INTELLIGENT INTERACTION TESTS SUITE GENERATOR FOR IOT TESTING

The use of Opposition-Based Learning Jaya Algorithm

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Universiti Malaysia PAHANG
Engineering • Technology • Creativity

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Background

- Typical Internet of Things (IOT) applications consist of large heterogeneous components.
- In order to ensure free-of-bug integration, there is need for testing all possible combinations (i.e., causing combinatorial explosion problem).
- Testing all possibilities is practically impossible owing to resource and time constraints.
- In order to address these issues, t-way testing approach has been adopted to minimize the tests systematically.

IOT Interconnected Manufacturing
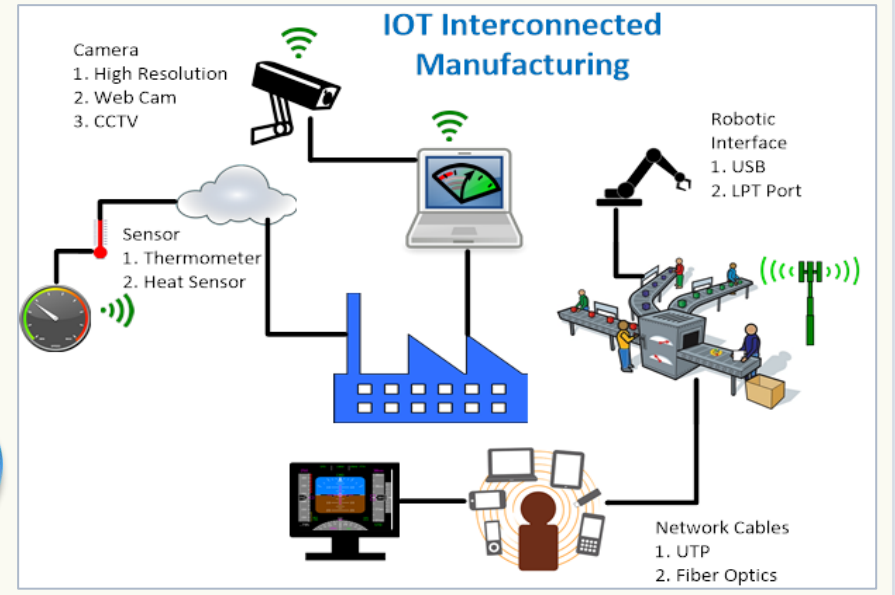
Novelty/Inventiveness

- IITSG designed for minimizing tests for large scale IOT applications.
- The tool can support both sequence and sequence-less test cases.
- IITSG utilizes the idea Adaptive Opposition-based Learning Selection (IEEE access paper).

Benefits/Usefulness/Applicability

- It is important to ensure best integration among internet of things devices.
- Finding defects and reduce risks of IOT devices.
- It is important to ensure the privacy and security issues in the internet of things.

Status of Innovation

- The tool ready for marketing.
- The tool has been tested and evaluated against existing tool.

Achievement/Award

- 4 ISI Q1 papers and 1 copyright
- 2 Gold medals at iCE-CInno 2016 + CITREX 2017.

Publication

- An Adaptive Opposition-based Learning Selection: The Case for Jaya Algorithm, 2021, IEEE Access, (Q1, IF 3.745), Early Access.
- An Elitist-Flower Pollination based Strategy for Constructing Sequence and Sequence-less T-way Test Suite Generation" International Journal of Bio-Inspired Computing, 2018, (ISI Q2, IF=1.93).
- Hybrid Flower Pollination Algorithm Strategies For T-Way Test Suite Generation" PlosOne, 2018 , (ISI Q1, IF=2.8).
- Pairwise Test Data Generation based on Flower Pollination Algorithm, MJCS, 30(3), 2017, pp. 242-257. (ISI Q4, IF=0.6)

Product Image and Product Characteristics/Results
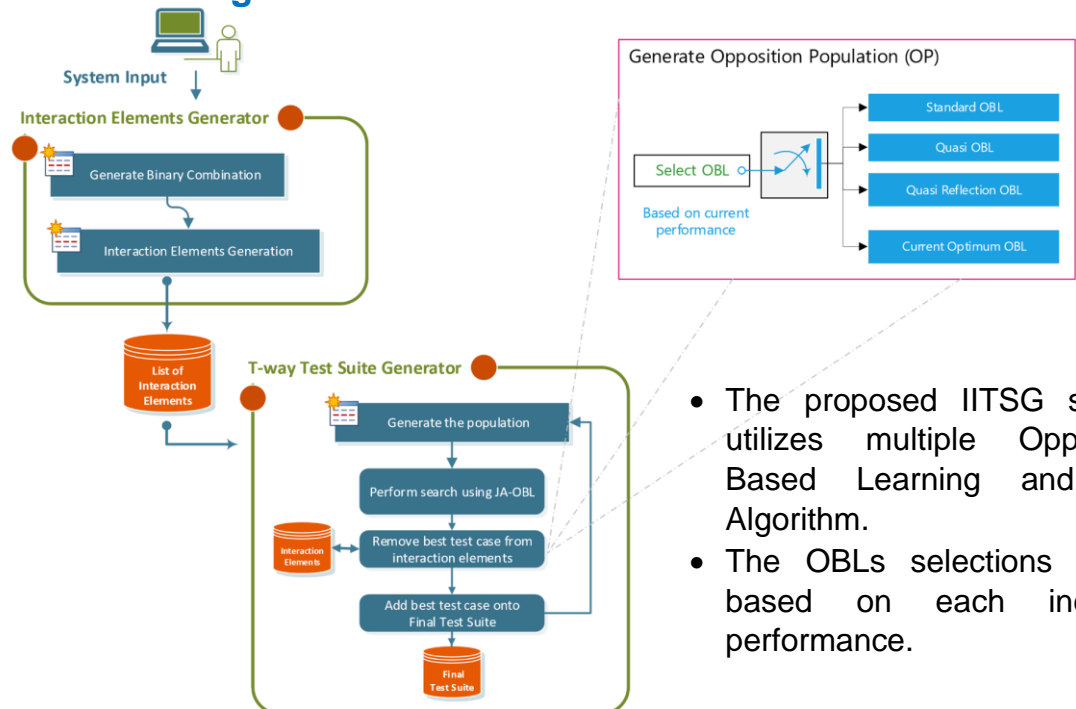
- The proposed IITSG strategy utilizes multiple Opposition-Based Learning and Jaya Algorithm.
- The OBLs selections will be based on each individual performance.

IITSG interface
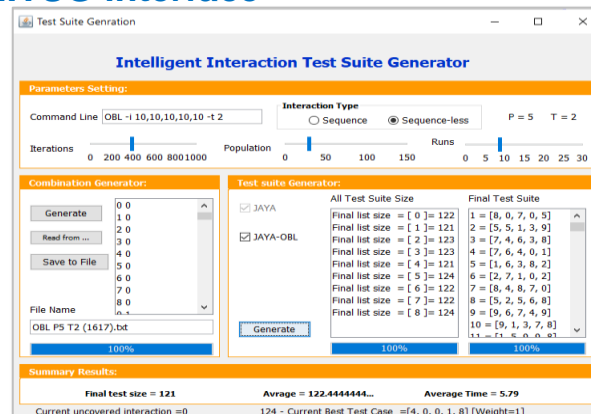
Result

t	Systems	SA	ACA	GA	PSO	HSS	CS	IITSG
2	3^3	9	9	9	9	9	9	9*
2	3^{13}	16	17	17	17	18	20	17
2	10^{10}	NA	159	157	NA	155	NA	153*
3	3^6	33	33	33	42	39	43	33*
3	4^6	64	64	64	102	70	105	64*
3	10^6	1508	1501	1473	1506	1505	NA	1470*
2	$5^1 3^8 2^2$	15	16	15	NA	20	21	20
3	$5^2 4^2 3^2$	100	106	108	NA	120	NA	117
4	2^{10}	NA	NA	NA	37	37	36	36*
5	2^{10}	NA	NA	NA	82	81	79	75*
9	2^{10}	NA	NA	NA	NA	512	NA	571
10	2^{10}	NA	NA	NA	NA	1024	NA	1024*

y^x: means that this system has x parameters, each parameter with y values.

Marketability & Commercialisation

- The developed tool can be used to test IOT applications and software product lines.
- The developed tool can be used for Software testing lab's subject.
- The tool has been successfully used to test hardware and software implementations.

Cost Analysis

Here are is some of popular tools in the market:

Tool	Price	Sequence feature
Hexawise	$1200 per year - Business unit	Not support
	$2600 per year - Enterprise-wide	Not support
SpiraTest	$6047.89 per year	Not support
IITSG	$7500 per year	Support