

# Dist-AI in TLA<sup>+</sup>\*

Xiaosong Gu  
State Key Laboratory for Novel  
Software Technology  
Nanjing University  
Nanjing, China  
xxx@smail.nju.edu.cn

Jiacheng Zhao  
State Key Laboratory for Novel  
Software Technology  
Nanjing University  
Nanjing, China

Wenjun Cai  
State Key Laboratory for Novel  
Software Technology  
Nanjing University  
Nanjing, China  
xxx@smail.nju.edu.cn

Hengfeng Wei\*  
State Key Laboratory for Novel  
Software Technology  
Nanjing University  
Nanjing, China  
hfwei@nju.edu.cn

Yu Huang  
State Key Laboratory for Novel  
Software Technology  
Nanjing University  
Nanjing, China  
yuhuang@nju.edu.cn

...

...

## ABSTRACT

### PVLDB Reference Format:

Xiaosong Gu, Jiacheng Zhao, Wenjun Cai, Hengfeng Wei\*, Yu Huang, ...,  
and .... Dist-AI in TLA<sup>+</sup>. PVLDB, 14(1): XXX-XXX, 2020.  
doi:XX.XX/XXX.XX

### PVLDB Artifact Availability:

The source code, data, and/or other artifacts have been made available at  
URL\_TO\_YOUR\_ARTIFACTS.

## 1 INTRODUCTION

*TLA<sup>+</sup>, TLC, and TLAPS.*

*Automatic invariant inference.*

Overview.

- TLA<sup>+</sup> traces sampling
  - Counter-example Guided
  - Coverage (e.g., minimal spanning)
- invariants space enumeration (exploration)
  - using Apalache: VARIABLES to relations (in Ivy), which are used as items in invariants
  - convert invariants in terms of relations back to those in terms of TLA<sup>+</sup> variables
- Validation (utilizing Apalache)
  - on finite models; for any steps
- Refinement
  - Counter-example Guided
- Generalization to any models (for any steps)
  - How to validate it? (find some SMT???)

### Our Contributions.

- 
- 
- 

## 2 OVERVIEW

### 2.1 Sampling TLA<sup>+</sup> Traces

### 2.2 Enumerating Invariants

- directed by syntax of TLA<sup>+</sup>
- restricting terms, operations, ...

### 2.3 Validating Inductive Invariants

- using Apalache (modified for validating fols with quantifiers)
- using [? ]

## 3 CASE STUDY

### 3.1 Lock Server

### 3.2 Two-phase Commit

### 3.3 Paxos

## 4 RELATED WORK

DistAI

SWISS

Ivy

I4: inductive invariants for finite models (utilizing Averroes), and then generalize them to general models

Apalache

## 5 CONCLUSION

@inproceedingsProofAutomation:PhDThesis2014, title=Proof automation and type synthesis for set theory in the context of TLA+, author=Hernán Vanzetto, year=2014

\*Corresponding author. Hengfeng Wei is also with Software Institute at Nanjing University.

This work is licensed under the Creative Commons BY-NC-ND 4.0 International License. Visit <https://creativecommons.org/licenses/by-nc-nd/4.0/> to view a copy of this license. For any use beyond those covered by this license, obtain permission by emailing [info@vldb.org](mailto:info@vldb.org). Copyright is held by the owner/author(s). Publication rights licensed to the VLDB Endowment.

Proceedings of the VLDB Endowment, Vol. 14, No. 1 ISSN 2150-8097.  
doi:XX.XX/XXX.XX