Pacioli: a PROLOG system for financial report validation

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Developed for auditchain.finance
"eXtensible Business Reporting language" is used in 60+ jurisdictions in 5 continents

a common format, XBRL is output by many different accounting systems worldwide

Example: human-readable, raw XBRL, PROLOG:-), human again

Needs validation/auditing, prior and after public filings

Rules galore: concept mappings, roll ups, structure, controls... may be pre-included or injected into the report
Pacioli at work

- Submit example via Pacioli notebook
- Example batch reports:
  - Apple, last decade
  - DOW 30
  - Fortune 100
  - Web3 app
Some Prolog code:

```prolog
% Some Prolog code: loadXBRL, evaluateFormula, block detection: rollUp, typeSubtypeViolation, reportsHTML

% The report model
% Prolog representation
% JSON subsets
```

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**Under the hood**

- Some Prolog code:
  - loadXBRL
  - evaluateFormula
  - block detection: rollUp
  - typeSubtypeViolation
  - reportsHTML

- The report model
  - Prolog representation
  - JSON subsets
Query report models

addBatchedReportModels( 'https://auditchain.infura-ipfs.io/ipfs/QmSYSWjjwypXeYhWCFrYwNX6jqVq3nXYAQ1dL3behL2dDG/reports.json' ).

What is the biggest inconsistency reported?

```
DeltaGoal = ( 
  ruleOutcome(R,i,RuleID,RuleInstanceID,SupportingFacts,Delta), 
  Delta\:=null, Delta_\:=abs(Delta), 
  \\+ member(factKey(_,_,_,failed),SupportingFacts), 
  \\+ member(factKey(_,_,_,facInitialZeros/_), SupportingFacts), 
  memberchk(factKey(_,Context,_,_),SupportingFacts), 
  context(R,Context,_,_Segments,Period), 
),
findunique(Delta_\,-\,What\,-\,RuleID\,-\,Context\,-\,Period, (DeltaGoal,pacioliReport(R,_,What,_)),LL_), 
reverse(LL_,Sorted), 
forall(member(Delta_\,-\,What\,-\,RuleID\,-\,Context\,-\,Period,Sorted), 
  format("~D:\tin ~a, rule ~w , ~w (context ~a)~n",[round(Delta),What,RuleID,Period,Context])).
```
Getting real: blockchain nodes

WEB3 INFRASTRUCTURE

AUDITCHAIN LUCA SUITE

BUSINESS AND INTELLIGENCE
CONTROL COMPOSITION AND
VALIDATION

Composition UI
Ontologies, Semantics

Ontology and Semantic
Control Verification

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Pacioli Logic & Reasoning
Engine

EXTERNAL VALIDATION

PACIOLI NODE OPERATORS

External Validation of Process
Control NFTs
The Pacioli node network

- One node (Docker): Web3 Jscript driving a local Pacioli
- Launching a node
- Some nodes running
- Inside a node
- Submitting a report for validation
Conclusion

- Auditchain’s Pacioli
  - Pacioli intersects logic programming with XBRL and SBRM
    - new rule types; Logical English; etc.
    - related tools - Luca, etc
  - Spring 2022: AUDT token was listed
  - Beta testing (Polygon Mumbai), for a year now; Mainnet launch expected Q1 2023

- PROLOG rocks at 50!
  - Logical variable, DCG-based UI generation, web stack, fabric for DSLs, multi language integration, libraries, portability... and logic too :-) declarative AND procedural
  - Powering “niche” apps that matter
  - Prolog developers needed! pls email Miguel if you’re hireable