STEM Automated Testing Framework

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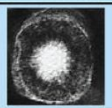
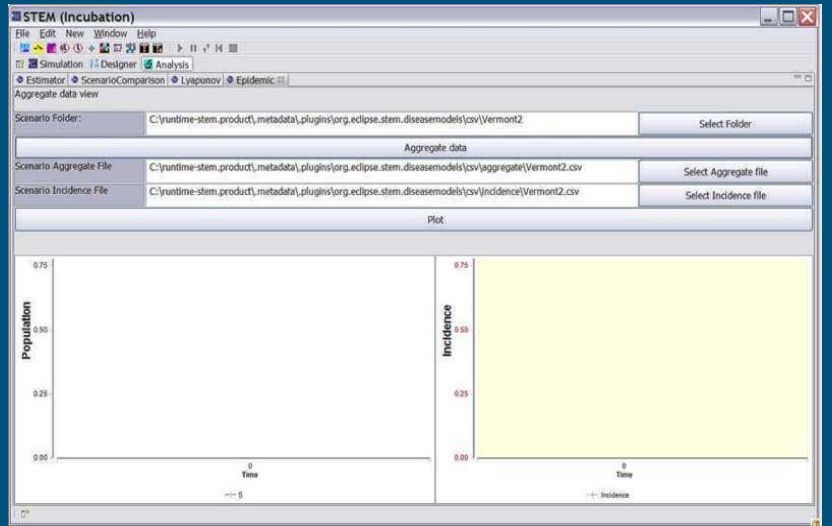
What is STEM?

- An acronym for: Spatiotemporal Epidemiological Modeler
- Software tool designed to help scientists and public health officials create and use models of emerging infectious diseases
- Aids in helping to understand and prevent the spread of such diseases

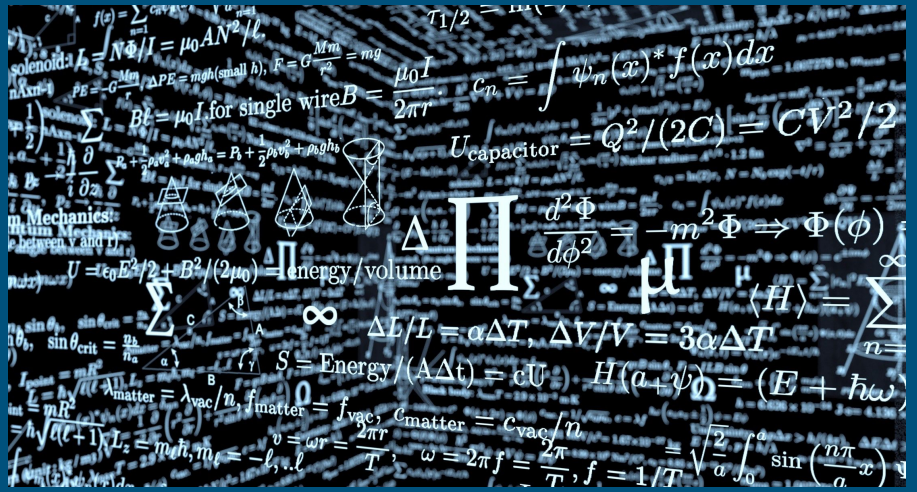
Type of pathogen	Description	Human diseases caused by pathogens of that type
Bacteria *Escherichia coli* 	Single-celled organisms without a nucleus	Strep throat, staph infections, tuberculosis, food poisoning, tetanus, pneumonia, syphilis
Viruses *Herpes simplex* 	Thread-like particles that reproduce by taking over living cells	Common cold, flu, genital herpes, cold sores, measles, AIDS, genital warts, chiken pox, small pox
Fungi *Death cap mushroom* 	Simple organisms, including mushrooms and yeasts, that grow as single cells or thread like filaments	Ringworm, athlete's foot, tinea, candidiasis, histoplasmosis, mushroom poisoning
Protozoa *Giardia lamblia* 	Single-celled organism with a nucleus	Malaria, "traveler's diarrhea" giardiasis, trypanosomiasis ("sleeping sickness")



Early Struggles

- Link failure
- Dated instructions
- Unable to run the application on Eclipse
- Tried emailing the development team
    - Never heard back

Methods Tested

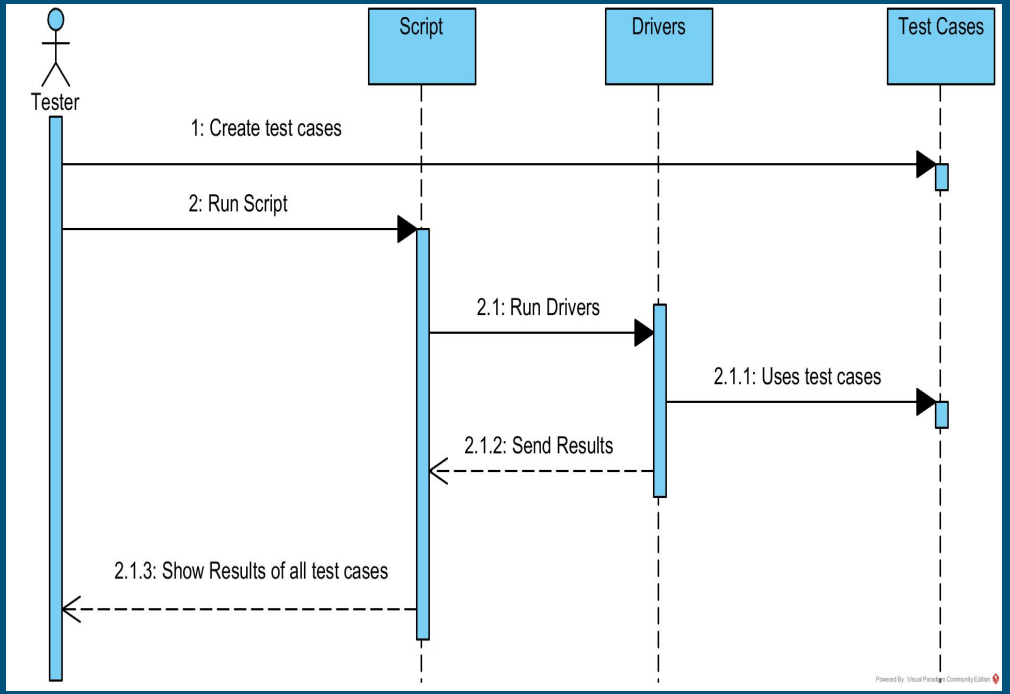


1. GCD (Greatest Common Divisor)
2. LCM (Least Common Multiple)
3. ArgMin
4. ArgMax
5. approxEqual

- All came from the MathOps.java class
- Chosen because they have definite outputs making them easy to test

Architecture

- Script is written in BASH
- Results shown in testing report




```
1
2
3  1.1
4  The ability to calculate the greatest common divisor between two integers
5  MathOps
6  gcd
7  TestAutomation.testCaseExecutables.GCDDriver
8  30
9  12
10 6
11
```

Testing Report

TEST REPORT

This report was generated on: Wed Nov 20 13:18:18 EST 2019

Test Case	Requirement	Component	Method	Driver	Arguments	Oracle	Result	PASS/FAIL
1.1	The ability to calculate the greatest common divisor between two integers	MathOps	gcd	TestAutomation.testCaseExecutables.GCDDriver	30, 12	6	6	PASS
1.2	The ability to calculate the greatest common divisor between two integers	MathOps	gcd	TestAutomation.testCaseExecutables.GCDDriver	20, 20	20	20	PASS
1.3	The ability to calculate the greatest common divisor between two integers	MathOps	gcd	TestAutomation.testCaseExecutables.GCDDriver	0, 50	50	50	PASS
1.4	The ability to calculate the greatest common divisor between two integers	MathOps	gcd	TestAutomation.testCaseExecutables.GCDDriver	2147483647, 5	1	1	PASS
1.5	The ability to calculate the greatest common divisor between two integers	MathOps	gcd	TestAutomation.testCaseExecutables.GCDDriver	-10, 17	1	1	PASS
2.1	the ability to find the index of the largest number among given indices of an array	MathOps	argMax	TestAutomation.testCaseExecutables.ArgMaxDriver	[1 2 3 4 5], [0 1 2 3 4]	4	4	PASS
2.2	the ability to find the index of the largest number among given indices of an array	MathOps	argMax	TestAutomation.testCaseExecutables.ArgMaxDriver	[500 4 3 2 1 0], [0 1 2 3 4 5]	0	0	PASS
2.3	the ability to find the index of the largest number among given indices of an array	MathOps	argMax	TestAutomation.testCaseExecutables.ArgMaxDriver	[3 4 1 100 0 -50 80], [6 3 4 1 2 0 5]	3	3	PASS
2.4	the ability to find the index of the largest number among given indices of an array	MathOps	argMax	TestAutomation.testCaseExecutables.ArgMaxDriver	[15 16 17 18 19], []	ERROR	ERROR	PASS
2.5	the ability to find the index of the largest number among given indices of an array	MathOps	argMax	TestAutomation.testCaseExecutables.ArgMaxDriver	[-45 13 16 57 11], [4 0 1]	1	1	PASS
3.1	the ability to find the index of the smallest number among given indices of an array	MathOps	argMin	TestAutomation.testCaseExecutables.ArgMinDriver	[3 4 1 100 0 -50 80], [6 3 4 1 2 0 5]	5	5	PASS
3.2	the ability to find the index of the smallest number among given indices of an array	MathOps	argMin	TestAutomation.testCaseExecutables.ArgMinDriver	[-10000000 4 1 100 0 -50 80], [6 3 4 1 2 0 5]	0	0	PASS
3.3	the ability to find the index of the smallest number among given indices of an array	MathOps	argMin	TestAutomation.testCaseExecutables.ArgMinDriver	[-5 -4 -3 -2 -1], [0 1 2 3 4]	0	0	PASS
3.4	the ability to find the index of the smallest number among given indices of an array	MathOps	argMin	TestAutomation.testCaseExecutables.ArgMinDriver	[-1 -2 -3 -4 -5], [0 1 2 3 4]	4	4	PASS
3.5	the ability to find the index of the smallest number among given indices of an array	MathOps	argMin	TestAutomation.testCaseExecutables.ArgMinDriver	[3 4 1 100 0 -50 80], []	ERROR	ERROR	PASS
4.1	The ability to calculate the least common multiple between two integers	MathOps	lcm	TestAutomation.testCaseExecutables.LCMDriver	30, 12	60	60	PASS
4.2	The ability to calculate the least common multiple between two integers	MathOps	lcm	TestAutomation.testCaseExecutables.LCMDriver	20, 20	20	20	PASS
4.3	The ability to calculate the least common multiple between two integers	MathOps	lcm	TestAutomation.testCaseExecutables.LCMDriver	0, 50	50	0	FAIL
4.4	The ability to calculate the least common multiple between two integers	MathOps	lcm	TestAutomation.testCaseExecutables.LCMDriver	2147483647, -2147483647	2147483647	0	FAIL
4.5	The ability to calculate the least common multiple between two integers	MathOps	lcm	TestAutomation.testCaseExecutables.LCMDriver	-10, -1000	1000	1000	PASS

Fault Injections

- Before the fault injections: 24 out of 25 test cases passed
- After the fault injections: Only 8 out of 25 test cases passed

TEST REPORT

This report was generated on: Wed, Nov 13, 2019 4:17:56 PM

Test Case	Requirement	Component	Method	Driver	Arguments	Oracle	Result	PASS/FAIL
1.1	The ability to calculate the greatest common divisor between two integers	MathOps	gcd	TestAutomation.testCaseExecutables.GCDDriver	30, 12	6	ERROR	FAIL
1.2	The ability to calculate the greatest common divisor between two integers	MathOps	gcd	TestAutomation.testCaseExecutables.GCDDriver	20, 20	20	ERROR	FAIL
1.3	The ability to calculate the greatest common divisor between two integers	MathOps	gcd	TestAutomation.testCaseExecutables.GCDDriver	0, 50	ERROR	ERROR	PASS
1.4	The ability to calculate the greatest common divisor between two integers	MathOps	gcd	TestAutomation.testCaseExecutables.GCDDriver	2147483647, 5	1	ERROR	FAIL
1.5	The ability to calculate the greatest common divisor between two integers	MathOps	gcd	TestAutomation.testCaseExecutables.GCDDriver	-10, 17	1	ERROR	FAIL
2.1	the ability to find the index of the largest number among given indices of an array	MathOps	argMax	TestAutomation.testCaseExecutables.ArgMaxDriver	[1 2 3 4 5], [0 1 2 3 4]	4	0	FAIL
2.2	the ability to find the index of the largest number among given indices of an array	MathOps	argMax	TestAutomation.testCaseExecutables.ArgMaxDriver	[500 4 3 2 1 0], [0 1 2 3 4 5]	0	5	FAIL
2.3	the ability to find the index of the largest number among given indices of an array	MathOps	argMax	TestAutomation.testCaseExecutables.ArgMaxDriver	[3 4 1 100 0 -50 80], [6 3 4 1 2 0 5]	3	5	FAIL
2.4	the ability to find the index of the largest number among given indices of an array	MathOps	argMax	TestAutomation.testCaseExecutables.ArgMaxDriver	[15 16 17 18 19], []	ERROR	ERROR	PASS
2.5	the ability to find the index of the largest number among given indices of an array	MathOps	argMax	TestAutomation.testCaseExecutables.ArgMaxDriver	[-45 13 16 57 11], [4 0 1]	1	0	FAIL
3.1	the ability to find the index of the smallest number among given indices of an array	MathOps	argMin	TestAutomation.testCaseExecutables.ArgMinDriver	[3 4 1 100 0 -50 80], [6 3 4 1 2 0 5]	5	3	FAIL
3.2	the ability to find the index of the smallest number among given indices of an array	MathOps	argMin	TestAutomation.testCaseExecutables.ArgMinDriver	[-10000000 4 1 100 0 -50 80], [6 3 4 1 2 0 5]	0	3	FAIL
3.3	the ability to find the index of the smallest	MathOps	argMin	TestAutomation.testCaseExecutables.ArgMinDriver	[-5 -4 -3 -2 -1], [0 1 2 3 4]	0	4	FAIL

Lessons Learned

- Within the project:
  - Became more familiar with shell scripting
  - Creating drivers
  - Benefits of Git
  - Capabilities of the Linux terminal
  - HTML/CSS for visual design
- In general:
  - Something will go wrong
  - Communication is vital in a team
  - Overall, this project was a challenging yet rewarding experience

Improvements for the Future

- Scheduling of the deliverables were spaced out nicely.
- Because most, if not everything in this project is new to us one improvement could be to demonstrate a previous group’s framework on day 1 to give us a visual idea of what we will be working towards throughout the semester.