Future Processing - summer internship 2017 document

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Unique identifier:

- XXXGITHUBVERSION
- XXXGITHUBVERSION

Total score: 40850
Archology score: 19600
Event score: 21250

2. What are your inclinations toward software engineering?

Writing clear code and reading such one makes me feel like I was popping bubble wrap. Simply I just can't hold myself back from doing it. The thought of myself being able to participate in unusual, world-changing projects, gives me shivers.

- What was the most fun for you while working with this application? Why?
First steps with the game itself. After some time it became rather frustrating (trying to maximize the score), but at the beginning I was very much into it. It was just entertaining, I enjoyed it really much.

- What was the least fun for you while working with the application? Why?
As I mentioned, maximizing the score. After I knew already how the game works, at least in some way, trying to find the best way to go through it started to be a little bit frustrating.

- Where did you spend the most time? Why?
Oh God... Trying to find the best solution for implementing the commands in the code. I wondered whether I should use polymorphism with abstract Command and a lot of subcommands, or to do two kinds of them - parameterized and unparameterized, or maybe to make something like DTO (Data transfer object), that contains name of the command inside, etc. After all I came to conclusion that the best solution is to make an enum, this way I minimized amount of code and complexity of it.

- What are you the proudest of (while working with this)? What is your greatest achievement in terms of making this solution happen?
It was my first time with C#. Also I'm proud that I managed without problems to find out how the mysterious JSON works here. Few of my friends gave up after seeing starting document, and the code itself. I'm proud that I've done this and how my code looks like. Also I'm happy that I spend a lot of time on analysis how the code should be done. I've earned some experience.

- What would you do differently if you started doing this again?
I think I wouldn't do it in any other way. What I would change is something in Your code. InternalServerError popping after the isTerminated is changing to true, should be done other way. I wrote more about it in point 6. of this document.

- What was the most difficult thing while working with this application? Why?
As always for me - to design such code, that is on decent level of readability and possibility of extending it. And of course to find out how the engine actually works. Runes, actions, etc.

1. How did you arrive to the solution?

First I kept falling at 15th month, due to earthquake. I read what advisors said in the starting document, then I tried to work out how the actions work in specific circumstances. Did You know that (Social capital increase value after Propaganda 2 / Propaganda 1) = 1.**1337 :D**.
After I knew something about results of the actions, I figured out how runes work and that helped me really much. At last I tried to find out when some events are happening.

- How did you explore the application
Import food 1, reset, Import food 2, reset… Import food 1, Import food 2, reset. I tried to find some formulas of taken actions, by having the results. After some time I tried to figure when events pop, so I tried to set specific state on the arcology and perform an action. Lots of resets were done there. Sometimes I even wrote code that was bringing me to specific month so I was able to test different scenarios after that month.

- How did you maximize the score?
After I managed to not lose I kept trying to understand what are the results of the actions. When finally I got that in some way, the thing was to prepare a scenario that ends in the way that runes are mostly OH and not less than DH. Firstly I was having problems with population. I saw that it doesn't matter if I have capacities > integrity. I just maxed it and set the population to the level I needed. Then I set the food capacity a little bigger to be able to have it higher than amount of population.

After all I got to the solution really quick, so I needed to perform some spam actions like propaganda 1 or expand population 1, just to go through the months to the last ones.

After I got there, I made sure my arcology state is fine, and used an event that pops at 90 social capital, that increased my production to the level it changed from DE to DH.

Finally I had only 2 runes of DH, so I left it like that.
You know, it was satisfying enough. I would try harder if only I had more time…

- What type of hypotheses did you make and how did you verify them?
At first I tried to find mathematical formulas between monthN and monthN+1 after taking specific action. Not understanding some actions resulted in hypotheses like:
Propaganda 200 makes people die, because population was going down every time I did it. To verify that, I tried to set my arcology in different states and perform Propaganda 200. After I got different results - sometimes people died, sometimes not, I managed to find out why it happens like that.
I found out that Propaganda 1 gives me 0.05 population. And exceeding maximum population with propaganda results in death of many…
That was the way I was verifying thoughts about my observations.

- Do you have some interesting observations you would like to share? Any thoughts about the process of solving this problem you would like to write?
Is there really a rune OE? Never had one ;D

2. What was your solution?

- What was your identifier
MarczykG@gmail.com
7A92B8815CDC8C1947EBA7E86DEDC455

- What was your solution you deemed to be the best?
Some of the actions here may be strange for You - like expand population 1, note that they are made only because I wanted to skip some months. They were intended, no randoms there.
Here goes the log (next page):

```
Report created on: 4/7/2017 16:29:52, by ArcPrime_Marczyk
Email: x
Token: x
=====================================================================

Turn: [1.0] Action performed: [Restart ]
IsTerminated: [False] Should restart: [Not yet, but be aware]

Total score:      [0.0]
Experiment score: [0.0]
Event score:      [0.0]

State of archology:
   - Food quantity:     32.0
   - Food capacity:     44.0
   - Waste:             7.0
   - Social capital:    75.0
   - Production:        100.0
   - Arcology integrity: 32.0
   - Population:        32.0
   - Population capacity: 41.0

Resulted in events:
   - SimulationStarted

Neho runes:

=====================================================================

Turn: [2.0] Action performed: [ExpandFoodCapacity 136]
IsTerminated: [False] Should restart: [Not yet, but be aware]

Total score:      [0.0]
Experiment score: [0.0]
Event score:      [0.0]

State of archology:
   - Food quantity:     25.3
   - Food capacity:     180.0
   - Waste:             10.75
   - Social capital:    75.0
   - Production:        75.0
   - Arcology integrity: 32.0
   - Population:        32.0
   - Population capacity: 41.0

Resulted in events:
   - ProductionChanged
   - FoodCapacityChanged
   - FoodQuantityChanged
   - WasteChanged

Neho runes:
[DH]
[DH]
[DH]
[NN]
[NN]
[DH]
[NN]

=====================================================================




Turn: [3.0] Action performed: [ExpandPopulationCapacity 111]
```

IsTerminated: [False] Should restart: [Not yet, but be aware]

Total score: [0.0]
Experiment score: [0.0]
Event score: [0.0]

State of archology:
  - Food quantity: 16.725
  - Food capacity: 180.0
  - Waste: 13.25
  - Social capital: 75.0
  - Production: 50.0
  - Arcology integrity: 32.0
  - Population: 32.0
  - Population capacity: 152.0

Resulted in events:
  - ProductionChanged
  - PopulationCapacityChanged
  - FoodQuantityChanged
  - WasteChanged

Neho runes:
[DH]
[DH]
[NN]
[NN]
[DH]
[DH]
[NN]

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Turn: [4.0] Action performed: [BuildArcology 168]
IsTerminated: [False] Should restart: [Not yet, but be aware]

Total score: [0.0]
Experiment score: [0.0]
Event score: [500.0]

State of archology:
  - Food quantity: 6.900
  - Food capacity: 180.0
  - Waste: 14.00
  - Social capital: 75.0
  - Production: 15.0
  - Arcology integrity: 200.0
  - Population: 32.0
  - Population capacity: 152.0

Resulted in events:
  - ProductionChanged
  - ArcologyStableAndFunctioning
  - ArcologyIntegrityChanged
  - FoodQuantityChanged
  - WasteChanged

Neho runes:
[DE]
[DH]
[OH]
[OH]
[NN]
[DH]
[NN]

==

Turn: [5.0] Action performed: [Clean 15]

IsTerminated: [False] Should restart: [Not yet, but be aware]

Total score: [0.0]
Experiment score: [0.0]
Event score: [600.0]

State of archology:
   - Food quantity: 3.700
   - Food capacity: 180.0
   - Waste: 0.375
   - Social capital: 88.0
   - Production: 7.5
   - Arcology integrity: 200.0
   - Population: 32.0
   - Population capacity: 152.0

Resulted in events:
   - WasteChanged
   - CleanArcology
   - SocialCapitalChanged
   - SocialCapitalChanged
   - ProductionChanged
   - FoodQuantityChanged
   - WasteChanged

Neho runes:
[DE]
[DH]
[OH]
[OH]
[NN]
[OH]
[NN]

==

Turn: [6.0] Action performed: [ImportFood 176]
IsTerminated: [False] Should restart: [Not yet, but be aware]

Total score: [0.0]
Experiment score: [0.0]
Event score: [600.0]

State of archology:
   - Food quantity: 176.3125
   - Food capacity: 180.0
   - Waste: 0.750
   - Social capital: 89.0
   - Production: 7.5
   - Arcology integrity: 200.0
   - Population: 32.0
   - Population capacity: 152.0

Resulted in events:
   - FoodQuantityChanged
   - SocialCapitalChanged
   - FoodQuantityChanged
   - WasteChanged

Neho runes:
[OH]
[DH]
[OH]
[OH]
[NN]
[OH]
[NN]

==

Turn: [7.0] Action performed: [WeAreReady 108]

IsTerminated: [False] Should restart: [Not yet, but be aware]

Total score: [0.0]
Experiment score: [0.0]
Event score: [600.0]

State of archology:
  - Food quantity: 134.9375
  - Food capacity: 180.0
  - Waste: 1.125
  - Social capital: 50.0
  - Production: 7.5
  - Arcology integrity: 200.0
  - Population: 140.0
  - Population capacity: 152.0

Resulted in events:
  - PopulationChanged
  - SocialCapitalChanged
  - FoodQuantityChanged
  - FoodQuantityChanged
  - WasteChanged

Neho runes:
[DH]
[DH]
[OH]
[OH]
[NN]
[DE]
[DH]

===

Turn: [8.0] Action performed: [Propaganda 200]
IsTerminated: [False] Should restart: [Not yet, but be aware]

Total score: [0.0]
Experiment score: [0.0]
Event score: [700.0]

State of archology:
  - Food quantity: 99.3750
  - Food capacity: 180.0
  - Waste: 1.125
  - Social capital: 83.0
  - Production: 0.0
  - Arcology integrity: 200.0
  - Population: 150.0
  - Population capacity: 152.0

Resulted in events:
  - SocialCapitalChanged
  - ProductionChanged
  - FoodQuantityChanged
  - PopulationChanged
  - GloryForTheLeader
  - SocialCapitalChanged
  - FoodQuantityChanged
  - WasteChanged

Neho runes:
[NN]
[DH]
[OH]
[OH]
[NN]
[OH]
[OH]

===

Turn: [9.0] Action performed: [Produce 200]

```
IsTerminated: [False] Should restart: [Not yet, but be aware]

Total score:       [0.0]
Experiment score:  [0.0]
Event score:       [700.0]

State of archology:
  - Food quantity:       77.4950
  - Food capacity:       180.0
  - Waste:               20.0775
  - Social capital:      78.0
  - Production:          126.350
  - Arcology integrity:  200.0
  - Population:          150.0
  - Population capacity: 152.0

Resulted in events:
  - ProductionChanged
  - WasteChanged
  - SocialCapitalChanged
  - FoodQuantityChanged
  - WasteChanged

Neho runes:
[NN]
[DE]
[OH]
[OH]
[NN]
[DH]
[OH]

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Turn: [10.0] Action performed: [Produce ]
IsTerminated: [False] Should restart: [Not yet, but be aware]

Total score:       [0.0]
Experiment score:  [0.0]
Event score:       [700.0]

State of archology:
  - Food quantity:       40.05875
  - Food capacity:       180.0
  - Waste:               54.8725
  - Social capital:      73.0
  - Production:          200.0
  - Arcology integrity:  200.0
  - Population:          150.0
  - Population capacity: 152.0

Resulted in events:
  - ProductionChanged
  - WasteChanged
  - SocialCapitalChanged
  - FoodQuantityChanged
  - WasteChanged

Neho runes:
[NN]
[NN]
[OH]
[OH]
[OH]
[DH]
[OH]

=======================================================================

Turn: [11.0] Action performed: [Clean 73]
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```
IsTerminated: [False] Should restart: [Not yet, but be aware]

Total score:      [0.0]
Experiment score: [0.0]
Event score:      [700.0]

State of archology:
   - Food quantity:      25.05875
   - Food capacity:      180.0
   - Waste:              8.175
   - Social capital:     76.0
   - Production:         163.5
   - Arcology integrity: 200.0
   - Population:         150.0
   - Population capacity: 152.0

Resulted in events:
   - WasteChanged
   - SocialCapitalChanged
   - ProductionChanged
   - FoodQuantityChanged
   - WasteChanged

Neho runes:
[NN]
[DH]
[OH]
[OH]
[DE]
[DH]
[OH]

=======================================================================

Turn: [12.0] Action performed: [Propaganda 1]
IsTerminated: [False] Should restart: [Not yet, but be aware]

Total score:      [0.0]
Experiment score: [0.0]
Event score:      [1200.0]

State of archology:
   - Food quantity:      5.86625
   - Food capacity:      180.0
   - Waste:              16.345
   - Social capital:     80.4142135623731
   - Production:         163.4
   - Arcology integrity: 200.0
   - Population:         150.05
   - Population capacity: 152.0

Resulted in events:
   - SocialCapitalChanged
   - BestLeaderEver
   - ProductionChanged
   - FoodQuantityChanged
   - PopulationChanged
   - FoodQuantityChanged
   - WasteChanged

Neho runes:
[NN]
[DH]
[OH]
[OH]
[DE]
[OH]
[OH]

=======================================================================


Turn: [13.0] Action performed: [ImportFood 174]
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IsTerminated: [False] Should restart: [Not yet, but be aware]

Total score: [0.0]
Experiment score: [0.0]
Event score: [1200.0]

State of archology:
   - Food quantity: 156.68875
   - Food capacity: 180.0
   - Waste: 24.515
   - Social capital: 81.4142135623731
   - Production: 163.4
   - Arcology integrity: 200.0
   - Population: 150.05
   - Population capacity: 152.0

Resulted in events:
   - FoodQuantityChanged
   - SocialCapitalChanged
   - FoodQuantityChanged
   - WasteChanged

Neho runes:
[OH]
[DE]
[OH]
[OH]
[DE]
[OH]
[OH]

===

Turn: [14.0] Action performed: [Clean 200]
IsTerminated: [False] Should restart: [Not yet, but be aware]

Total score: [0.0]
Experiment score: [0.0]
Event score: [1200.0]

State of archology:
   - Food quantity: 141.68375
   - Food capacity: 180.0
   - Waste: 3.17
   - Social capital: 84.4142135623731
   - Production: 63.4
   - Arcology integrity: 200.0
   - Population: 150.05
   - Population capacity: 152.0

Resulted in events:
   - WasteChanged
   - SocialCapitalChanged
   - ProductionChanged
   - FoodQuantityChanged
   - WasteChanged

Neho runes:
[DH]
[DH]
[OH]
[OH]
[NN]
[OH]
[OH]

===

Turn: [15.0] Action performed: [ExpandPopulationCapacity 1]

IsTerminated: [False] Should restart: [Not yet, but be aware]

Total score: [0.0]
Experiment score: [0.0]
Event score: [1450.0]

State of archology:
   - Food quantity: 125.09375
   - Food capacity: 180.0
   - Waste: 5.09
   - Social capital: 84.4142135623731
   - Production: 38.4
   - Arcology integrity: 200.0
   - Population: 150.05
   - Population capacity: 153.0

Resulted in events:
   - ProductionChanged
   - PopulationCapacityChanged
   - FoodQuantityChanged
   - WasteChanged
   - SurvivedTheEarthquake

Neho runes:
[DE]
[DH]
[OH]
[OH]
[NN]
[OH]
[OH]

==

Turn: [16.0] Action performed: [Propaganda 1]
IsTerminated: [False] Should restart: [Not yet, but be aware]

Total score: [0.0]
Experiment score: [0.0]
Event score: [1450.0]

State of archology:
   - Food quantity: 107.43875
   - Food capacity: 180.0
   - Waste: 7.005
   - Social capital: 88.8284271247462
   - Production: 38.3
   - Arcology integrity: 200.0
   - Population: 150.10
   - Population capacity: 153.0

Resulted in events:
   - SocialCapitalChanged
   - ProductionChanged
   - FoodQuantityChanged
   - PopulationChanged
   - FoodQuantityChanged
   - WasteChanged

Neho runes:
[NN]
[DH]
[OH]
[OH]
[NN]
[OH]
[OH]

==

Turn: [17.0] Action performed: [Produce]

IsTerminated: [False] Should restart: [Not yet, but be aware]

Total score: [0.0]
Experiment score: [0.0]
Event score: [1450.0]

State of archology:
    - Food quantity: 80.413429000896436845
    - Food capacity: 180.0
    - Waste: 32.543462997310689465
    - Social capital: 83.8284271247462
    - Production: 170.25641998207126310
    - Arcology integrity: 200.0
    - Population: 150.10
    - Population capacity: 153.0

Resulted in events:
    - ProductionChanged
    - WasteChanged
    - SocialCapitalChanged
    - FoodQuantityChanged
    - WasteChanged

Neho runes:
[NN]
[DE]
[OH]
[OH]
[DE]
[OH]
[OH]

===

Turn: [18.0] Action performed: [Clean 200]
IsTerminated: [False] Should restart: [Not yet, but be aware]

Total score: [0.0]
Experiment score: [0.0]
Event score: [1450.0]

State of archology:
    - Food quantity: 65.403429000896436845
    - Food capacity: 180.0
    - Waste: 3.512820999103563155
    - Social capital: 86.8284271247462
    - Production: 70.25641998207126310
    - Arcology integrity: 200.0
    - Population: 150.10
    - Population capacity: 153.0

Resulted in events:
    - WasteChanged
    - SocialCapitalChanged
    - ProductionChanged
    - FoodQuantityChanged
    - WasteChanged

Neho runes:
[NN]
[DH]
[OH]
[OH]
[NN]
[OH]
[OH]

===

Turn: [19.0] Action performed: [Produce]

IsTerminated: [False] Should restart: [Not yet, but be aware]

Total score: [0.0]
Experiment score: [0.0]
Event score: [1450.0]

State of archology:
   - Food quantity: 38.6214265031375289575
   - Food capacity: 180.0
   - Waste: 33.544004995517815775
   - Social capital: 81.8284271247462
   - Production: 200.0
   - Arcology integrity: 200.0
   - Population: 150.10
   - Population capacity: 153.0

Resulted in events:
   - ProductionChanged
   - WasteChanged
   - SocialCapitalChanged
   - FoodQuantityChanged
   - WasteChanged

Neho runes:
[NN]
[DE]
[OH]
[OH]
[OH]
[OH]
[OH]

===

Turn: [20.0] Action performed: [Clean 35]
IsTerminated: [False] Should restart: [Not yet, but be aware]

Total score: [0.0]
Experiment score: [0.0]
Event score: [1450.0]

State of archology:
   - Food quantity: 23.6114265031375289575
   - Food capacity: 180.0
   - Waste: 9.125
   - Social capital: 84.8284271247462
   - Production: 182.5
   - Arcology integrity: 200.0
   - Population: 150.10
   - Population capacity: 153.0

Resulted in events:
   - WasteChanged
   - SocialCapitalChanged
   - ProductionChanged
   - FoodQuantityChanged
   - WasteChanged

Neho runes:
[NN]
[DH]
[OH]
[OH]
[DH]
[OH]
[OH]

===

Turn: [21.0] Action performed: [ImportFood 156]

IsTerminated: [False] Should restart: [Not yet, but be aware]

Total score: [0.0]
Experiment score: [0.0]
Event score: [1450.0]

State of archology:
   - Food quantity: 160.0389265031375289575
   - Food capacity: 180.0
   - Waste: 18.250
   - Social capital: 85.8284271247462
   - Production: 182.5
   - Arcology integrity: 200.0
   - Population: 150.10
   - Population capacity: 153.0

Resulted in events:
   - FoodQuantityChanged
   - SocialCapitalChanged
   - FoodQuantityChanged
   - WasteChanged

Neho runes:
[OH]
[DH]
[OH]
[OH]
[DH]
[OH]
[OH]

==

Turn: [22.0] Action performed: [Clean 19]
IsTerminated: [False] Should restart: [Not yet, but be aware]

Total score: [0.0]
Experiment score: [0.0]
Event score: [1450.0]

State of archology:
   - Food quantity: 145.0289265031375289575
   - Food capacity: 180.0
   - Waste: 8.65
   - Social capital: 88.8284271247462
   - Production: 173.0
   - Arcology integrity: 200.0
   - Population: 150.10
   - Population capacity: 153.0

Resulted in events:
   - WasteChanged
   - SocialCapitalChanged
   - ProductionChanged
   - FoodQuantityChanged
   - WasteChanged

Neho runes:
[DH]
[DH]
[OH]
[OH]
[DE]
[OH]
[OH]

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Turn: [23.0] Action performed: [Propaganda 1]

```
IsTerminated: [False] Should restart: [Not yet, but be aware]

Total score:       [0.0]
Experiment score:  [0.0]
Event score:       [1550.0]

State of archology:
   - Food quantity:      125.5889265031375289575
   - Food capacity:      190.0
   - Waste:              18.295
   - Social capital:     93.2426406871193
   - Production:         192.9
   - Arcology integrity: 200.0
   - Population:         150.15
   - Population capacity: 163.0

Resulted in events:
   - SocialCapitalChanged
   - SuperMotivated
   - FoodCapacityChanged
   - PopulationCapacityChanged
   - ArcologyIntegrityChanged
   - PopulationChanged
   - ProductionChanged
   - FoodQuantityChanged
   - PopulationChanged
   - FoodQuantityChanged
   - WasteChanged

Neho runes:
[DE]
[DH]
[OH]
[OH]
[DH]
[OH]
[OH]

======================================================================

Turn: [24.0] Action performed: [Clean 25]
IsTerminated: [False] Should restart: [Not yet, but be aware]

Total score:       [0.0]
Experiment score:  [0.0]
Event score:       [1550.0]

State of archology:
   - Food quantity:      110.5739265031375289575
   - Food capacity:      190.0
   - Waste:              9.02
   - Social capital:     96.2426406871193
   - Production:         180.4
   - Arcology integrity: 200.0
   - Population:         150.15
   - Population capacity: 163.0

Resulted in events:
   - WasteChanged
   - SocialCapitalChanged
   - ProductionChanged
   - FoodQuantityChanged
   - WasteChanged

Neho runes:
[DE]
[DH]
[OH]
[OH]
[DH]
[OH]
[OH]

======================================================================
```

```
Turn: [25.0] Action performed: [ImportFood 80]
IsTerminated: [True] Should restart: [Perhaps, no idea]

Total score:        [40850.0]
Experiment score:   [19600.0]
Event score:        [21250.0]

State of archology:
   - Food quantity:       170.18803674843123552125
   - Food capacity:       190.0
   - Waste:               18.6139265031375289575
   - Social capital:      87.2426406871193
   - Production:          180.4
   - Arcology integrity:  200.0
   - Population:          150.15
   - Population capacity: 163.0

Resulted in events:
   - FoodQuantityChanged
   - FoodWasted
   - SocialCapitalChanged
   - WasteChanged
   - SocialCapitalChanged
   - FoodQuantityChanged
   - WasteChanged
   - EndOfSimulation

Neho runes:
[OH]
[DH]
[OH]
[OH]
[DH]
[OH]
[OH]
```

- Have you found any bugs in the code …?
Not really a bug, but I've mentioned before the thing with InternalServerError. Nothing besides of that. I wrote more about it in point 6. of the document.

- What types of events have you encountered and when are they fired.

- **ArcologyStableAndFunctioning** when integrity > max(capacities)
- **CleanArcology** when performing Clean with value at least 1 higher than the value of current waste
- **GloryForTheLeader**, when propaganda is used and population is higher than 100
- **SuperMotivated** when social capital exceeds 90
- **BestLeaderEver, PerfectSustain** , didn't find out when its fired.
- **Catastrophic, DieToEarthquake**, obvious.
- **SurvivedTheEarthquake**, 15th month is the earthquake, need 100 integrity to survive.
- **PeopleAreStartving, PeopleAreStillStarving, NevermindWeStarved**, I think that doesn't need any explanation
- **ToxicKiss** - after WasteSpill, when produce is used and waste >30 (or somewhere around that value)
- **BuildTheWorld** when production > integrity for the first time.

- How do you understand the system to work? What influences what?

Runes:

1. **Food**, easy to have OH, never really thought about that. Perhaps OH when Food >= Population, NN when lower than 1/2 of population, but not really sure about that.

2. **Waste**, NN when higher than 40, DE <21,40>, DH <1,20>, OH when 0

3 and 4 is a bit mysterious for me, I have always the same runes on both. I'm sure that it's something about integrity and capacity. Perhaps one is showing relation between **integrity** and **capacity**, and the other about integrity and current amount of food and population or something like this. Anyway, with high integrity I had always these runes of OH

5. Relation between **production and integrity** - production must be close to it, OH when >= integrity, DH when not lower by 20 than integrity, DE when lower than Integrity-20

6. **Social capital**, NN when lower than 50, DE <50,70> DH <71,80>, OH when >80

7. **Population**, NN when lower than 100, DE <100,129>, DH <130,149>, OH >= 150

Actions:

Propaganda:

- Decreases production by 10% of the value of the action, for example 100 propaganda does -10 production.

- Decreases food by 0,1 for every point of the value of the action, for example 10 propaganda does -1 food

- Propaganda 1 gives 4,41 social capital. After Propaganda 20 every point is giving no more than +0,16 social capital, so I think its most efficient to perform propaganda around this value, if you need social capital. I didn't manage to find the formula, but it has to be logarithmic one. At social capital >90 an event is fired (SuperMotivated), really useful one.

And also:
Social capital increase = 4,41 for Propaganda 1
Social capital increase = 5 for Propaganda 2
5/4,41 ~~ 1.**1337**

ILLUMINATI CONFIRMED

- Increases population for 0.05 for every point of the value of the action, for example propaganda 10 gives 0.5 population

- Doing propaganda that makes population exceed population capacity, results in death of people :(

Clean:

- Decreases production by 50% of the value of the action, for example 100 clean decreases production by 50

- Every point of value of the action reduces food lost by 0.5, for example doing clean 20 will result in losing 10 food less, than would be lost without cleaning.

- It's most efficient if you do clean with the value of the action that is at least higher by 1 comparing to the waste, for example:
Waste = 5, you should do Clean 6.

- Doing clean gives +3 to social capital. If cleaning results in waste < 5, an event CleanArcology fires with +10 capital.

Import food:

- Every point of the action should give you +1 food, but if value of the action will result in exceeding food capacity, each point that exceeds the capacity results in -0,5 food. For example:

    Food = 50, Capacity = 100
    Doing Import food 53 will result in having + 50 - 1,5 food, if not taking into count the value of waste.

- Every round you lose 10% of the population in food, if waste is 0, for example:
Population = 32, Waste = 0, in next turn the food lost passively is 3,2

- Formula of food increase after doing Import food is:
Food increased = **-10% of the value of population - 50% of the value of waste + value of food import.**
This works if value of the action will not make food exceed the capacity, like I mentioned few sentences before. For example:

    Food = 50, Capacity = 100, Waste = 5, Population = 10
    Import food 40
    Food increased = -1 -2,5 +40 = 36,5
    Food = Food -1 - 2,5 + 40 = 50 + 36,5 = 86,5

We are ready:

- Every point of value of action decreases food by 0.35 and social capital by 1, if social capital is <= 50, it doesn't reduce the social capital anymore.

- Population +1, obvious.

Build arcology:

- Always -35 production, no matter what the value of the action is.

Expand food capacity / Expand population capacity:

- Always -25 production.

- How do you think the score is calculated? Can you give your approximation of formula?
I tried to solve some systems of equations but each ones gave different results. As the variables I took experiment score and runes. I think that only runes have influence on experiment score.

For the final event score I have no idea. I had worse statistics, but higher event score in one of my attempts, and then in the other attempt I had better statistics and lower event score comparing to the one I mentioned. So events must depend only on themselves. I did not manage to find out how it works.

5. How would you improve the recruitment? What would you change in the application itself (in set of tasks you are supposed to do), why?

I think if You would give us format of the log and the document it would be easier for You to analyze our job.

About the tasks - a functionality in the application that allows to set a sequence of actions and follow the results step by step. That would be useful in trying to find out how the game works and maximize the score faster, but also show You that a person is able to write a functionality that allows to test the application. Setting the arcology in specific state and testing whether specific event fires or not in given circumstances is form of testing the app.

Also a log with exceptions, fails etc. Would be a useful information for You if the person can do such thing, but doing logging every round is something similar, so it may be enough. Of course You don't want people to fail at school or overextend too much during solving these tasks.

6. Anything you want to write to add which is not in the questions?

About the InternalServerException, and the code in MainView class at line 54.

The state of arcology is updated (Describe method in example code) no matter that TryExecuting method fails or not. The reason is that InternalServerError is returned even if the execution takes place, but the action performed led to destroying the arcology, so the simulation is terminated and **no MORE** executions are allowed **from NOW on.**

Perhaps your engine sets **IsTerminated** as first, and if its **== true** it returns InternalServerError, trying to not allow executing actions anymore.

What I think happens in your solution is:

- If the executed action stops simulation, set IsTerminated = true and return InternalServerError.

But the execution was succeful!
No matter that arcology is destroyed, execution takes place and everything is fine. The **NEXT** executions should result in InternalServerError, preventing to perform any action, because arcology is destroyed, or maybe isn't destroyed, but the simulation ended.

What I think it should look like:
If the executed action destroyed the arcology, or executed action ended the simulation, set **IsTerminated = true** and return the current state, **THEN forbid next actions from executing.**

What happens is:
{ DO STUFF, if(IsTerminated) return ERROR }

What should happen in my opinion:
{ if(IsTerminated) return ERROR, else DOSTUFF }

This would not let to execute any more actions **AFTER** terminating of the simulation, but **allow to execute ones that stop** the simulaton, without firing InternalServerError.

Why am I even pointing this? Because after InternalServerError I'm always catching false in TryExecuting and I don't know if simulation is ended or something really gone wrong. That's why the method **executeCommand in MainView** is done like it's done.

1. TryExecute, store the result
2. Even if execution failed, this may be just the end of simulation, successful or unsuccessful, never mind, go on, **it may not be an error yet.**

3. Now in try-catch, no matter that executing method failed or not, try to get the arcology state (Describe in example code) anyway, and update view. The try-catch will eventually catch an error or something, if something gone wrong while trying to receive the state of arcology from the server.
4. After updating view and arcology state, if no exception or error was fired,it means that receiving the state was fine itself. Now check if it is the end of the simulation, firstly if its successful or not, and show proper message.
5. Then if the experiment did not end, but the updating was done properly - there's only one option - TryExecute caused the fail. Execution was not successful, something must have gone wrong when sending command to the server.

That's why the method executeCommand looks like it looks. I tried to code it in a way that if something will happen, user and actually anyone will know what happened - Simulation ended successfully, the arcology got destroyed, receiving state from server failed for some reason, or maybe sending the command to the server caused the problem.

That's all what I wanted to say.
If You read all this things I wrote, I respect You.
Thanks for the opportunity to learn something new.
Have a nice day!

   Grzegorz Marczyk