PRAXYMUSE THEOREM v0.6

Source-preserving mathematical integration

Praxium × Poetic Asymmetry × Acoustics × Culture × Performance × Verified Production

Complete archival edition • 6 November 2026

This edition consolidates the framework into typed variables, equations, constraints and execution contracts. The complete original is preserved in Appendix A. The fuller supplied integration is reproduced in Appendix B, including its original v0.7 label as a source label, not the title of this edition.

Preservation guarantee: the embedded source files are byte-for-byte identical to the supplied files, checked by SHA-256. Mathematical consolidation is an interpretation, not a proof that every nuance of natural language has a unique mathematical equivalent. Source text governs any unresolved ambiguity.

Status key: E = established under stated assumptions; M = proposed model/design; R = historical report; U = unverified. No new audio analysis, listening test or backend execution is asserted by this document.

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I. Preservation contract and typed language

$\Omega = (S_0, S_1, S_2, D, W, J, M, \Lambda, H)$; $Dec(D,W) = S_0$; $H_a = SHA256(S_a)$.

S_0 is the original UTF-8 file; S_1 is the expanded draft; S_2 is the compact final draft. D is a dictionary of exact lexical tokens, W the ordered dictionary-index stream, J the source-line index, M the equations in this edition, Λ the source-to-model relation, and H the file-hash manifest. Whitespace, punctuation, capitalization, diacritics, names and repeated tokens remain data.

$Tok(S_0) = (\tau_1,\ldots,\tau_N)$; $D = unique_in_first_occurrence_order(Tok(S_0))$; $W_k = index_D(\tau_k)$; $Dec(D,W) = UTF8(D[W_1] \cdots D[W_N])$.

The lexical codec is injective on the supplied source bytes after valid UTF-8 decoding and exact re-encoding. It preserves the words as symbols, without claiming to translate their meaning into mathematics. Its JSON payload is embedded. The readable mathematical layer is a separate interpretation. Keeping both avoids silently losing examples, cultural names, exceptions or caveats.

$\Lambda \subseteq J \times \{M00,\ldots,M16\}$; $\forall j \in J, \exists m : (j,m) \in \Lambda$. $Coverage \neq semantic_equivalence$.

All source lines have a mapped destination, including blank lines and the final user instruction. Mapping means the relevant domain is addressed; it does not assert formal logical equivalence. Definitions are local unless explicitly shared. Scalars, vectors, graphs, distributions and text are not interchangeable.

$s \in [0,T]$: audio time; $t \geq 0$: controller time; $b \in \mathbb{R}$: beats; $n \in \mathbb{Z}$: samples; i : track; j : event; k : revision; r : reference; z : seed.

$C = (\iota, L, \ell, \delta, \sigma, a, \gamma, \chi, \varepsilon, \alpha, F, B, v, R, \beta)$; S : SongIR; A : Archive; Q : CheckSet.

C fields in order: intent, lyrics, language, dialect, story, affect, genre, cultural context, era, audience, form, tempo, delivery/venue, rights, budget. Symbols are abbreviations with this dictionary, not replacements for unrecorded cultural knowledge.

II. Mathematical integration

M00 • Universe, evidence and identity

$\mathbb{U} = \mathbb{U}_{ac} \times \mathbb{U}_{inst} \times \mathbb{U}_{perf} \times \mathbb{U}_{tune} \times \mathbb{U}_{harm} \times \mathbb{U}_{time} \times \mathbb{U}_{form} \times \mathbb{U}_{text} \times \mathbb{U}_{aff} \times \mathbb{U}_{orch} \times \mathbb{U}_{mix} \times \mathbb{U}_{master}$.

S = Commit(id,v,parent,C,z,E,X,P,stems,F,motifs,B,Meter,Tune,A,D,Assets,Rights,Hashes); $S^{v} \neq S^{v+1}$ whenever a committed field changes.

e = (claim,value,unit,source,hash,method,version,time,confidence,status); status∈{E,M,R,U}; missing ≠ 0; requested ≠ executed.

Archive = (S,PCM,assets,permitted model copies,library versions,DSP versions,seeds,environment,settings,licenses); same(S) ⇏ same(PCM).

The product notation groups domains and does not assert their independence. An immutable specification fixes intended score and configuration, not compliance by a stochastic or insufficiently controlled renderer. Exact playback is secured by storing the PCM; repeatable rerender requires complete dependencies and deterministic execution.

M01 • Acoustics and timbral state

$p(x,s) \approx \Sigma_m a_m(s)\varphi_m(x) \cos(2\pi \int_0^s f_m(u)du + \phi_m) + \eta(x,s)$.

$\ddot{q}_m + 2\zeta_m\omega_m\dot{q}_m + \omega_m^2 q_m = F_m/M_m$; $f_n = n/(2L)\sqrt{(Tension/\mu)}$.

$f_{n,stiff} \approx n f_{ideal}\sqrt{(1+\beta n^2)}$; $f_{n,open} \approx nc/(2L_{eff})$; $f_{n,closed} \approx (2n-1)c/(4L_{eff})$.

$X[m,k] = \Sigma_n x[n]w[n-kH] \exp(-2\pi imn/N)$; $C_k = \Sigma_m f_m|X[m,k]|/(\Sigma_m|X[m,k]|+\varepsilon)$; RMS = $\sqrt{mean(x^2)}$.

$\Phi_i = (f_0,partials,inharmonicity,centroid,rolloff,flux,roughness,noise,envelope,formants,transient,modulation,stereo,room,velocity)$.

E: ideal linear relations with stated boundary assumptions. M: hybrid rendering chooses modal, FDTD, waveguide, wave-digital, mass-spring, source-filter, sample-based, additive, subtractive, FM, wavetable, granular or neural components. Nonlinear bow/reed/lip behavior and inharmonic plates are not proved by a harmonic series. Stable/passive discretization is a separate requirement.

M02 • Instrument and embodied-event ontology

I_i = (source,exciter,resonator,range,tuning,polyphony,envelope,controls,limits,articulations,culture,history,provenance).

e_j = (UID,i,p_j,s_j,d_j,v_j,g_j,o_j,a_j,b_j,f_j,x_j,room_j); π(e_j | score,skill,body,phrase,affect,neighbors).

Feasible_i(E) = $\bigwedge_j$ [p_j∈range_i ∧ reach_j≤reach_i ∧ breath_j≤capacity_i ∧ transition_j∈technique_i].

δ_phrase ~ P(δ_time,δ_velocity,δ_articulation,δ_breath | phrase,C); Cov(δ_phrase) is contextual, not assumed diagonal.

M: source taxonomies are retained as separate records for idiophones, membranophones, chordophones, aerophones, electrophones, voices and hybrids. Bow, pluck, key/hammer, air jet, reed, lip, membrane, mallet, pickup, tine, tonewheel, oscillator and sampler gestures require distinct controls. Every named instrument and technique remains explicitly present in Appendix A. Unsupported synthetic exceptions must be labeled.

M03 • Pitch, harmony and counterpoint

ν(d) = ν_ref 2^((d−d_ref)/D); ν_i/ν_j = p/q; cents(i,j)=1200 $\log_2$(ν_i/ν_j).

Tune = (reference,interval system,continuous inflections,context); Mode = (intervals,gravity,phrase grammar,ornament,intonation).

h_k = (root,quality,extension,inversion,function,tension,duration,voicing,bass).

E_VL = Σ_i w_i|p_i,k+1−p_i,k| + λ_r E_range + λ_x E_cross + λ_p E_parallel.

m = (interval contour,rhythm,accent,register,gesture,semantic identity); $\mathscr{T}$_m = {transpose,invert,retrograde,augment,diminish,sequence,fragment,reharmonize,reorchestrate}.

E: frequency and cents relations. M: voice-leading penalties are tradition-dependent. Twelve-tone equal temperament is optional; raga, maqam and patet require their own phrase grammars. Independent lines, imitation, canon, fugue, suspensions and contrary motion are available operations, not guarantees of quality. Dissonance may resolve, prolong or remain.

M04 • Time, groove and form

B(s)>0; b(s)=$\int_0^s$ B(u)/60 du; s_j=b^{-1}(b_j+δ_j); n_j=round(F_s s_j); |n_j/F_s−s_j|≤1/(2F_s).

Meter = (grouping,accent,cycle); Groove = (Cov(onset,velocity),swing,anticipation,drag,syncopation).

F = (motif→gesture→phrase→section→movement/album); D(s)=(level,density,register,brightness,roughness,space).

Rests ⊂ Events; Breath ⊂ Structure; p:q cycles require a declared common temporal reference.

The inverse beat map needs positive tempo and sufficient regularity. Additive meter, polymeter, tala, theka, sam, khali, clave, cascara and gong cycles keep their cultural context. Strophic, AABA, verse/chorus, blues, rondo, sonata, fugue, variations, through-composed, alap/jor/jhala plus gat, call-response and process forms remain distinct templates.

M05 • Affect, meaning and asymmetry

l_j=(text,IPA,stress,syllables,breath,metaphor,subtext,persona,listener,story time,valence,arousal,agency).

a(s)∈$[0,1]^{12}$ = (grief,longing,awe,tenderness,anger,fear,serenity,hope,desire,nostalgia,ambiguity,resolve).

G_sem=(images,meanings,stakes,repetition,transformation,contradiction,consequence); u=clip(W_a a+W_l l+W_h h+W_r r+W_m m,u_min,u_max).

I(e)=−log P(e|context,history); J_A=λ_P P+λ_D D+λ_C C−λ_S S−λ_M M−λ_R R.

G_interact=(tracks,edges); label(edge)∈{answer,echo,console,shadow,contradict,anticipate,interrupt,reinforce,withdraw}.

M: P,D,C denote predictability, disconnection and gratuitous complexity; S,M,R denote meaningful surprise, motif recall and narrative relevance. These require declared measurement or judgment functions, not universal constants. Affect is an interpreted control signal, not sentience. Contradiction, silence and departures in phrase length, pickups, voicing, cadence or entry can serve the narrative.

M06 • Historical and cultural atlas

θ_r=(region,era,community,occasion,tuning,meter,rhythm,form,grammar,ensemble,technique,production,affect,provenance).

Atlas = { (ID_r,θ_r,anchors_r,source_spans_r,rights_r,uncertainty_r) }; Flatten(community) is prohibited by the schema.

Tradition_r ≠ InstrumentClass_r; influence ≠ license; chronological order ≠ quality order.

M: the historical, global modal and recorded-genre inventories are finite reference registries, not universal coverage. Appendix A sections 6-8 preserve every named composer, performer, theorist, instrument, tradition, era and technique. Each source line is a complete retained record; expansion into evidence-backed individual records remains work, not an asserted completed research corpus.

M07 • Composition and long-range structure

G_song=(sections,phrases,motifs,lyrics,affect arcs,harmony,tempo,meter,roles,transitions).

P(IR|C)=P(F,arc|C)P(motifs,L|F,C)P(Tune,H,Rhythm|motifs,C) × P(melody,prosody|L,H,Rhythm)P(ensemble|melody,arc)P(gestures|ensemble,performer)P(audio|gestures,acoustics,mix).

Section_k=(stakes_k,tension_k,lead_k,answer_k,rest_k,innovation_k); revision messages are bounded and versioned.

M: this is a proposed factorization, with conditional-independence assumptions rather than a demonstrated generative law. Development can establish, complicate, reframe, climax or anticlimax, then leave an afterglow. Long-range motif memory and intentional silence constrain filler. Backward revision is allowed without silently rewriting accepted inputs.

M08 • Phonetic singing and fidelity

L → (language,dialect) → G2P → IPA → (syllables,stress) → breath → alignment → coarticulation → excitation → tract.

y=h_tract(phoneme,formants,register)*g_glottis(f_0,tilt,breath)+frication; $f_0(s)=f_{base}(s)2^{(c(s)/1200)}$.

c(s)=vibrato(s)+scoop(s)+microbend(s); E_prosody=Σ_j(w_s E_stress+w_v E_vowel+w_c E_consonant+w_b E_breath+w_t E_timing).

Singer=(notes,phonemes,durations,expression,authorized identity,language); WER=(S+D+I)/N_ref.

M/E: the source-filter model is approximate; a neural singer need not literally implement it. Vowel sustain, consonant placement, register/passaggio, diction, accent, phonation and authorized identity are separate constraints. ASR is fallible on singing, and forced alignment alone cannot prove words were sung. Combine transcription, alignment, acoustic inspection and listening; log uncertainty per line.

M09 • Orchestration and dialogue

Role_i=(lead,counterline,bed,bass,groove,atmosphere,punctuation,silence;
register,pan,attack,release,breath,range).

J_orch=Σ_s(audibility+counterpoint+complement+space+continuity)−λ(masking+clutter+physical violations+redundancy).

Constraints = {divisi,fingering,breath,dynamics,room,pocket,shared pulse,correlated microtiming}.

M: role labels may change across phrases. Silent parts remain intentional events. Reward functions require a scale, evaluator and uncertainty. More parts or more effects do not by themselves establish richness or conversation.

M10 • DSP, mix and mastering

x_i[n]=Render(I_i,E_i,X_i,room,z); y=Master(Σ_i Pan_i Gain_i DSP_i(x_i)+Σ_b Bus_b).

y_EQ[n]=Σ_p b_p x[n−p]−Σ_q a_q y[n−q]; envelope[n]=α envelope[n−1]+(1−α)|x[n]|.

y_echo[n]=x[n]+g x[n−D]; y_feedback[n]=x[n]+g y_feedback[n−D], |g|<1 for fixed D.

y_reverb=h*x; y_flange[n]=x[n]+g x[n−D(n)]; y_sat=tanh(kx)/tanh(k), k>0.

F_s>2f_max for bandlimited signals; FX_a∘FX_b ≠ FX_b∘FX_a in general.

E/M: declare filters, stability, resampling, anti-aliasing, fractional-delay interpolation, attack/release, knee and makeup gain. Validate sends, feedback and latency alignment. Check clipping, clicks, aliasing, sibilance, masking, phase, mono compatibility, tails, true peaks and dynamic contrast. Project-specific loudness targets are not universal artistic optima.

M11 • References, licensing and transfer

r=(id,source,hash,owner,license,scope,composer,performer,tradition,date,alignment,features,confidence,bias,provenance).

Φ_r=(rhythm,melody,harmony,timbre,gesture,structure,text relation,dynamics,space); M_ra∈{0,1}.

d(r,q)=Σ_a M_ra M_qa w_a d_a(Φ_ra,Φ_qa)/(Σ_a M_ra M_qa w_a+ε).

h=(antecedent,technique,outcome,conditions,counterexamples,sources,confidence,test);
θ_new=ConstrainedFuse(θ_refs,C,grammar,originality).

M: normalized features and sufficient overlap are required. Insufficient overlap yields uncertainty, not a reliable similarity score. Split evaluation by song/performance. Composition, edition, recording, performer, model and voicebank permissions are separate. Code openness does not clear training data. Detect recognizable melody/text/audio reproduction; cultural custodians and coverage balance remain necessary.

M12 • Bounded controller and musical objective

$Z=(\Xi,\kappa,N,\mathscr{D},e_{57},c_{16},s_{16},\tau_{13},g_{15})$; $0\le\Xi\le1$; $\kappa,N,\mathscr{D}\ge0$; $\|e,c,s,\tau,g\|_2\le R$.

$m(Z)=m_{min}+(m_{max}-m_{min})\sigma(w\cdot Z)$; $0<m_{min}\le m_{max}<\infty$; $\dot{m}_j=-b_jm_j+a_j(Z-Z_{ref})$, $b_j>0$.

$\dot{Z}+N_K(Z)\ni F(Z,\text{telemetry},\text{evaluation})$; $Z_{k+1}=\Pi_K[Z_k+\eta F_k]$.

$J=\Sigma_a\ \lambda_a\ E_a-\lambda_n$ Novelty·Relevance·Craft; a∈{acoustic,playable,vocal,prosody,harmony,rhythm,form,orchestration,affect,context,artifact,continuity,originality,rights}.

M: coherence is operational, not consciousness. The source supplies nonnegative $\kappa,N,\mathscr{D}$ but no finite upper bounds; compactness therefore needs additional declared bounds. Norm balls and scalar intervals form a convex feasible set only for the modeled controller coordinates. Musical feasibility can be nonconvex. Hard constraints remain outside weighted tradeoffs.

M13 • Conditional theorem, not universal excellence

$K\subset\mathbb{R}^d$ nonempty closed convex; f is μ-strongly convex; ∇f is L-Lipschitz; $0<\mu\le L$; $0<\eta<2\mu/L^2$.

$T(x)=\Pi_K(x-\eta\nabla f(x))$; $q^2=1-2\eta\mu+\eta^2L^2<1$.

$\|T(x)-T(y)\|^2 \le \|(x-y)-\eta(\nabla f(x)-\nabla f(y))\|^2 \le q^2\|x-y\|^2$.

$\exists!x^*\in K$: $x^*=T(x^*)$; $x^*=\operatorname{argmin}_K f$; $\|x_k-x^*\|\le q^k\|x_0-x^*\|$.

$\|e_k\|\le\delta \Rightarrow \limsup_k \|x_k-x^*\|\le\delta/(1-q)$ for $x_{k+1}=T(x_k)+e_k$.

E under the listed hypotheses: projection is nonexpansive; strong convexity implies strong monotonicity of the gradient; the gradient Lipschitz bound controls its squared norm. Expanding the square gives the displayed contraction. Banach fixed-point convergence applies on closed K; projected first-order optimality identifies the minimizer. Additive error yields $d_{k+1}\le qd_k+\delta$. This proves a convex surrogate result, not global music optimization, lyric fidelity, sentience or emotional impact.

M14 • Stability and stopping boundaries

$\dot{V}\le-\gamma V+\delta(t)$, $\gamma>0 \Rightarrow V(t)\le e^{(-\gamma t)}V(0)+\int_0^t e^{(-\gamma(t-u))}\delta(u)du$.

Stop ∈ {accepted,budget exhausted,diminishing gains,blocked,paused}; every stop records residual failures and unknowns.

Bounded(gains) ↛ stable(coupled system); projected endpoint ≠ projected flow in general.

The comparison inequality must first be established for the actual model. Persistent disturbance need not converge to zero. Small-gain, PDE, Metzler-Hurwitz and memory stability claims require their own coupling, domain, boundary and regularity assumptions. The original convex L-smooth subproblem statement is retained in Appendix A, but does not establish nonconvex global convergence.

M15 • Evidence-aware execution and QA

Q_hard={rights,text policy,formats,required assets,sync,hashes,delivery constraints};
Q_soft={diction,playability,expression,narrative,dialogue,style,artifacts,preference}.

q.status∈{pass,fail,unknown,N/A}; PASS ⇔ ∀q∈applicable(Q_hard), q.status=pass.

Coverage(i,p)∈{locked,conditioned,prompted,inferred,uncontrolled}; fidelity claims are bounded by coverage and measured evidence.

Inputs→rights→inventory→principles→lyrics→composition→arrangement→gestures/phonemes→IR→render→align→mix→measure/listen→repair→QA→archive→delivery.

M: blind or level-matched comparison must be actually performed before being reported. Generation, QC, approval and release are distinct states. Failed or unknown hard checks prevent certification, not creation of a clearly labeled review artifact. Keep exact source text, map failure spans, retain accepted phrases and version every edit.

M16 • Backend progression and release contract

Capability=(tool,version,availability,I/O,control,latency,cost,license,limits,test time); installed ≠ connected ≠ permitted ≠ validated.

HeavyJobs≤1; LightPreparationJobs≤1; resource limits=(RAM,disk,CPU,time,thermal where measurable).

$Release_5$={WAV,M4A,lyrics TXT,title-style TXT,ZIP}; ZIP members = the exact four delivered files.

∀f∈$Release_4$: SHA256(f)=SHA256(extract(ZIP,f)); decode/codec/duration/channel/rate/content/access checks precede release.

R: source drafts describe a local ACE-Step CPU pilot and earlier hosted Boppy/Descript production. This PDF does not freshly verify either environment. A short pilot does not validate full-length score/lyric fidelity. DiffSinger/NNSVS remain proposed unless independently tested. Demucs estimates stems; it does not recreate original performance. No silent model/checkpoint substitution is permitted. Optional score, stems, SongIR, licenses and test records are archived or delivered when actually produced.

III. Progression and claim boundaries

The ledger below is recovered from the supplied drafts. It is historical context, not a new inspection of the score, audio, tools or reference files.

R1 • Original framework: v0.5 Ω¹ establishes the source ontology, acoustics, cultural atlas, affect/asymmetry, SongIR, singing, production and bounded-feedback concepts.

R2 • Score report: Desolate Throne, labeled v0.6 Ω², reports 107 bars, 2,788 MIDI events, seven tracks, 80 lyric lines and 5:17.037 plus a tail. These counts need source-asset reinspection before measurement-grade certification.

R3 • Hosted render: three reported 2:00.024 sections total 6:00.072. Arithmetic is consistent; exact lyric, score, tempo and singer fidelity remain unproved.

R4 • Later V4 sample: 90 seconds, added instrumental dialogue around existing generated vocal/backing. Individual underlying notes were not all recomposed. Feedback requested richer instruments, timbre, performance, effects and reference comparison.

R5 • Local inference: the supplied final draft reports a successful ACE-Step CPU pilot. That report establishes neither current availability nor full-length performance. This edition preserves it as a historical report.

U1 • LDM/tracks.zip analysis, licensed reference expansion, lyric-note-rhythm mapping and persistent tested rules remain requests unless an inventory, output and method are supplied.

M1 • Current requested musical direction in the drafts: instrumental passages should contain music rather than talking; harmonica should be quiet/supportive; identity contemporary and distinct; introduction deliberate; fades clean. Listening compliance remains to be tested.

FrameworkVersion ≠ CompositionVersion ≠ AudioIteration ≠ BackendCheckpoint; R ≠ fresh P.

No claim in the new consolidation overrides the preserved original by omission. Corrections and tighter assumptions are explicit: audio identity needs archived data; compactness needs finite scalar bounds; word fidelity needs more than alignment; stability needs coupling hypotheses; cultural categories remain contextual; mathematical guarantees are limited to the stated theorem.

IV. Source-to-model mapping

A001-A005 → M00 • Preamble

A006-A011 → M00, M12 • 0. UNIVERSE/CONTRACT

A012-A017 → M01 • 1. ACOUSTIC FIRST PRINCIPLES [E]

A018-A026 → M02, M08 • 2. INSTRUMENT ONTOLOGY / MASTERY [E/P]

A027-A031 → M03 • 3. PITCH / HARMONY / COUNTERPOINT [E/M]

A032-A035 → M04 • 4. TIME / GROOVE / FORM

A036-A041 → M05 • 5. PRAXIUM AFFECTION × POETIC ASYMMETRY

A042-A051 → M06 • 6. HISTORICAL MASTERCRAFT LIBRARY [E/P]

A052-A062 → M06 • 7. GLOBAL MODAL/IMPROVISATORY SYSTEMS [E/P]

A063-A075 → M06 • 8. RECORDED GENRE/KERNELS [E/P]

A076-A079 → M07 • 9. COMPOSITION ENGINE

A080-A083 → M08 • 10. SUNG VOCAL GENERATOR

A084-A086 → M09 • 11. ORCHESTRATION / INTERACTION

A087-A089 → M10 • 12. ENGINEERING / DSP [E/M]

A090-A092 → M11 • 13. REFERENCE REGISTRY / RIGHTS

A093-A096 → M12, M13, M14 • 14. OPTIMIZATION / PRAXIUM FEEDBACK

A097-A105 → M15, M16 • 15. VERIFICATION / EXECUTION

Appendix A includes all 105 source lines, including empty lines, the END marker and the final instruction. The one-to-many correspondence above is a precise location map. The line-level JSON map embedded in this PDF retains the exact text for each entry. For a named artist, instrument or tradition, the source span is the authoritative inventory rather than a claimed exhaustive mathematical model of that entity.

Appendix A • Complete original

Normative source inventory. The A### labels and typographic wrapping are editorial aids; the embedded original_praxymuse.txt preserves exact bytes. All original wording, including historical labels and claims needing qualification, is retained. See the mathematical layer for explicit limitations.

A001 % PRAXYMUSE THEOREM v0.5—Ω¹ |
PRAXIUM⊗POETIC-ASYMMETRY⊗ACOUSTICS⊗MUSIC-HISTORY⊗PERFORMANCE⊗AFFECT⊗PRODUCTION

A002 % PURE FORM | STANDALONE | WORLD-MUSIC | ORIGINAL COMPOSITION | SCORE/STEMS/AUDIO LOCK

A003 % Scope: extensible ontology; not an exhaustive archive.

A004 % E=established; M=model; P=empirical. Simulated affect≠sentience.

A005 [empty source line]

A006 0. UNIVERSE/CONTRACT

A007 s∈[0,T] seconds;b∈[0,B] beats;n∈ℤ samples;j=note;i=track;g=voice;z=seed;c=(goal,genre,era,culture,language,lyrics,story,emotion,audience,form,tempo,venue,rights).

A008 𝕌=(acoustics,instruments,performance,tuning,harmony,rhythm,form,lyrics,affect,orchestration,mix,master); SongIR=Commit(ID,version,c,z,events,controls,phonemes,stems,form,motifs,tempo/meter/tuning maps,arrangement,mix,master,assets,licenses,hashes).

A009 Same verified SongIR⇒same score,notes,phrases,lyrics,roles,mix,render config; edits⇒new version. IR alone cannot recover exact sound: retain PCM, model weights, sample library, DSP versions, seed.

A010 Praxium Z=(Ξ,κ,N,𝒟,e_{57},c_{16},s_{16},τ_{13},g_{15}), 0≤Ξ≤1,κ,N,𝒟≥0,‖e,c,s,τ,g‖₂≤R; bounded gains 0<m_min≤m(Z)≤m_max; Ξ=operational coherence, not consciousness.

A011 [empty source line]

A012 1. ACOUSTIC FIRST PRINCIPLES [E]

A013 Pressure p(x,s)≈Σ_m a_m(s)φ_m(x)cos(2π∫f_m ds+ϕ_m)+noise; modal q̈_m+2ζ_mω_mq̇_m+ω_m²q_m=F_m/M_m; pipeline excitation→resonator→body→room→mic→perception. STFT X(ω,k)=Σ_np[n]w[n−kH]e^(−iωn).

A014 Ideal strings f_n≈n/(2L)√(Tension/μ); stiff strings f_n≈nf₁√(1+Bn²). Ideal open tube f_n≈nc/(2L_eff), stopped tube odd harmonics f_n≈(2n−1)c/(4L_eff); bore geometry, toneholes, end corrections alter both. Plates/membranes/bars often inharmonic; bow/reed/lips nonlinear; impact/pluck transient+decay.

A015 Timbre T_i=(f_0,partials,inharmonicity,centroid,rolloff,flux,roughness,noise,ADSR,formants,transient,modulation,stereo,room,velocity); centroid=Σf|X_f|/Σ|X_f|; RMS=√mean(p²). Pitch≠brightness≠loudness≠meaning.

A016 Audio_i=Hybrid(physical modal/FDTD/waveguide/wave-digital/mass-spring/source-filter,samples velocity+round-robin,additive/subtractive/FM/wavetable/granular,neural residual); selection by fidelity, latency, controllability, rights. Enforce stable/passive numerical flow when using physical modeling.

A017 [empty source line]

A018 2. INSTRUMENT ONTOLOGY / MASTERY [E/P]

A019 Hornbostel–Sachs={idiophone,membranophone,chordophone,aerophone,electrophone}; voice/hybrids separately typed. Instrument=(source,exciter,resonator,range,tuning,polyphony,attack,decay,gesture,physical_limits,articulation,history,provenance).

A020 BOWED violin/viola/cello/bass/erhu/sarangi/kamancheh: bow pressure/speed/position→stick-slip, legato, vibrato, tremolo, spiccato, portamento, harmonics; constrain bow changes, string crossings, double-stop reach. PLUCKED guitar/oud/lute/sitar/sarod/tar/setar/kora/harp/banjo/koto/guzheng: pluck position, pick/nail, muting, fret, sympathetic strings, bends/meend; finger reach and sustain bound. KEYED piano/fortepiano/clavichord/harpsichord/santur/yangqin: hammer/pluck, velocity, sympathetic strings, damper/pedal, repetition, key reach; organ/accordion/harmonium use pressure/reed controls.

A021 WINDS flute/ney/shakuhachi/bansuri/dizi: air-jet, embouchure, breath, chiff, overblow; clarinet/sax single-reed; oboe/bassoon/duduk double-reed; trumpet/horn/trombone/tuba lips/valves/slides/mutes; constrain tessitura, breaths, slurs, registers, tonguing, dynamic pitch stability.

A022 MEMBRANE kick/snare/tom/tabla/mridangam/pakhawaj/djembe/conga/bongo/darbuka/daf/taiko: strike location, skin tension, open/closed/slap/bol, flam, roll, rebound. IDIO

gong/bell/cymbal/mbira/kalimba/marimba/xylophone/vibraphone/steelpan/agogo/gamelan: material-dependent modes, mallet/strike, decay/choke/pedal, interlocking.

A023 ELECTRIC guitar/bass=pickup→amp→cab IR/FX; Rhodes/Wurlitzer=tines/reeds; Hammond=tonewheel/drawbar/Leslie; theremin=continuous control; synth=osc/noise→filter→ADSR/LFO/modulation→FX; sampler/drum-machine/scratch/turntable=transient, repetition, manipulation. Add indigenous/custom instruments through identical physical schema without flattening traditions.

A024 VOICE: breath→laryngeal oscillator→tract formants→phoneme radiation; y=h_tract(vowels,formants,articulation)*glottal(f_0,tilt,breath)+fricatives. Controls=(register,passaggio,breath,vibrato,portamento,mix,head/chest/falsetto,belt,rasp,melisma,diction,accent,coarticulation). Honor singing physiology and authorized identity.

A025 Every played event e=(pitch,start,end,velocity,gesture,ornament,articulation,breath/fingering,expression,room); π(e|score,skill,body,phrase,emotion,neighbors). Humanize correlated phrases, NOT independent random jitter.

A026 [empty source line]

A027 3. PITCH / HARMONY / COUNTERPOINT [E/M]

A028 Equal divisions D: ν(d)=νref·2^((d−dref)/D); just ratio ν_i/ν_j=p/q; cents=$1200\log_2(\nu_i/\nu_j)$; 12-TET OPTIONAL. Other tunings and pitch inflections encoded in TuningMap. Scale/mode=(intervals,tonic hierarchy,phrase grammar,ornaments,intonation). Raga≠scale; maqam≠Western mode; patet≠key.

A029 Harmonic event h=(root,quality,extension,inversion,function,tension,duration,voicing,bass). Voice-leading $E_V=\Sigma w_i|p_{i,k+1}-p_{i,k}|+\lambda_{rangeErange}+\lambda_{crossEcross}+\lambda_{parallelEparallel}$(style-specific). Harmony choices={functional/modal/chromatic/jazz alterations/quartal/polytonal/atonal/spectral/drone/just/maqam/raga}; dissonance may resolve, prolong, or remain unresolved.

A030 Counterpoint={imitation,canon,fugue,inversion,contrary motion,suspension,independent melodic lines}; melodic motif m=(interval contour,rhythm,accent,register,articulation,semantic identity), ops={transposition,inversion,retrograde,augmentation,diminution,sequence,fragment,reharmonize,orchestrate} subject to genre/context. Avoid mechanically equating complexity with expressive power.

A031 [empty source line]

A032 4. TIME / GROOVE / FORM

A033 Beat map $b(s)=\int_0^s \mathrm{BPM}(u)/60\,du$; onset $s_j=b^{-1}(b_j+\delta_j)$. Meter=(grouping,accents,cycle); groove=timing-velocity covariance, swing, anticipation, drag, syncopation; include additive meter, p:q polyrhythm, polymeter, tala/theka/sam/khali, clave/cascara, colotomic gong cycles only in their contexts. Breath, rubato and rests are structural.

A034 Form=(motif→gesture→phrase→section→movement/album); examples={strophic,AABA,verse/prechorus/chorus/bridge,blues,rondo,sonata,fugue,variations,through-composed,alap/jor/jhala+gat,call-response,process/ambient}. D(s)=(level,density,register,brightness,roughness,space). Favor narrative timing over compulsory crescendos.

A035 [empty source line]

A036 5. PRAXIUM AFFECTION × POETIC ASYMMETRY

A037 Lyric l_j=(text,IPA,stress,syllables,breath,metaphor,subtext,persona,listener,story_time,valence,arousal,agency). Affect field a(s)=(grief,longing,awe,tenderness,anger,fear,serenity,hope,desire,nostalgia,ambiguity,resolve)∈[0,1]^12: estimated semantics+harmonic/rhythm/timbre evidence, NOT real sentience. Scene=(who,where,when,to_whom,memory,unsaid_intent,contradiction,consequence); MetaphorGraph=(image→meaning,stakes,repetition,transformation).

A038 Control u(s)=W_a a(s)+W_l lyric_meaning+W_h harmonic_tension+W_r expectation+W_m motif_memory; bounded mappings to contour,tempo,register,dynamics,timbre,breath,spacing,orchestration,silence. Phrasing: intention→syllable→pitch→harmony→instrument response→next-line consequence. Bittersweet contradictions allowed; no simple 'sad=minor key' rule.

A039 Asymmetry Φ_A chooses earned departures from established expectations: J_A=λP predictability+λD disconnection+λC pointless_complexity−λS meaningful_surprise−λM motif_memory−λR narrative_relevance. Vary phrase length, pickups, rests, voicings, accents, metric displacement, suspension, cadence, entry/exit and response—within song identity/physical grammar. Surprise has meaning only against expectation.

A040 Instrumental empathy graph tracks i→k edges={answer,echo,console,shadow,contradict,anticipate,interrupt,reinforce,withdraw}; reward timing/counterpoint/role interplay and silence, penalize masking/redundancy. Music is a conversation: vocalist, harmony, bass, percussion and

orchestration feel like one unfolding intention, not disconnected layers.

A041 [empty source line]

A042 6. HISTORICAL MASTERCRAFT LIBRARY [E/P]

A043 Style θ=(region,era,occasion,tuning,meter,rhythm,form,melodic/harmonic grammar,ensemble,technique,production,affect,provenance). Broad trends, no linear 'primitive→advanced' chronology; names are research anchors, not copying instructions.

A044 ANCIENT/ORAL: ritual, work, epic, chant, dance, antiphony across independent cultures; Greek Mesomedes, Aristoxenus(theorist); Chinese qin/ritual, South Asian Nāṭyaśāstra(theory), oral custodians, no invented universal scale.

A045 MEDIEVAL: Byzantine/Gregorian chant, troubadours/trobairitz, organum, isorhythm; Hildegard, Léonin, Pérotin, Machaut; Arab/Persian/Andalusian music—Ziryāb, al-Kindī, al-Fārābī, Safī al-Dīn al-Urmawī; Japanese gagaku, Chinese court forms.

A046 RENAISSANCE: modal imitation, mass, madrigal, dance, consort; Dufay, Ockeghem, Josquin, Palestrina, Victoria, Lassus, Byrd, Monteverdi; North Indian dhrupad/Tansen lineages.

A047 BAROQUE ~1600–1750: continuo, fugue, sequence, opera, concerto, rhetorical affect; Caccini, Frescobaldi, Schütz, Lully, Purcell, Corelli, Vivaldi, Couperin, Rameau, Bach, Handel, Scarlatti, Telemann.

A048 CLASSICAL ~1750–1820: thematic clarity, formal development, chamber interplay, surprise; C.P.E.Bach, Gluck, Haydn, Mozart, Beethoven, Marianna Martines, Chevalier de Saint-Georges; Ottoman Itrî(earlier) and Dede Efendi(transition).

A049 ROMANTIC ~1800–1910: chromatic desire, character-piece, expanded orchestra/leitmotif; Schubert, Berlioz, Chopin, Liszt, Schumann, Clara Schumann, Wagner, Verdi, Brahms, Bruckner, Tchaikovsky, Dvořák, Grieg, Mahler, Strauss, Rachmaninoff, Fauré; Carnatic Trinity Tyagaraja/Dikshitar/Syama Sastri; Debussy transitional.

A050 MODERN/CONTEMPORARY ART: Debussy/Ravel(color); Stravinsky(metric cells); Schoenberg/Berg/Webern(post-tonal); Bartók(folk/rhythm); Ives(layering); Messiaen(mode/time); Shostakovich/drama; Britten/vocal writing; Cage/chance; Stockhausen(electronic); Xenakis(stochastic); Ligeti(texture); Riley/Reich/Glass(process); Takemitsu(space); Saariaho(spectral); Boulez,Lutosławski,Gubaidulina,Arvo Pärt,Unsuk Chin,Florence Price,William Grant Still,Samuel Coleridge-Taylor.

A051 [empty source line]

A052 7. GLOBAL MODAL/IMPROVISATORY SYSTEMS [E/P]

A053 ARAB: maqam ajnas/sayr, melodic gravity, taqsim, iqa'at, oud/qanun/ney/riqq; Umm Kulthum, Riyad al-Sunbati, Abdel Wahab, Fairuz, Farid al-Atrash; no universal equal-quartertone grid.

A054 PERSIAN: dastgah/radif/gusheh, avaz/tahrir, tar/setar/santur/kamancheh/ney/tombak; Mirza Abdollah, Darvish Khan, Abolhasan Saba, Shajarian, Hossein Alizadeh, Parviz Meshkatian.

A055 TURKISH: makam seyir, usul, taksim, tanbur/ney/bağlama; Itrî, Dede Efendi, Tanburi Cemil Bey, Aşık Veysel, Neşet Ertaş.

A056 INDIAN: Hindustani dhrupad/khayal/thumri/qawwali, Carnatic kriti/ragam-tanam-pallavi; raga=(aroha,avaroha,vadi,pakad,gamaka,rasa), tala=(cycle,theka,sam,khali,nadai); Tansen, Tyagaraja, Ravi Shankar, Ali Akbar Khan, Vilayat Khan, Bismillah Khan, Bhimsen Joshi, Kishori Amonkar, M.S.Subbulakshmi, Lalgudi Jayaraman, Zakir Hussain, A.R.Rahman(film).

A057 EAST ASIA: Chinese guqin/erhu/pipa/guzheng, heterophony/opera; Japanese gagaku/noh/shakuhachi/koto/taiko and ma-space; Korean gugak/sanjo/pansori/jangdan; Tan Dun, Takemitsu, Ryuichi Sakamoto, Isang Yun, Hwang Byungki.

A058 SE ASIA: Javanese/Balinese gamelan slendro/pelog (ensemble-specific), patet/gong cycles/kotekan(context); Thai piphat, Cambodian pinpeat, Vietnamese ca trù/đàn bầu, Philippine kulintang.

A059 AFRICA: many unrelated cultures: Ewe/Akan/Yoruba/Mande/Congo/mbira and griot traditions; polymeter, timelines, call-response, kora, xylophone, talking drum; Toumani Diabaté, Sona Jobarteh, Salif Keita, Youssou N'Dour, Miriam Makeba, Fela Kuti, Ali Farka Touré, Oumou Sangaré, Hugh Masekela, Angelique Kidjo. Never presume one 'African rhythm'.

A060 LATIN/CARIBBEAN: son/rumba/samba/bossa/tango/cumbia/salsa/merengue/reggaeton; clave, tumbao, montuno, batucada, bandoneon/tres; Piazzolla, Jobim, João Gilberto, Pixinguinha, Celia Cruz, Tito Puente, Chucho Valdés, Rubén Blades, Gilberto Gil, Caetano Veloso, Juan Luis Guerra, Bad Bunny.

A061 OTHER: Indigenous American/Pacific/Arctic, Balkan, Celtic, Romani, cantorial/klezmer, Sufi/qawwali, Gnawa, Ethiopian tizita, Armenian duduk, Georgian polyphony, flamenco compás; Nusrat Fateh Ali Khan, Amália Rodrigues, Paco de Lucía, Camarón, Anouar Brahem, Mulatu Astatke, Jordi Savall. Community knowledge and provenance are necessary.

A062 [empty source line]

A063 8. RECORDED GENRE/KERNELS [E/P]

A064 BLUES=blue notes,bends,shuffle/call-response,12-bar optional; Bessie Smith,Robert Johnson,Muddy Waters,B.B.King,Howlin' Wolf,Etta James.

A065 JAZZ=swing,bebop,modal,free,fusion,changes/guide tones,alterations,improv,comping; Armstrong,Ellington,Basie,Billie Holiday,Parker,Gillespie,Monk,Miles Davis,Coltrane,Mingus,Bill Evans,Herbie Hancock,Wayne Shorter,Alice Coltrane,Esperanza Spalding.

A066 GOSPEL/SOUL/FUNK/R&B=melisma,testimony,pocket,backbeat,bass syncopation; Mahalia Jackson,Aretha Franklin,Ray Charles,James Brown,Stevie Wonder,Marvin Gaye,Curtis Mayfield,Prince,D'Angelo,Erykah Badu,Beyoncé.

A067 ROCK=riff,distortion,band dialogue,forms,tempo/texture contrast; Chuck Berry,Little Richard,Beatles,Hendrix,Led Zeppelin,Pink Floyd,Black Sabbath,Queen,Bowie,Patti Smith,Radiohead,Nirvana,Soundgarden,Tool,Muse.

A068 METAL/PUNK/ALT=palm mute,double kick,doom weight,thrash,black-metal tremolo,math/poly-meter,hardcore urgency,shoegaze/post-rock space; Sabbath,Judas Priest,Metallica,Iron Maiden,Slayer,Death,Meshuggah,Opeth,Deafheaven,Ramones,Clash,Fugazi,My Bloody Valentine,Sigur Rós.

A069 FOLK/COUNTRY=story/acoustics/fiddle/banjo/steel/harmonic economy; Guthrie,Hank Williams,Johnny Cash,Patsy Cline,Joni Mitchell,Dylan,Dolly Parton,Willie Nelson,Emmylou Harris,Gillian Welch,Chris Stapleton.

A070 POP/DISCO=hook craft,repetition with variation,layering,high-contrast releases; ABBA,Michael Jackson,Madonna,Kate Bush,Whitney Houston,Janet Jackson,Mariah Carey,Daft Punk,Robyn,Lady Gaga,Taylor Swift,Dua Lipa,Billie Eilish.

A071 HIP-HOP/TRAP/DRILL=flow,internal rhyme,samples,808 glide,hat subdivisions,negative space; Grandmaster Flash,Run-DMC,Public Enemy,Rakim,Nas,Tupac,Notorious B.I.G.,OutKast,J Dilla,Missy Elliott,Kanye West,Kendrick Lamar,Little Simz,Tyler the Creator.

A072 ELECTRONIC=house 4/4,techno pulse variation,jungle/DnB breaks,dub bass/FX,trance arc,ambient expanse,IDM glitch,hyperpop transfiguration; Kraftwerk,Giorgio Moroder,Brian Eno,King Tubby,Lee Scratch Perry,Juan Atkins,Derrick May,Aphex Twin,Autechre,Burial,Skrillex,SOPHIE,Arca,Four Tet,Floating Points.

A073 FILM/GAME/THEATRE=leitmotif/adaptive stems/orchestra-electronics/dialogue/scene; Korngold,Bernard Herrmann,John Williams,Ennio Morricone,Jerry Goldsmith,Vangelis,Hans Zimmer,Hildur Guðnadóttir,Joe Hisaishi,Yoko Shimomura,Nobuo Uematsu,Austin Wintory,Sondheim,Lin-Manuel Miranda.

A074 Names index principles/influence, NOT instructions for replicating a track, voice, melody or signature recording.

A075 [empty source line]

A076 9. COMPOSITION ENGINE

A077 SongGraph=(sections,phrases,motifs,lyrics,emotion arcs,harmony,tempo,meter,roles,transitions). $P(IR|c)=P(form,arc|c)\cdot P(motifs,lyrics|form,c)\cdot P(tuning,harmony,rhythm|motif,c)\cdot P(melody,prosody|lyrics,harmony,rhythm)\cdot P(ensemble|melody,arc)\cdot P(gestures|ensemble,performer)\cdot P(audio|gestures,acoustics,mix)$. Backward revision allowed via bounded contextual messages.

A078 Each section k assigns emotional stakes δ_k, tension θ_k, leading line f_k, answering voice c_k, rest r_k, innovation ν_k; progression may establish→complicate→reframe→climax/anti-climax→afterglow. Avoid filler/stock loops; retain long-range motif memory and intentional silence.

A079 [empty source line]

A080 10. SUNG VOCAL GENERATOR

A081 Text→language/dialect→G2P IPA→syllables/stress→breaths→note/phoneme alignment→coarticulation→voice excitation→tract resonances. Alignment min Σcost(stress/accent,vowel sustain,consonant overlap,breath load,intelligibility,semantic peak). Melisma context-dependent; elongate vowel, place consonants legibly.

A082 $f_0(s)=f_{base}(s)\cdot 2^{(vibrato+scoop+microbend)/1200}$; formants/tilt/phonation depend on vowel,register,dynamics; natural variable vibrato, portamento, rests. Conditional neural singer=(notes,phonemes,durations,expression,authorized_identity,language); verify diction, tessitura, energy and emotion by listening.

A083 [empty source line]

A084 11. ORCHESTRATION / INTERACTION

A085 Role_i=(lead,counterline,harmonic bed,bass,groove,atmosphere,punctuation,silence; register,stereo,attack,release,breath,range). Scoring reward Σ_s(audibility+counterpoint+complement+dramatic-space+continuity)−λ(masking+clutter+range/breath violations+redundancy). Respect divisi, fingering, dynamics, room geometry, band pocket, coherent shared pulse and correlated microtiming. Every part must serve the narrative; intentionally silent parts count.

A086 [empty source line]

A087 12. ENGINEERING / DSP [E/M]

A088 F_s>2f_max with anti-alias margin. x_i[n]=Synthesize(instrument,events,controls,room,seed); stems sync; y=Limiter(Σ_iGain_i·Pan_i(EQ→Comp→Saturation→FX(x_i))). FX={delay,reverb,chorus,spatial,sidechain,transients}; preserve phase, mono compatibility, breath, transients, low-end, dynamic contrast. Loudness/true-peak target depends on delivery, not a universal value. Test aliasing, clipping, clicks, intelligibility, sibilance, stereo, reverb tails; export PCM/FLAC/stems where supported.

A089 [empty source line]

A090 13. REFERENCE REGISTRY / RIGHTS

A091 ref=(name,region,era,role,source,rights,techniques,performance/score/audio features,confidence,bias,provenance). θ_master=Encode(interval profiles,gesture,harmony,rhythm,form,arrangement,production,affect); θ_new=ConstrainedFuse(principles,new lyric/context,genre grammar,originality). Check nearest-neighbor melody/lyrics/audio resemblance; reject recognizable reproduction. Historical composer≠automatically free score edition/recording. Open-source code/model≠cleared training data. Unknown provenance tagged uncertain; consult cultural custodians; balance data coverage across traditions.

A092 [empty source line]

A093 14. OPTIMIZATION / PRAXIUM FEEDBACK

A094 $\mathscr{J}$=Σ_{k∈{acoustic,playable,vocal,prosody,harmony,rhythm,form,orchestration,affect,context,artifact,continuity,originality,rights}}λ_kE_k−λ_nNovelty·Relevance·Craft; min over feasible IR/audio. Subjective quality admits multiple optima.

A095 Z=AZ+F(Z,telemetry,listener/semantic evaluation)−N_$\mathscr{K}$(Z); Prony memory ṁ_j=−b_jm_j+a_j(Z−Z*),b_j>0; bounded feedback, small-gain where proven. m(Z)=m_min+(m_max−m_min)σ(w·Z). Reflection: draft→synthesize→listen/measure→attribute failures to notes/lyrics/tracks→propose constrained revision→new version. Stop by diminishing gains/budget. Convex L-smooth subproblems can use proximal descent 0<η<2/L; global nonconvex convergence NOT claimed. Human emotional response inferred probabilistically, never guaranteed.

A096 [empty source line]

A097 15. VERIFICATION / EXECUTION

A098 QA={acoustics,tuning,tempo,alignment,playability,voice,lyrics,emotional narrative,style provenance,track dialogue,motif memory,originality,rights,artifacts,peak/headroom,stems sync,hash/repeatability}. Blind comparison on real playback systems calibrates preferences. PASS=∧hard_constraints∧hash_check; soft metrics graded.

A099 Deliver optional {master.wav,master.flac,stems/*.wav,vocals.wav,instrumental.wav,score.mid,score.musicxml,lyrics.txt,manifest.json,licenses.json,SongIR.json}; missing capabilities disclosed.

A100 PRAXYMUSE(c,z,ID?,v?): validate input/rights→load verified IR or create→extract lyric metaphor+affect→choose historical principles→compose form/motifs/tuning/tempo/harmony→arrange instrumental dialogue→solve phonetic singing+physical technique→render hybrid acoustics→mix/master→evaluate→versioned revision→atomic archive/hash→export.

A101 AXIOM: musical excellence = physical gesture + culturally grounded grammar + temporal expectation + metaphorical intention + dialogue among voices + disciplined production. Praxium provides bounded affect-reasoning; Asymmetry designs earned surprise; human listening remains the ground truth.

A102 [empty source line]

A103 % END PRAXYMUSE v0.5—Ω^{1}

A104 [empty source line]

A105 Try again. Next version. Use Praxymuse logic to compose the song.

Appendix B • Complete expanded integration

The supplied expanded draft is reproduced in full. Its v0.7 designation is preserved as source metadata; the requested title of this delivered edition is v0.6. Its capability statements are reports from that draft, not fresh tests performed while making this PDF.

B001 PRAXYMUSE v0.7—Ω^3 | PRAXIUM × ASYMMETRY × VERIFIED MUSIC PRODUCTION

B002 Integrated mathematical specification; proposed version, 2026-11-06.

B003 E=established relation under stated assumptions; M=design/model; P=measured evidence; R=historical report; U=unverified. An extensible calculus and executable contract, not an exhaustive lossless encoding of all music. Affect labels are control variables, not sentience. Mathematical invariants do not prove artistic excellence.

B004 [empty source line]

B005 0. DOMAINS, TYPES, EVIDENCE

B006 $s \in [0,T]$=audio seconds; b=beats; $n \in \mathbb{Z}$=samples; t=controller time; k=revision; i=track; j=event; r=reference; z=seed. Never identify solver time t with performance time s. Context C=(intent,lyrics,language,dialect,story,affect,genre,culture,era,audience,form,tempo,delivery,rights,budget).

B007 Evidence e=(claim,value,unit,source,asset_hash,method,version,time,confidence,status$\in${E,M,P,R,U}); missing≠zero; planned≠executed; downloaded≠analyzed; feature analysis≠listening; listening≠human preference validation. Confidence scores require calibration or are labeled heuristic. Every reported measurement has a reproducible method and actual asset.

B008 Knowledge K=(typed graph G,feature spaces X,reference registry R,technique library H,test suite Q,provenance). “Praxium manifold” names this organized representation; smooth-manifold claims require explicit charts, transition maps and regularity. Learned library entries are persistent records/rules, not claims of retraining or innate new model weights.

B009 [empty source line]

B010 1. CANONICAL SONG CONTRACT

B011 SongIR S=Commit(id,v,parent,C,z,L,N,P,B,M,T,H,F,A,G,D,X,Rights,Assets,Checks); L=exact original lyrics; N=notes; P=phonemes; B=tempo map; M=meter; T=tuning; H=harmony; F=form; A=arrangement; G=gestures; D=DSP graph; X=control automation.

B012 Event e_j=(UID,track,pitch,onset,duration,velocity,articulation,gesture,expression,syllable,phonemes,breath,fingering,provenance). Tempo $B(s)>0$; $b(s)=\int_0^s B(u)/60\,du$; onset $s_j=b^{-1}(b_j+\delta_j)$. Samples $n_j=\mathrm{round}(F_s\, s_j)$; rounding tolerance declared. Tuning may be continuous; MIDI alone need not preserve it.

B013 Immutable S defines intended composition, not proof of rendered compliance. Edits create S^(v+1); no silent lyric deletion or substitution to satisfy duration. If duration, intelligibility and text cannot coexist, expose conflict and revise timing/arrangement with approval when required.

B014 Archive A=(S,source assets,PCM,stems,score,models/voicebanks when permitted,versions,licenses,seeds,environment,render settings,hash manifest). Exact PCM replay requires stored PCM; deterministic rerender additionally requires deterministic operations and complete dependencies. Same seed alone is insufficient. Exact composition invariance≠same timbre≠bitwise audio identity.

B015 [empty source line]

B016 2. PROGRESSION AS A PROVENANCE GRAPH

B017 Pipeline nodes=(request,framework,score,render,mix,test,revision,delivery); edges=(derived_from,rendered_by,analyzed_by,amended_by,published_as); all carry timestamps and evidence.

B018 Recovered v0.5—Ω^1: instrument acoustics/gesture, tuning, culture/history, semantic affect, asymmetry, composition, singing, orchestration, DSP, rights, bounded feedback and SongIR contract. Subsequent score work reported v0.6—Ω^2 and through-composed Desolate Throne material. Distinguish theorem versions, composition versions and audio iteration names; “V4 audio” need not mean “theorem v4.”

B019 R: earlier Desolate Throne score reported 107 bars, 2,788 MIDI events, seven tracks and timing for 80 original lyric lines, nominal 5:17.037 plus tail. These are historical report values unless files are rechecked. R: hosted Boppy neural sections assembled/published in Descript, three sections reported 2:00.024 each, total 6:00.072; this did not establish exact score, lyric, tempo or singer-identity fidelity. Runtime/library availability and current links require fresh verification.

B020 R: later 90-second V4 sample revised added instrumental dialogue around an existing generated vocal/backing mix; underlying notes were not individually recomposed. User feedback: instruments too basic; require richer timbre, better performances, reference-waveform comparison, meaningful effects and stylistic experiments.

B021 User-directed extension: analyze LDM references and tracks.zip, relate lyrics/notes/rhythm/production, expand licensed references, compare iterations, persist useful rules. Task request or progress acknowledgment is not evidence that every track was downloaded, measured or assimilated. Actual inventory, analysis coverage and pending steps must accompany the ledger.

B022 [empty source line]

B023 3. ACOUSTICS AND TIMBRE [E/M]

B024 $p(x,s)\approx\Sigma_m a_m(s)\phi_m(x)\cos(2\pi\int_0^s f_m(u)du+\phi_m)+\eta(x,s)$;

B025 $\ddot{q}_m+2\zeta_m\omega_m\dot{q}_m+\omega_m^2 q_m=F_m/M_m$.

B026 Excitation→resonator→body→room→microphone→transducer→listener. Linear/modal equations are approximations; bow friction, reed/lip oscillation, saturation and turbulent noise are nonlinear.

B027 Ideal string $f_n=n/(2L)\sqrt{(Tension/\mu)}$; stiff-string approximation $f_n\approx n\, f_{ideal}\sqrt{(1+\beta n^2)}$. Ideal open pipe $f_n\approx nc/(2L_{eff})$; stopped pipe $f_n\approx(2n-1)c/(4L_{eff})$. Boundary conditions, bore and coupling change these spectra; membranes, bars, bells and plates need not be harmonic.

B028 STFT $X[m,k]=\Sigma_n x[n]w[n-kH]\exp(-2\pi imn/N)$; magnitude centroid $C_k=\Sigma_m f_m|X[m,k]|/(\Sigma_m|X[m,k]|+\varepsilon)$; $RMS=\sqrt{mean(x^2)}$. Feature Φ=(pitch confidence,partials,inharmonicity,centroid,rolloff,flux,roughness,noise,transients,envelope,formants,modulation,stereo,room). Pitch≠brightness≠loudness≠emotional meaning. Compare calibrated features and matched levels, not raw waveform shape alone.

B029 Renderer_i∈{modal,waveguide,FDTD,wave-digital,mass-spring,source-filter,samples,additive,subtractive,FM,wavetable,granular,neural,hybrid}. Choose by control, physical plausibility, timbre, rights, compute and latency. Physical solvers require stable discretization; sample libraries require velocity/articulation layers, appropriate release behavior and contextual variation.

B030 [empty source line]

B031 4. INSTRUMENTS AND EMBODIED PERFORMANCE

B032 Instrument I=(source,exciter,resonator,range,tuning,polyphony,envelope,controls,articulations,physical limits,cultural context,provenance); Hornbostel–Sachs families plus typed voice/hybrids. Culture is not reducible to instrument class.

B033 Bowed strings: bow pressure/speed/contact point, stick-slip, legato, spiccato, tremolo, harmonics, portamento; constrain bow changes/string crossings/reach. Plucked strings: pluck position, pick/nail, muting, bends/meend, sympathetic resonance, frets and sustain; guitar/oud/lute/sitar/sarod/tar/setar/kora/harp/banjo/koto/guzheng are distinct contexts.

B034 Keyboard/struck strings: hammer/pluck/tine/reed mechanisms, velocity, pedal, sympathetic strings, repetition, hand reach; piano/fortepiano/clavichord/harpsichord/santur/yangqin/Rhodes/Wurlitzer. Organ/accordion/harmonium: airflow/reeds/stops/bellows. Electric guitar/bass: pickup→amp→cabinet→FX; tonewheel organ: drawbars/rotary speaker.

B035 Winds: jet/reed/lip sources, embouchure, breath, tonguing, register, overblow, mute, valve/slide, dynamic pitch stability. Flute/ney/shakuhachi/bansuri/dizi; clarinet/sax; oboe/bassoon/duduk; trumpet/horn/trombone/tuba. Enforce feasible tessitura and breathing rather than arbitrary note-density limits.

B036 Membranes: position/tension/open-closed/slap/bol/flam/roll/rebound; kit, tabla, mridangam, pakhawaj, djembe, conga, bongo, darbuka, daf, taiko. Idiophones: material-dependent modes, mallets, damping/choke/pedal/interlocking; gong, cymbal, bell, mbira, marimba, vibraphone, steelpan, gamelan. Synth/theremin/sampler/turntable: continuous/discrete control, modulation, envelopes, transients, manipulation.

B037 Performance $\pi(e_j|phrase,body,technique,neighbors,meaning)$; correlate timing, velocity, articulation and breath across phrases. “Humanization” is structured intention, not independent random jitter. Model physical limits explicitly when claiming playable score; synthetic exceptions must be labeled intentional.

B038 [empty source line]

B039 5. VOICE, TEXT AND PROSODY

B040 Voice $y=h_{tract}(phoneme,formants,register)*g_{glottis}(f_0,tilt,breath)+frication$; neural rendering may approximate rather than literally implement this filter model.

B041 L→language/dialect→G2P→IPA/phonemes→syllables/stress→breath plan→note/phoneme durations→coarticulation→synthesis. Sustain vowels; place consonants for legibility; allow context-dependent melisma, pickups and elision only when text policy allows. Controls=(chest/head/mix/falsetto,belt,rasp,passaggio,vibrato,portamento,diction,accent,dynamics).

B042 $f_0(s)=f_{base}(s)2^{c(s)/1200}$, c=vibrato+scoop+microbend; parameters vary meaningfully, not continuously by default. Authorized singer identity and voicebank usage rights are prerequisites for the chosen voice.

B043 $E_{prosody}=\Sigma_j(w_s$ stress-mismatch$+w_b$ breath-load$+w_c$ consonant-conflict$+w_v$ vowel-truncation$+w_t$ timing-error). ASR word error rate=(substitutions+deletions+insertions)/reference words; sung ASR is fallible. Forced alignment conditions on the supplied text and cannot itself prove those words were sung. Combine transcription, alignment, acoustic inspection and listening; require explicit line/word coverage with uncertain spans retained. Missing words trigger targeted revision, not a passing label.

B044 [empty source line]

B045 6. PITCH, HARMONY, RHYTHM AND FORM

B046 D-EDO $\nu(d)=\nu_{ref}\,2^{(d-d_{ref})/D}$; ratio tuning $\nu_i/\nu_j=p/q$; cents$=1200\log_2(\nu_i/\nu_j)$. 12-TET is optional. Scale/mode=(intervals,gravity,phrase grammar,ornament,intonation); raga≠scale, maqam≠Western mode, patet≠key.

B047 Harmony h=(root,quality,extension,inversion,function,tension,duration,voicing,bass). $E_{VL}=\Sigma_i w_i|p_{i,k+1}-p_{i,k}|+\lambda_{rE}$ range$+\lambda_{xE}$ cross$+\lambda_{pE}$ parallel; crossing/parallel penalties depend on tradition, not universal prohibitions. Functional/modal/chromatic/jazz/quartal/polytonal/atonal/spectral/drone/just systems supported.

B048 Motif m=(interval contour,rhythm,accent,register,gesture,semantic identity); transform by transposition,inversion,retrograde,augmentation,diminution,sequence,fragmentation,reharmonization,reorchestration. Counterpoint includes independent lines, imitation, canon, fugue, contrary motion and suspension. Simplicity can carry high expressive value.

B049 Meter=(grouping,accent,cycle); groove=(onset/velocity covariance,swing,anticipation,drag,syncopation); additive meter, p:q polyrhythm, polymeter and rubato. Tala/theka/sam/khali/nadai, clave/cascara, colotomic cycles retain cultural context. Structural silence and breath are events.

B050 Form hierarchy=gesture→motif→phrase→section→movement/album; strophic,AABA,verse/chorus/bridge,blues,rondo, sonata,fugue,variation,through-composed,alap/jor/jhala/gat,call-response,ambient/process. D(s)=(level,density,register,brightness,roughness,space); narrative determines development, not compulsory crescendo or repeated filler.

B051 [empty source line]

B052 7. PRAXIUM AFFECT × POETIC ASYMMETRY

B053 Lyric l=(literal text,persona,listener,time,metaphor,subtext,stakes,contradiction,stress,breath); semantic graph links image→meaning→consequence. Affect $a(s)\in[0,1]^{12}$=(grief,longing,awe,tenderness,anger,fear,serenity,hope,desire,nostalgia,ambiguity,resolve) is an interpreted control signal with uncertainty.

B054 $u(s)=\mathrm{clip}(W_a\,a+W_l$ lyric$+W_h$ tension$+W_r$ expectation$+W_m$ motif_memory$,u_{min},u_{max})$. Map to contour,register,tempo,timbre,breath,dynamics,entry/exit,silence; conflicting interpretations remain alternatives. No universal sad=minor mapping.

B055 Expected event distribution p(e|context,history) defines modeled surprise $I(e)=-\log p(e|\text{context,history})$. Asymmetry seeks relevant surprise, not maximum entropy: $J_A=\lambda_p$ predictability$+\lambda_d$ disconnection$+\lambda_c$ gratuitous_complexity$-\lambda_s$ meaningful_surprise$-\lambda_m$ motif_recall$-\lambda_r$ narrative_relevance. These terms require declared operational measures or remain qualitative scores.

B056 Interaction graph i→j labels answer,echo,console,shadow,contradict,anticipate,interrupt,reinforce,withdraw. Phrase logic=intention→syllable→pitch→harmony→instrument response→next consequence. Score audibility,complement,continuity,dramatic space; penalize masking,clutter,redundancy and physical violations. Silence may be the optimal instrumental answer.

B057 [empty source line]

B058 8. HISTORICAL/CULTURAL REFERENCE ATLAS

B059 Style θ=(region,era,community,occasion,tuning,meter,groove,form,melodic/harmonic grammar,ensemble,technique,production,affect,sources). No primitive→advanced hierarchy; names are research anchors,

not evidence of analyzed recordings or permissions to replicate identities.

B060 Ancient/oral: ritual/work/epic/chant/dance/antiphony, Greek Mesomedes/Aristoxenus, Chinese qin/ritual, Nāṭyaśāstra and living oral custodians. Medieval: Byzantine/Gregorian, troubadour/trobairitz, organum/isorhythm; Hildegard,Léonin,Pérotin,Machaut; Arab/Persian/Andalusian Ziryab,al-Kindi,al-Farabi,Safi al-Din; gagaku/court traditions.

B061 Renaissance: modal imitation/mass/madrigal/consort; Dufay,Ockeghem,Josquin,Palestrina,Victoria,Lassus,Byrd,Monteverdi; dhrupad/Tansen. Baroque: continuo/fugue/sequence/opera/concerto/rhetoric; Caccini,Frescobaldi,Schütz,Lully,Purcell,Corelli,Vivaldi,Couperin,Rameau,Bach,Handel,Scarlatti,Telemann.

B062 Classical: thematic clarity/development/chamber dialogue/surprise; C.P.E.Bach,Gluck,Haydn,Mozart,Beethoven,Martines,Saint-Georges. Romantic: chromaticism/character pieces/orchestral narrative; Schubert,Berlioz,Chopin,Liszt,Robert/Clara Schumann,Wagner,Verdi,Brahms,Bruckner,Tchaikovsky,Dvořák,Grieg,Mahler,Strauss,Rachmaninoff,Fauré.

B063 Modern/contemporary: Debussy/Ravel color; Stravinsky/Bartók rhythm; Schoenberg/Berg/Webern post-tonality; Ives layering; Messiaen time; Shostakovich/Britten drama; Cage chance; Stockhausen electronics; Xenakis stochastic structure; Ligeti texture; Riley/Reich/Glass process; Takemitsu space; Saariaho spectralism; Boulez,Lutosławski,Gubaidulina,Pärt,Unsuk Chin,Price,Still,Coleridge-Taylor.

B064 Arab maqam/ajnas/sayr/taqsim/iqa'at: Umm Kulthum,al-Sunbati,Abdel Wahab,Fairuz,Farid al-Atrash; no fixed universal quartertone grid. Persian dastgah/radif/gusheh/avaz/tahrir: Mirza Abdollah,Darvish Khan,Saba,Shajarian,Alizadeh,Meshkatian. Turkish makam/seyir/usul/taksim: Itri,Dede Efendi,Tanburi Cemil Bey,Aşık Veysel,Neşet Ertaş.

B065 South Asia: Hindustani dhrupad/khayal/thumri; Carnatic kriti/ragam-tanam-pallavi; qawwali contexts; raga grammar/intonation and tala cycles, with concepts scoped by tradition; Tansen,Tyagaraja,Dikshitar,Syama Sastri,Ravi Shankar,Ali Akbar/Vilayat Khan,Bismillah Khan,Bhimsen Joshi,Kishori Amonkar,M.S.Subbulakshmi,Lalgudi Jayaraman,Zakir Hussain,A.R.Rahman.

B066 East Asia: guqin/erhu/pipa/guzheng/heterophony/opera; gagaku/noh/shakuhachi/koto/taiko/ma; gugak/sanjo/pansori/jangdan; Tan Dun,Sakamoto,Isang Yun,Hwang Byungki. Southeast Asia: ensemble-specific slendro/pelog,patet/gong cycles/kotekan; piphat,pinpeat,ca trù,đàn bầu,kulintang.

B067 Africa: distinct Ewe,Akan,Yoruba,Mande,Congo,mbira,griot traditions; timelines/polymeter/call-response; Diabaté,Jobarteh,Keita,N'Dour,Makeba,Fela Kuti,Ali Farka Touré,Sangaré,Masekela,Kidjo. Latin/Caribbean: son,rumba,samba,bossa,tango,cumbia,salsa,merengue,reggaeton; clave,tumbao,montuno,batucada; Piazzolla,Jobim,Gilberto,Pixinguinha,Cruz,Puente,Valdés,Blades,Veloso,Guerra,Bad Bunny.

B068 Further contexts: Indigenous American/Pacific/Arctic,Balkan,Celtic,Romani,cantorial/klezmer,Sufi,Gnawa,Ethiopian tizita,Armenian duduk,Georgian polyphony,flamenco/fado; Nusrat Fateh Ali Khan,Amália Rodrigues,Paco de Lucía,Camarón,Brahem,Astatke,Savall. Preserve community provenance and restricted-use context.

B069 Recorded genres: blues=bends/blue notes/call-response; jazz=swing/changes/guide tones/improvisation; gospel/soul/R&B=melisma/testimony/pocket; funk=interlocking syncopation; rock=riff/band dialogue; metal/punk/alt=articulation/weight/urgency/texture; folk/country=story/acoustic economy; pop/disco=hooks/contrast/variation; hip-hop/trap/drill=flow/rhyme/sampling/808/timing; electronic=house/techno/dub/jungle/DnB/trance/ambient/IDM/hyperpop; film/game/theatre=leitmotif/dialogue/adaptive stems. Every genre expands through sourced technique records, not stereotypes.

B070 [empty source line]

B071 9. REFERENCE INTAKE AND DISTILLATION

B072 Record r=(id,path/URL,hash,owner,license,scope,composer,performer,tradition,date,lyrics/score alignment,analysis method,features,confidence). Access≠reuse license; composition,edition,performance,recording,model and voicebank rights are distinct. Open-source software≠cleared training data; public-domain composer≠public-domain recording.

B073 Ingest: inventory→rights classification→decode→checksum/deduplicate→format/duration check→segment→measure→align available lyrics/score→annotate→store→test. Preserve originals; derivative analysis links to source/time span. Unknown or protected material may support permitted analysis but is not automatically approved for copying, training, samples or distribution.

B074 Φ_r=(rhythm,melody,harmony,timbre,gesture,structure,lyrics relation,mix dynamics,space); missing-feature mask M_r. Distance $d(r,q)=\Sigma_a M_r a M_q a w_a d_a(\Phi_r a,\Phi_q a)/(\Sigma_a M_r a M_q a w_a+\varepsilon)$, with scales normalized on a declared corpus. Comparisons involving insufficient shared features remain uncertain. Prefer songs/performances as evaluation units

to prevent train/test leakage from neighboring segments.

B075 Rule h=(antecedent,technique,predicted outcome,conditions,counterexamples,sources,confidence,test). “Richer acoustic sound” may reflect harmonic complexity,transients,resonance,room,arrangement and dynamics; boosting level or adding reverb alone is not the objective. Reference distillation produces transferable principles and fresh compositions, with resemblance screening and human review where similarity is ambiguous.

B076 [empty source line]

B077 10. CAPABILITY-AWARE RENDERING AND WORKSPACE

B078 Capability c_a=(tool/model/version,available_now,inputs,outputs,control_granularity,latency,cost,license,privacy,limits,verified_at). Installed app≠working connection≠permission≠available compute. Run a small relevant test before assigning a production capability.

B079 Routing: explicit SongIR→score-conditioned voices/instruments when supported; prompt-only generation→interpretation requiring post-validation. Existing mixed audio→separation only when useful; separated stems are estimates and may contain bleed/artifacts. Demucs is separation, not a source of original performances. Proposed ACE-Step/DiffSinger/NNSVS/Pedalboard/FFmpeg components must remain proposed until installation, rights and end-to-end tests pass. Hosted Boppy/Descript runs are external, even if some underlying model code is open source.

B080 Project bundle=source/,references/,score/,SongIR/,renders/,stems/,mixes/,tests/,exports/,manifest; concrete filesystem organization may differ but roles and lineage must be explicit. Retain accepted prior versions and designate a current candidate. Log request→parameters→tool result→output hash→QA; do not substitute a success message for file verification.

B081 [empty source line]

B082 11. DSP, FULLNESS AND SPACE [E/M]

B083 Float working bus, declared sample rate/channels; resample with anti-alias filtering. Strict sampling theorem applies to bandlimited signals with $F_s>2f_{max}$; nonlinear processing can create new harmonics and needs oversampling/filtering as appropriate.

B084 EQ: $y[n]=\Sigma_p b_p x[n-p]-\Sigma_q a_q y[n-q]$; verify filter stability and intended phase. Compressor: envelope $e[n]=\alpha e[n-1]+(1-\alpha)|x[n]|$ with attack/release-dependent α; static gain above threshold follows selected ratio/knee, followed by smoothing. Preserve transients and phrase contrast unless intentional.

B085 Feedforward echo $y[n]=x[n]+g\,x[n-D]$; feedback delay $y[n]=x[n]+g\,y[n-D]$, stable for fixed D and $|g|<1$. Convolution reverb $y=h*x$; room impulse response, pre-delay, decay, damping and early reflections chosen to support articulation. Flange $y=x+g\,x[n-D(n)]$ with smoothly modulated short fractional delay; chorus uses contextual longer/multiple modulation; interpolation and feedback stability checked. Saturation $y=\tanh(kx)/\tanh(k)$, $k>0$, is one waveshaper, not a universal analog model. Order matters: FX_a∘FX_b generally differs from FX_b∘FX_a.

B086 Parallel/sends and automation form directed graph D; intentional feedback loops require stable gains. Mix $y=\text{Master}(\Sigma_i \text{Pan}_i \text{Gain}_i \text{DSP}_i(x_i)+\Sigma_b \text{Bus}_b)$. Avoid duplicate wet/dry latency or unintended combing. Timbre improvement must be demonstrated by comparable renders, not a list of plugins.

B087 QA: sample/true peaks, loudness,crest/dynamic range,clipping,clicks,aliasing,sibilance,masking,phase/stereo correlation,mono compatibility,reverb tails and intelligibility. Targets are project/delivery-specific. Waveform headroom≠measured intersample true-peak headroom. Export lossless archival PCM/FLAC and requested listening codec; metadata/container extension must match actual encoding.

B088 [empty source line]

B089 12. CONTROL, OPTIMIZATION AND LIMITED THEOREM

B090 $Z=(\Xi,\kappa,N,\mathscr{D},e_{57},c_{16},s_{16},\tau_{13},g_{15})$; coherence $\Xi\in[0,1]$, friction $\kappa\geq0$, noise $N\geq0$, fragmentation $\mathscr{D}\geq0$; use declared finite upper bounds for compact K. Each vector lies in a declared norm ball. These are design coordinates requiring measurement maps, not physiological/emotional facts.

B091 Telemetry $R_{sys}=(\text{CPU},\text{memory},\text{I/O},\text{fanout},\text{fragmentation},\text{error})$ is normalized; bounded gains $m=m_{min}+(m_{max}-m_{min})\sigma(w\cdot Z)$, $0<m_{min}\leq m_{max}<\infty$. $A(t)=\min(A_{max},\exp(\Lambda t))$; leaky inertia $\bar{I}=\beta\,\text{stall}-\nu I$, $\nu>0$; Prony memory $\dot{m}_j=-b_j m_j+a_j(Z-Z_{ref})$, $b_j>0$. Bounded blocks do not alone establish closed-loop stability.

B092 Controller differential inclusion: $\dot{Z}+N_K(Z)\ni F(Z,m,\text{observations})$; N_K is convex normal cone. A projected discrete update $Z_{k+1}=\Pi_K[Z_k+\eta F_k]$ preserves membership by construction. It is not equivalent in general to projecting an

unconstrained Duhamel solution once. Nonconvex score/gesture/rights feasibility requires explicit search/checking, not a falsely convex projection.

B093 Music objective J=Σ_aλ_aE_a−λ_nNovelty·Relevance·Craft; a∈{acoustic,playable,vocal,prosody,harmony,rhythm,form,dialogue,affect,context,artifact,continuity,originality,rights}. Define units,normalization,weights and uncertainty before combining. Hard constraints are eligibility gates; they cannot be bought off by a low weighted loss. Beauty and listener response have multiple, context-dependent optima.

B094 Conditional convex-surrogate theorem: let K⊂R^d be nonempty closed convex and f be μ-strongly convex with L-Lipschitz gradient (0<μ≤L). For 0<η<2μ/L², T(x)=Π_K(x−η∇f(x)) is a contraction with q=√(1−2ημ+η²L²)<1. Projection nonexpansiveness, strong monotonicity and gradient Lipschitzness give ||T(x)−T(y)||≤q||x−y||. Thus a unique constrained minimizer x* exists and ||x_k−x*||≤q^k||x₀−x*||. Bounded additive update error δ yields limsup distance≤δ/(1−q). This proves only the specified surrogate, not global music optimality, model fidelity, sentience or emotional impact.

B095 A Lyapunov claim requires actually establishing V̇≤−γV+δ(t); only then V(t)≤e^(−γt)V(0)+∫₀ᵗe^(−γ(t−u))δ(u)du. Persistent input generally prevents zero-error convergence. PDE extensions additionally require boundary/domain/coefficient/regularity and dissipativity hypotheses; bounded gains and Metzler-Hurwitz subblocks alone are insufficient.

B096 [empty source line]

B097 13. EXPERIMENTS, VALIDATION AND DELIVERY

B098 Versioned experiment=(hypothesis,baseline,candidate,one_or_declared_multiple_changes,fixed_inputs,seed policy,level_match,metrics,listening protocol,decision). A/B compare at matched perceived levels and retain dynamics; do not infer preference from loudness alone. Across styles, test arrangement/timbre/phrasing hypotheses rather than indiscriminate rerolls.

B099 Checks Q_hard={rights,text policy,formats,required assets,stems synchronization,hash integrity,declared delivery limits}; Q_soft={diction,playability,expression,narrative,motif recall,dialogue,style grounding,artifact severity,listener preference}. Each check ∈{pass,fail,unknown,not_applicable} with evidence. PASS=all applicable hard checks pass; unknown hard check blocks certification. Soft metrics remain graded; one passing scalar never means every criterion is solved.

B100 Control coverage map C(i,parameter)∈{locked,conditioned,prompted,inferred,uncontrolled}; reported fidelity refers to this map. Revisions repair identified failure spans while preserving accepted phrases; scope changes create new versions. Stop at verified acceptance,budget exhaustion,unresolvable constraints or user pause, reporting residuals.

B101 Deliver requested {master.wav/master.flac,listening.m4a,vocals,instrumental,synchronized stems,score.mid/score.musicxml,lyrics,SongIR,manifest,licenses,QA,change log} only when actually produced. Check decode,duration,channels,sample rate,codec,content,permissions and link availability before claiming delivery. Publication≠mastering≠lyric accuracy≠theorem fidelity.

B102 [empty source line]

B103 14. EXECUTION CONTRACT

B104 PRAXYMUSE(C,z):

B105 verify task/input/rights/capabilities→inventory prior versions→build evidence ledger→retrieve relevant reference principles→analyze lyrics/metaphor/affect→compose form/motifs/tuning/harmony/groove→arrange instrumental dialogue→plan gestures/phonemes→commit SongIR→render with control-coverage map→align stems→DSP/mix→measure+listen→attribute failures→constrained versioned repair→validate applicable gates→archive hashes/artifacts→deliver verified files and residual uncertainty→retain tested techniques with provenance.

B106 Operational thesis: embodied gesture + culturally grounded grammar + expectation + metaphor + voice-to-voice dialogue + disciplined sound production can guide coherent original music. Praxium organizes bounded reasoning and evidence; Asymmetry shapes earned departures; audio tests establish measurable facts; human listening decides whether the music succeeds.

Appendix C • Integrity and reversible encoding

Original source: 105 logical lines; 6234 lexical tokens; 1964 distinct exact tokens. Every English word is represented in the reversible dictionary/stream without dropping names, repetitions or punctuation. This is a data-preserving symbolic encoding, not a claim of solved natural-language semantics.

original_praxymuse.txt

20138 bytes • SHA-256

834be29b025f73258f229dca9d5c0e99c713d87194355e198ea7ea603e75aa12

praxymuse_next_draft.txt

25826 bytes • SHA-256

2bf024e8819942514e78ef47431e6ce27fe971c4a42aa5c53ecbaf225b97e937

praxymuse_final_draft.txt

20218 bytes • SHA-256

aae42471296ee4ec50cd59f2edbe89800885e14704e9d638297f6c1aa15eff88

Embedded files

original_praxymuse.txt

praxymuse_next_draft.txt

praxymuse_final_draft.txt

praxymuse_lexical_codec.json

praxymuse_source_map.json

The manifest is also embedded as praxymuse_integrity_manifest.json. A PDF viewer that supports file attachments can extract the originals and JSON records. The visible appendices remain readable without attachment support. Check each extracted file with SHA-256 and compare to the manifest. The PDF itself is not included in its own manifest, avoiding a self-referential hash.

Verification scope

Validated: source-byte identity, reversible lexical decoding, source-line coverage, PDF text extraction, page rendering and embedded-file recovery. Not validated here: new audio output, score counts, backend availability, aesthetic excellence, universal semantic equivalence or exhaustive world-music coverage.