AI-powered Autonomous Test

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The era of the Artificial Intelligence has arrived.

It is time to Apply AI to Test.

A.I. will be ‘billions of times’ smarter than humans and man needs to merge with it, expert says

What is Autonomous Test?

A. Autonomous Testing and the Future of Software Development

B. AI, Please Test My App! - Software Testing and the Role of AI

C. "Uncle" Bob Martin - "The Future of Programming”

D. Not Only Cars: The Six Levels of Autonomous Testing

E. Autonomous Testing Is Like Autonomous Driving: The AI Needs Human Assistance

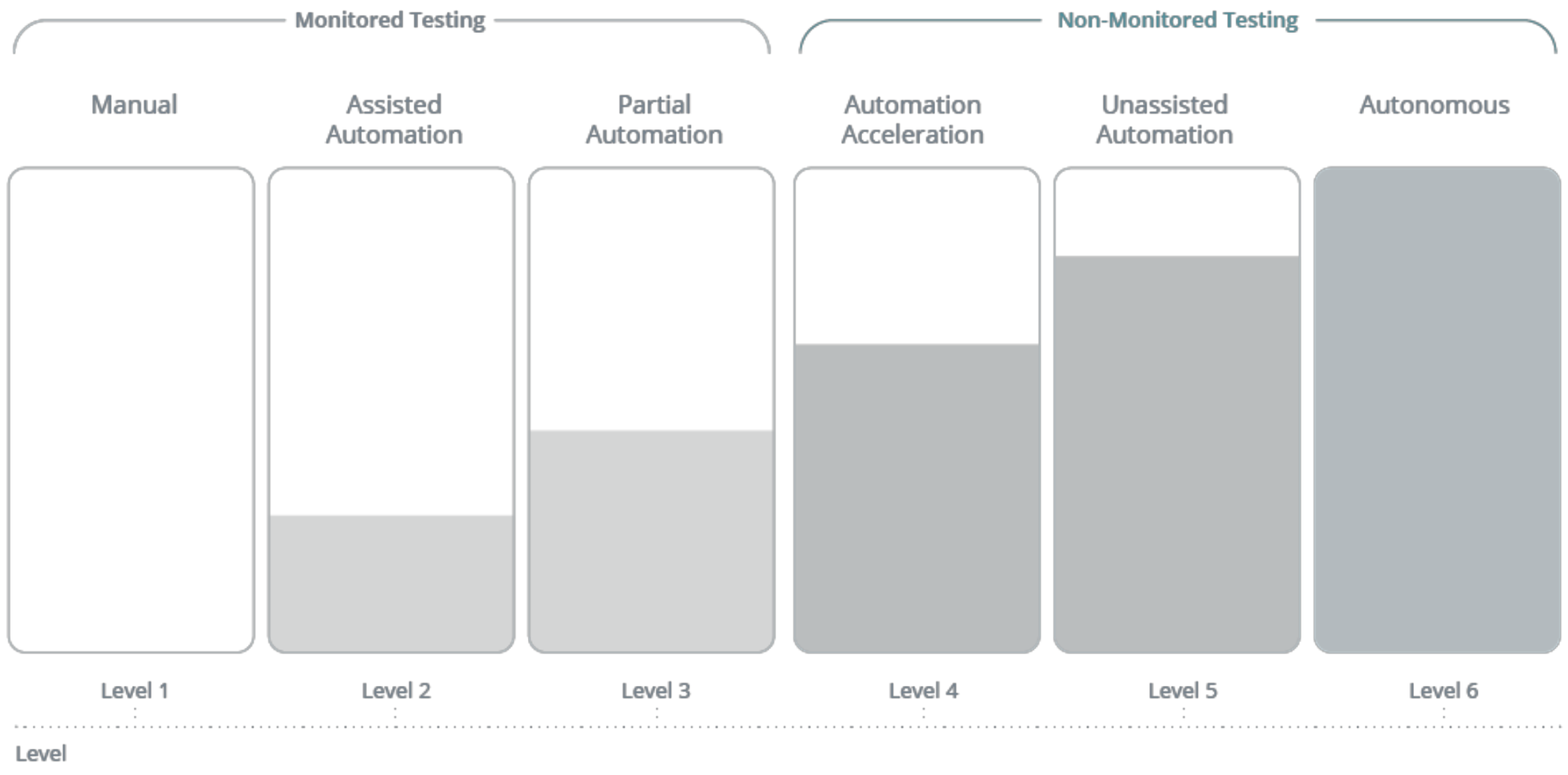
F. Six Stages from Manual to Autonomous Testing

G. Not Only Cars: The Six Levels of Autonomous Testing

H. Getting Past the Hype of Autonomous Testing

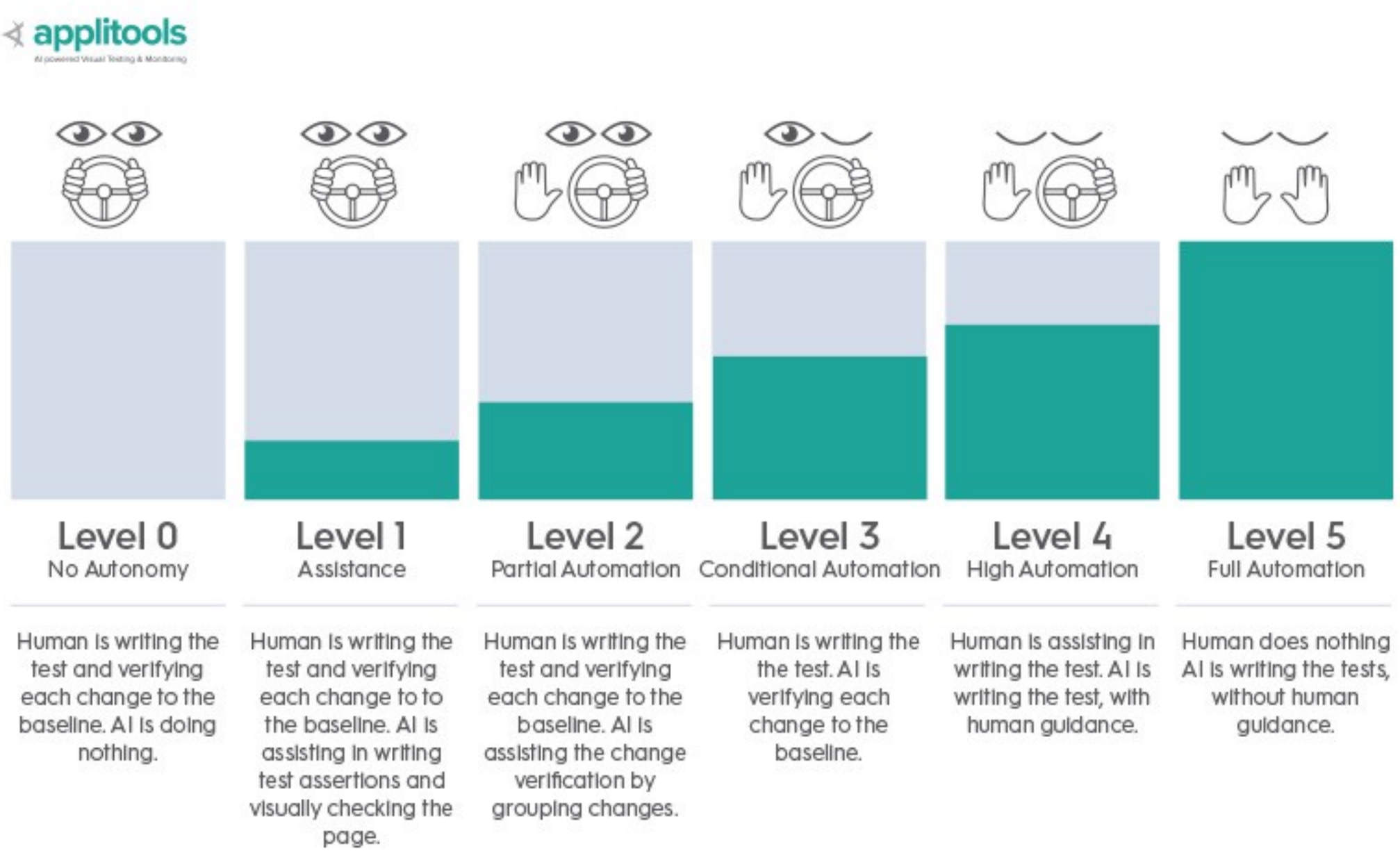
I. Autonomous Testing™ for SAP

Autonomous Test



https://smartbear.com/resources/ebooks/six-stages-from-manual-to-autonomous-testing/

Autonomous Test



https://smartbear.com/resources/ebooks/six-stages-from-manual-to-autonomous-testing/

What is Autonomous Test?

Manual → **Automation** → **Autonomy**

"Completely **Autonomous Test**" means AI will fully control the whole STLC (Software Testing Life Cycle) and take responsible for each stage of testing.

A Typical Software Testing Life Cycle

Requirement Analysis

Test Planning

Test Case Development

Test Environment Setup

Test Execution

Test Cycle Closure

https://dzone.com/articles/software-testing-life-cycle-different-stages-of-so
https://www.edureka.co/blog/software-testing-life-cycle/#testcycleclosure
https://www.guru99.com/software-testing-life-cycle.html
https://en.wikipedia.org/wiki/Software_testing#A_sample_testing_cycle

A Typical Software Testing Life Cycle

Requirement Analysis AI+

Test Planning AI+

Test Case Development AI+

Test Environment Setup AI+

Test Execution AI+

Test Cycle Closure AI+

A Typical Software Testing Life Cycle

AI+?

Requirement Analysis AI+

Test Planning AI+

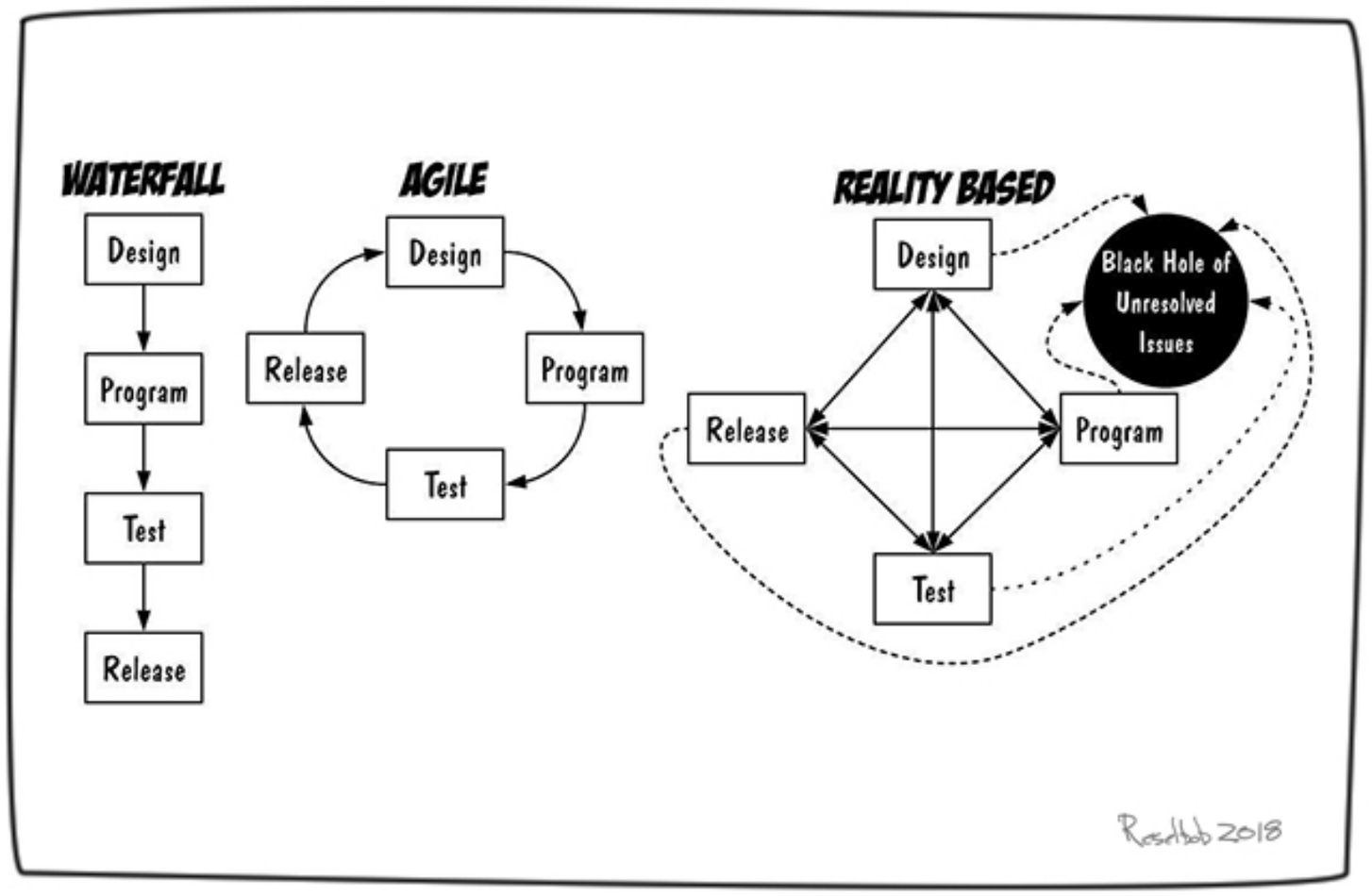
Test Case Development AI+

Test Environment Setup AI+

Test Execution AI+

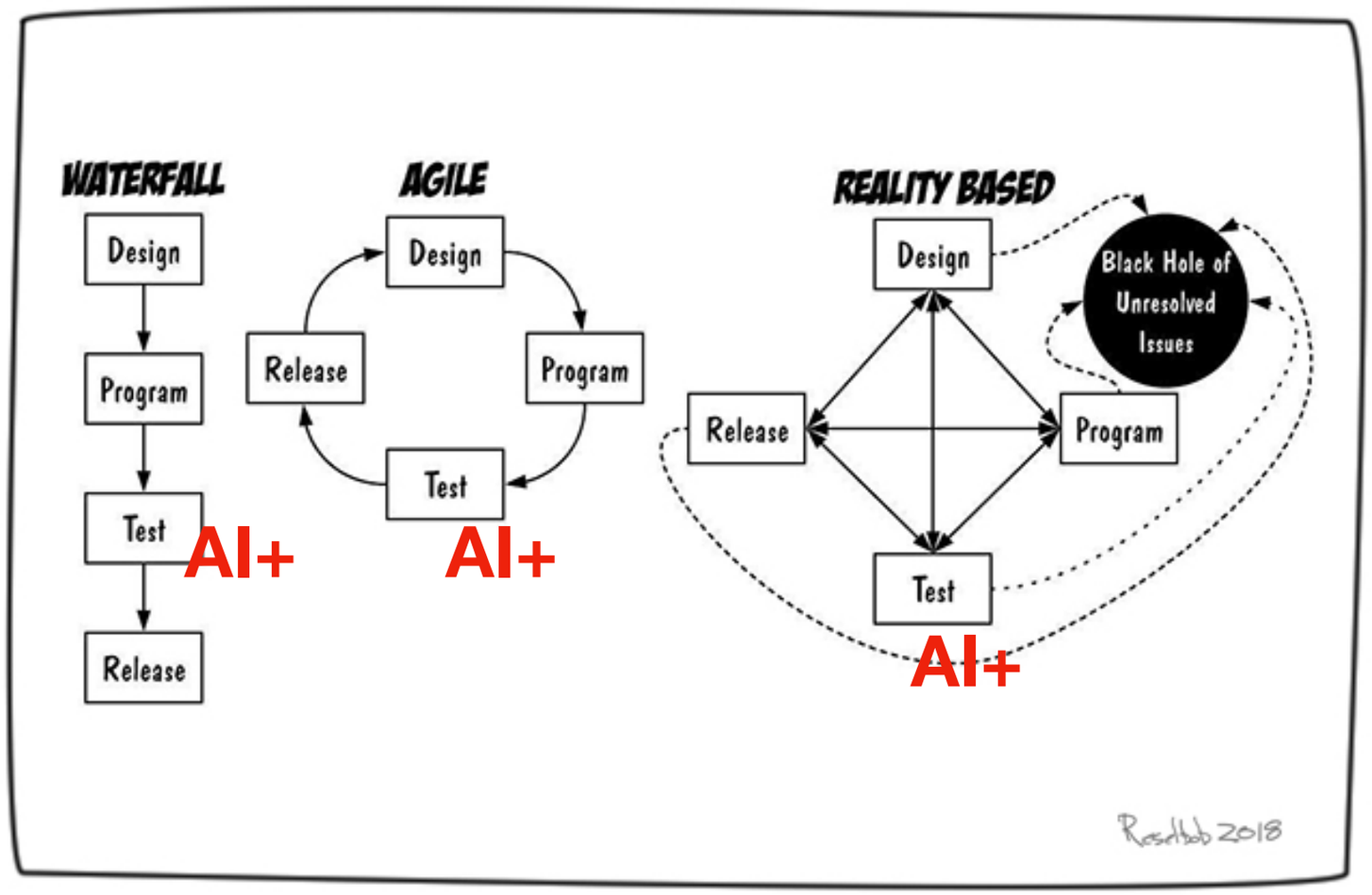
Test Cycle Closure AI+

Software Development Lifecycle Patterns



https://devops.com/software-development-lifecycle-patterns/

AI-powered Tests in Software Development Lifecycle Patterns



https://devops.com/software-development-lifecycle-patterns/

Introduction

AI-powered Autonomous Testing Platform

It’s not a single AI related test tool or solution. It’s a whole set of AI plus techniques and solutions for each software test life cycle to achieve autonomous test. Person or enterprise can take and assemble the techniques and solutions from the (AATP) platform to implement autonomous tests in their own environments.

Vision

Continuously embracing new technologies to achieve AI-driven the tests without human intervention

Challenge

- The use of AI-driven systems is still very much in its early days
- Software can never test software? (Halting_problem)
- Requirement understanding, predict and decision making
- What AIs and Robots cannot do better than humans

Challenge is also opportunity, and some startups have launched

Value

- Low latency on defect finding
- Low cost
  - 7 * 24 hour continuous working
- Find diverse issues difficult for human to cover
- Things AIs and robots do better than humans

Mission

Autonomous Test

Stage 0. Without AI, the test automation rate has not been reached to 100% (Current)

Stage 1. AI-assisted testing with human intervention implement 100% automation

Stage 2. AI analyze requirement, test plan and code generation with human guidance

Stage 3. AI fully drive test itself without human supervision

Objectives — Stage 1

STLC Stage	Mainly Activities	Objectives (obstacles to overcome)	Solutions
Requirement Analysis	Identify types of tests to be performed. Gather details about testing priorities and focus. Identify test environment details	N/A	N/A
Test Planning	Analyze various testing approaches available. Resource planning Test plan/strategy document	N/A	N/A
Test Case Development	Create test cases, test design, automation scripts, etc.	N/A	N/A
Test Environment Setup	Setup test environment and test data	Quickly setup test environments especially hardware boards involved To update or scale test environments as need	Robot arm can be used if needed
Test Execution	Execute tests as per plan Analyze failures and file defects Update test plans/test cases, if necessary Defect fixes verifications Regression tests	Too many graphic or audio related UI tests can break automation testing. Apply AI to tests to recognize the images, texts and audio, etc., in those particular scenarios.	Machine Vision, etc.
Test Cycle Closure	Test reports	N/A	N/A

AI gernerate test code

Objectives — Stage 2

STLC Stage	Mainly Activities	Objectives (obstacles to overcome)	Solutions
Requirement Analysis	Identify types of tests to be performed Gather details about testing priorities and focus Identify test environment details	AI can “understand” requirement documents	Deep Learning for Text Classification, Text Understanding, and Inference, etc.
Test Planning	Analyze various testing approaches available. Resource planning Test plan/strategy document	AI make test plan and leverage resources	AI in decision making Knowledge Graph can be involved if needed (TODO)
Test Case Development	Create test cases, test design, automation scripts	AI write and update test case	Code generation with AI
Test Environment Setup	Setup test environment and test data	N/A	N/A
Test Execution	Execute tests as per plan Analyze failures and file defects Update test plans/test cases, if necessary Defect fixes verifications Regression tests	N/A	N/A
Test Cycle Closure	Test reports	AI generate test report	AI in decision making

Objectives — Stage 3

AI fully drive test itself

STLC Stage	Mainly Activities	Objectives (obstacles to overcome)	Solution
Requirement Analysis	Identify types of tests to be performed. Gather details about testing priorities and focus. Identify test environment details	AI can “understand” requirement without human guiding	Unsupervised Learning (TODO)
Test Planning	Analyze various testing approaches available. Resource planning Test plan/strategy document	AI make test plan and leverage resources without human guiding	Unsupervised Learning (TODO)
Test Case Development	Create test cases, test design, automation scripts	AI write and update test case independently	Unsupervised Learning (TODO)
Test Environment Setup	Setup test environment and test data	AI trigger the action of test environment setting up and adjustment	N/A
Test Execution	Execute tests as per plan Analyze failures and file defects Update test plans/test cases, if necessary Defect fixes verifications Regression tests	AI take the action of test execution itself	N/A
Test Cycle Closure	Test reports	Test report was generated by AI	Unsupervised Learning (TODO)

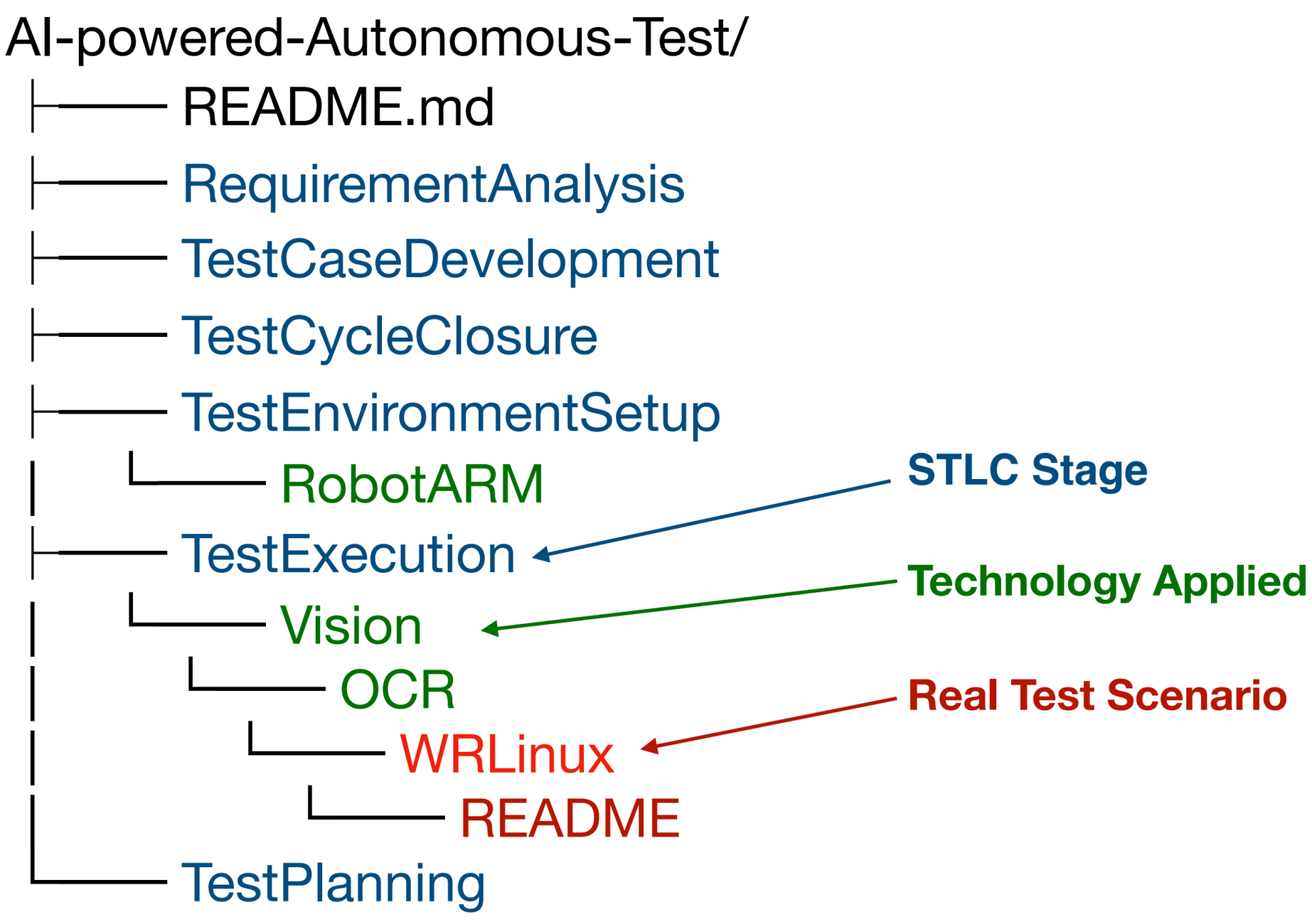
Strategies

- **Continuously following and including new AI technologies into the platform**
- **Develop and construct the test platform to the real test scenario**
- **Open Source**

Architecture

```
AI-powered-Autonomous-Test/
├── README.md
├── RequirementAnalysis
├── TestCaseDevelopment
├── TestCycleClosure
├── TestEnvironmentSetup
│   └── RobotARM
├── TestExecution
│   └── Vision
│       └── OCR
│           └── WRLinux
│               └── README
└── TestPlanning
```

Architecture



Action

Autonomous Test

STLC Stage	Actions
Requirement Analysis	More investigation on the references
Test Planning	More investigation on the references
Test Case Development	To investigate the auto code generate references
Test Environment Setup	To make a demonstration on setting up test environment with robot arm
Test Execution	To apply machine vision to detect text from video stream To apply real time object detection to do visual, automated validation UI testing
Test Cycle Closure	More investigation on the references