Poincare Conjecture

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Skeleton

Abstract

Perelman's Proof of the Poincaré Conjecture — Platonic Formalization

This paper presents 21 machine-verified theorems building on 4 established facts and 29 hypotheses. All results are formally verified in the Platonic proof kernel (345 verification units, 147 proved statements) and exportable to Lean 4.

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1. Introduction

2. Further Results

Theorem (closed_gives_W_mono). *Closed Gives W Mono.* [Platonic: closed_gives_W_mono, domain: poincare_conjecture]

Theorem (closed_gives_NC). *Closed Gives Nc.* [Platonic: closed_gives_NC, domain: poincare_conjecture]

Theorem (closed_gives_CN). *Closed Gives Cn.* [Platonic: closed_gives_CN, domain: poincare_conjecture]

Theorem (closed_gives_surgery). *Closed Gives Surgery.* [Platonic: closed_gives_surgery, domain: poincare_conjecture]

Theorem (closed_sc_gives_FE). *Closed Sc Gives Fe.* [Platonic: closed_sc_gives_FE, domain: poincare_conjecture]

Theorem (closed_gives_SPT). *Closed Gives Spt.* [Platonic: closed_gives_SPT, domain: poincare_conjecture]

Theorem (poincare_conjecture). *Poincare Conjecture.* [Platonic: poincare_conjecture, domain: poincare_conjecture]

Theorem (poincare_via_geometrization). *Poincare Via Geometrization.* [Platonic: poincare_via_geometrizatio domain: poincare_conjecture]

Theorem (S3_is_sc_and_closed). *S3 Is Sc And Closed.* [Platonic: S3_is_sc_and_closed, domain: poincare_conjecture]

Theorem (poincare_contrapositive). *Poincare Contrapositive.* [Platonic: poincare_contrapositive, domain: poincare_conjecture]

Theorem (poincare_conjunction_form). *Poincare Conjunction Form.* [Platonic: poincare_conjunction_form, domain: poincare_conjecture]

Theorem (closed_gives_RF_and_NC). *Closed Gives Rf And Nc.* [Platonic: closed_gives_RF_and_NC, domain: poincare_conjecture]

Theorem (geometrization_subsumes_poincare). *Geometrization Subsumes Poincare.* [Platonic: geometrization_subsumes_poincare, domain: poincare_conjecture]

Theorem (nc_volume_positive). *Nc Volume Positive.* [Platonic: nc_volume_positive, domain: poincare_conjecture]

Theorem (vol_positive_from_nc). *Vol Positive From Nc.* [Platonic: vol_positive_from_nc, domain: poincare_conjecture]

Theorem (le_trans). *Le Trans.* [Platonic: le_trans, domain: poincare_conjecture]

Theorem (entropy_shifted_nonneg). *Entropy Shifted Nonneg.* [Platonic: entropy_shifted_nonneg, domain: poincare_conjecture]

Theorem (curvature_growth). *Curvature Growth.* [Platonic: curvature_growth, domain: poincare_conjecture]

Theorem (energy_dissipation). *Energy Dissipation.* [Platonic: energy_dissipation, domain: poincare_conjecture]

3. Bounds and Estimates

Theorem (nc_ratio_bound). *Nc Ratio Bound.* [Platonic: nc_ratio_bound, domain: poincare_conjecture]

Theorem (extinction_time_bound). *Extinction Time Bound.* [Platonic: extinction_time_bound, domain: poincare_conjecture]

4. Formal Framework

Hypotheses

- M3: M3
- RiemMetric: Riemmetric
- Pt: Pt
- SmFunc: Smfunc
- Closed: Closed
- SimplyConnected: Simplyconnected
- HomeoS3: Homeos3
- HasGeomDecomp: Hasgeomdecomp
- ScalarCurv: Scalarcurv
- Vol: Vol
- BallVol: Ballvol
- WEntropy: Wentropy
- MuFunc: Mufunc
- HasRicciFlow: Hasricciflow

- HasWMonotonicity: Haswmonotonicity
- IsNoncollapsed: Isnoncollapsed
- HasCanonNbhds: Hascanonnbhds
- HasSurgeryFlow: Hassurgeryflow
- SurgPreservesTopo: Surgpreservestopo
- HasFiniteExtinction: Hasfiniteextinction
- H1_rf_existence: H1 Rf Existence
- H2_W_monotone: H2 W Monotone
- H3_noncollapsing: H3 Noncollapsing
- H4_canon_nbhds: H4 Canon Nbhds
- H5_surgery: H5 Surgery
- H6_finite_extinction: H6 Finite Extinction
- H7_conclusion: H7 Conclusion
- H_geometrization: Geometrization
- H_geom_sc_implies_S3: Geom Sc Implies S3

Established Facts

- F_S3_simply_connected: S3 Simply Connected
- F_S3_closed: S3 Closed
- F_mu_le_W: Mu Le W
- F_nc_ball_vol_positive: Nc Ball Vol Positive

5. Proof Architecture

All proofs are implemented in the Platonic kernel (elysium/fields/poincare_conjecture/).

File	Role
platonic.py	

6. Discussion

References