black-and-white line drawings per USPTO standards)	To prepare (patent illustrator)

Document	Description	Status
Declaration (optional for provisional)	Inventor declaration is NOT required for provisional filing	Not needed
Fee payment	Filing fee based on entity status	At filing time
Application Data Sheet (ADS)	Inventor name, correspondence address, entity status	To prepare

3.3 What Is NOT Needed for Provisional Filing

- Formal claims (included for completeness, but not examined)
- Oath or declaration
- Information disclosure statement (IDS)
- Formal specification formatting (37 CFR 1.52 format not required for provisional)

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4. Filing Process via EFS-Web (USPTO Patent Center)

Step 1: Create a USPTO Account

1. Navigate to https://patentcenter.uspto.gov
2. Click "Create Account"
3. Register with personal or business information
4. Verify email address
5. Set up two-factor authentication

Step 2: Prepare the Filing

1. **Convert specification to PDF.** The provisional specification (`provisional-specification.md`) should be converted to PDF format. Markdown rendering with LaTeX math notation is acceptable.
2. **Prepare formal drawings.** Convert the mermaid flowcharts to formal patent drawings. Options:
   - Hire a patent illustrator ($300-500) for USPTO-compliant drawings
   - Use a tool like draw.io, Lucidchart, or Visio to create black-and-white line drawings
   - Each figure should be on its own page, numbered (FIG. 1, FIG. 2, etc.)
3. **Prepare cover sheet.** Use USPTO form SB/16 (Provisional Application for Patent Cover Sheet):
   - Title: "System and Method for Iterative Formal Verification of AI-Generated Code Using a Hallucination-Verification Loop"
   - Inventor(s): Ty Wells
   - Correspondence address
   - Entity status: Micro-entity or Small entity (as qualified)
4. **Prepare Application Data Sheet (ADS).** USPTO form with inventor details.

Step 3: File via Patent Center

1. Log in to https://patentcenter.uspto.gov
2. Click "New Submission" > "Provisional Application"
3. Upload documents:
   - Specification (PDF)
   - Drawings (PDF)
   - Cover sheet (SB/16)
   - Application Data Sheet (ADS)
4. Pay filing fee:
   - Micro-entity: ~$160
   - Small entity: ~$320
5. Submit and save the filing receipt

Step 4: Receive Filing Receipt

- USPTO assigns an application number and filing date
- Save the filing receipt — the filing date is the priority date
- The priority date is the date against which all prior art will be evaluated

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5. Timeline and Milestones

Critical Dates

Date	Event	Action
ASAP	File provisional application	Establishes priority date
Filing date + 12 months	**Deadline for non-provisional filing**	Must file full (non-provisional) patent application or the provisional expires
Before filing	Do NOT publish implementation details	Protect against self-created prior art
After filing	Safe to publish benchmark report, arXiv paper	Filing date protects against this disclosure

Recommended Timeline

When	Action
Week 1	Review this package; engage patent attorney (optional but recommended)
Week 1-2	Attorney reviews and polishes specification and claims
Week 2	Patent illustrator creates formal drawings from mermaid flowcharts
Week 2-3	**File provisional application**
Week 3+	Publish benchmark report, arXiv paper, begin outreach (protected by filing date)

When	Action
Month 6	Assess commercial traction; decide on non-provisional filing strategy
Month 10-11	Engage patent attorney for non-provisional application preparation
Month 12	**Deadline: file non-provisional or lose provisional priority**

Post-Filing Decision Matrix

At month 6-8, assess whether to file a non-provisional based on:

Signal	Action
Platform pilot signed, revenue potential clear	File non-provisional (budget $8,000-15,000 with attorney)
Academic interest strong, commercial uncertain	Consider PCT international filing for broader protection
No commercial traction	Let provisional expire; publish as prior art to prevent others from patenting
Competitive threat (someone else filing similar claims)	File non-provisional urgently

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6. Cost Summary

Provisional Filing (Now)

Item	Self-File	With Attorney
USPTO filing fee (micro-entity)	$160	$160
USPTO filing fee (small entity)	$320	$320
Attorney review and preparation	$0	$1,500-2,500
Patent illustrator (drawings)	$0-300	$300-500
Total (micro-entity)	**$160-460**	**$1,960-3,160**
Total (small entity)	**$320-620**	**$2,120-3,320**

Non-Provisional Filing (12 months from now, if decided)

Item	Estimated Cost
USPTO filing fee (micro-entity)	~$400
USPTO search fee (micro-entity)	~$200
USPTO examination fee (micro-entity)	~$200
Patent attorney preparation	$5,000-10,000
Patent illustrator (updated drawings)	$500-1,000

Item	Estimated Cost
Total (micro-entity)	**~$6,300-11,800**

Optional Future: PCT International Filing

Item	Estimated Cost
PCT filing fee	~$3,000-4,000
PCT search fee	~$2,000-3,000
Attorney preparation	$3,000-5,000
National phase entries (per country, after 30 months)	$3,000-8,000 each
Total PCT filing	**~$8,000-12,000**
Per-country national phase	**$3,000-8,000 each**

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7. Prior Art Considerations

Known Prior Art to Disclose

The following prior art should be disclosed in the Information Disclosure Statement (IDS) when filing the non-provisional application:

Reference	Relevance	How LUCID Differs
AlphaEvolve (DeepMind, 2025)	Generate-evaluate loop for code	No formal verification; no convergence guarantee; no neuroscience grounding
Propose, Solve, Verify (Wilf et al., 2025)	Formal verification in generate-verify loop	Math domain only; no iterative remediation; no specification gap
Darwin Godel Machine (Sakana AI, 2025)	Self-improving code generation	Benchmark-based evaluation, not formal verification; reward hacking risk
DeepSeek-R1 (2025)	Emergent self-verification in LLMs	Learned (not formal) verification; shared failure modes with generator
Constitutional AI (Anthropic, 2022)	Self-critique and revision	Semantic (not formal) verification; shared failure modes
Scaling LLM Test-Time Compute (Snell et al., 2024)	Verification-guided search at inference time	Process reward models (learned), not formal verification
VERSES AI AXIOM (2025)	Active inference for reinforcement learning	Different domain (games, not code); no formal verification of code
Xu et al. (2024)	Impossibility of hallucination elimination	Motivational prior art (establishes the problem); no solution
Karpowicz (2025)	Hallucination-creativity identity	Motivational prior art; no solution
Huang et al. (2024)	Self-correction limitations	Shows self-refinement doesn't work; motivates external verification

Key Differentiators from All Prior Art

1. **Formal (execution-based) verification in the iterative loop.** No prior system uses formal verification (test execution with zero noise) as the iterative feedback signal in a code generation loop.
2. **Monotonic convergence property.** No prior system demonstrates that accuracy increases monotonically with iteration count. LUCID proves this both theoretically and empirically.
3. **Explicit treatment of hallucination as a feature.** No prior system deliberately uses LLM hallucination as a generative resource to be verified rather than a defect to be suppressed.
4. **Specification gap as convergence metric.** The quantitative metric driving the loop (specification gap = 1 - pass_rate) is novel and enables precision-weighted prioritization.
5. **Model-agnostic meta-architecture.** LUCID is not a specific model but a verification layer composable with any generator.

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8. Risks and Mitigations

Risk	Likelihood	Mitigation
Claims too broad (rejected by examiner)	Medium	Dependent claims provide fallback positions; specification includes detailed implementation
Prior art found during examination	Medium	Strongest prior art already known and differentiated; formal verification + monotonic convergence is novel
Competitor files first	Low	File ASAP to establish priority date; provisional is fast and cheap
Patent attorney disagrees with claim scope	Low	This draft provides a strong starting point; attorney will refine
12-month deadline missed	Low	Calendar the deadline immediately; set reminders at 6, 9, and 11 months
Changes to patent law	Very Low	Provisional system is well-established; unlikely to change in 12 months

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9. Immediate Action Items

1. **Verify micro-entity eligibility** with Ty Wells (income and prior patent history)
2. **Decide: self-file or engage patent attorney**
   - Self-file: Cheapest, fastest, but weaker protection
   - Attorney: More expensive, better claims, stronger protection
3. **Convert specification to PDF** (from markdown)
4. **Create formal patent drawings** from mermaid flowcharts
5. **Create USPTO Patent Center account** if not already done

6. **File the provisional application**
7. **Calendar the 12-month deadline** for non-provisional filing
8. **After filing: publish benchmark report and arXiv paper** (protected by filing date)

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10. Patent Attorney Recommendations

If engaging a patent attorney, look for one with experience in:

- **Software patents / computer-implemented methods** (35 U.S.C. 101 eligibility under Alice)
- **AI/ML patents** (growing specialty area)
- **Provisional-to-non-provisional conversion**

The Alice/101 risk (patent eligibility for software methods) is the main legal concern. The specification addresses this by emphasizing: - The *technical improvement* (monotonic convergence, zero-noise verification) - The *specific technical implementation* (sandboxed execution, test generation, structured remediation) - The *concrete, measurable results* (100% on HumanEval, +65.5% on SWE-bench) - The *unconventional approach* (treating hallucination as a feature, not a defect)

A patent attorney experienced in Alice analysis can further strengthen the claims against 101 rejections.

Appendix A: Key Statistics for Patent Application

These numbers should be referenced in the specification:

Metric	Value	Source
HumanEval LUCID k=3 accuracy	100% (164/164)	Benchmark experiments
HumanEval Self-Refine k=5 accuracy	87.8% (144/164)	Benchmark experiments
HumanEval LLM-Judge k=5 accuracy	97.0% (159/164)	Benchmark experiments
LLM-Judge regression (k=3 to k=5)	-2.4 pp (99.4% to 97.0%)	Benchmark experiments
SWE-bench baseline accuracy	18.3% (55/300)	Benchmark experiments
SWE-bench LUCID best accuracy	30.3% (91/300)	Benchmark experiments
SWE-bench relative improvement	+65.5%	Computed
Improvement-to-regression ratio (SWE-bench k=1)	7.7:1 (23:3)	Benchmark experiments
Random-verify divergence	97.6% to 95.1% (k=1 to k=3)	Ablation study
Total benchmark cost	~$472	Cost tracking
Cost per verification call	$0.005-0.008	Cost tracking

Metric	Value	Source
Production codebase convergence	57.3% to 90.8% (iterations 3-6)	Case study
Production codebase size	30,000 lines TypeScript, 200+ files, 91 claims	Case study

Appendix B: Glossary

Term	Definition
LUCID	Leveraging Unverified Claims Into Deliverables. The name of the system and method described in this application.
Specification gap	A quantitative metric equal to 1 minus the fraction of applicable claims that pass formal verification.
Formal verification	Execution-based verification that produces exact (zero-noise) verdicts within its decidable domain, as distinguished from learned verification.
Learned verification	Verification performed by a machine learning model (LLM-as-judge, reward model, discriminator), which produces noisy verdicts subject to approximation error.
Monotonic convergence	The property that accuracy never decreases with additional iterations.
Claim	A decidable predicate about an expected behavior of source code.
Remediation	The process of generating targeted code modifications to address specific verification failures.
Regeneration	The process of producing updated source code incorporating remediation, with full context from prior iterations.
Hallucination	The generation by an LLM of plausible but potentially incorrect content. Treated as a generative resource in this invention.
Meta-architecture	A system that is composable with any generative model, functioning as an additional layer rather than a replacement.