

Segula Technologies
Programing Assignment Solution Report

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1. Problem Statement : Gate Of Ishtar V1.0

A portal to the other side where the council of wise resides.

Background

We are developing an action/roll-playing game which is happening in the ancient babylonian time. One important object in this fantasy world is “The Gate Of Ishtar”. Different champions in the game should occasionally pass through the gate and meet with the “council of wise”. Simple enough! But be aware that sometimes there are ancient gods and demons who guard the gate and they can hurt our champions that dare to pass the gate. Below you can find the requirement draft:

1. The amount of health (HP) a champion may lose varies between 7 and 25 HP depending on the time of the day (different god and demon forces are appearing during the day).
2. “Brand” the god of fire and “Mithr” goddess of the sun have the highest damage and a champion will lose more HP when they are guarding!
3. Champion should only lose HP once every hour.
4. Some Magical champions (e.g. Wizards, Spirits) are able to deceive the guards and pass through the gate without losing any HP.
5. Tuesdays and Thursdays are holly days in ancient babylon, so neither gods nor demons roam around the Gate. Our champions are safe from harm on the holly days.
6. Champions initial health are:
 - Human 100
 - Wizard 100
 - Spirit 100
 - Giant 150
 - Vampire 110

Assignment

The previous developer of “The Gate of Ishtar” is working in a different section nowadays (he realized that his passion lies in graphic design) and claims that the solutions is almost ready to release. You are now the new developer of this feature! Your job is to deliver the code and from now on, you are the responsible go-to-person for this solution. This is a solution you will have to put your name on as the creator of “The Gate Of Ishtar”.

This should be already given by the nature of any programming assignment, I might even offend your glorious programmer’s ego if I remind you this!

You are a software developer not someone who happens to know a programming language and hack something together (does this remind you of our previous developer who happened to be a graphic designer!). Your future is intertwined with how well you apply good software practices and avoid code smells! After all every natural born software developer respects that!

Instructions

You will find more details about your assignment if you check the previous developers code. You can make any modifications or suggestions for modifications that you see fit.

Fork this repository and deliver your results via a pull-request. You could also create a gist, for privacy reasons, and send us the link.

Solution

As Amir has suggested, I have kept it simple. The solution is implemented in **C++ Qt 5.10**¹ across the following three classes *TheGateOfIshtar*, *Champion*, and *Testing*. The class *TheGateOfIshtar* is created simply from Python code provided in the Github repository and immediately followed by few logical bug fixes. The Champion's are implemented in the class *Champion*. The testing class serves the purpose to generate input parameters (like champion object and date time list) required by the *TheGateOfIshtar* class method *calculateChampionHealth* and also performs memory management (garbage collection) to prevent memory leaks from the dynamic memory allocated (method *deallocateNewMemory*), in case if the user wants to play multiple games. Let us briefly look into the mentioned requirements and their respective implementations

- 1 The amount of health (HP) a champion may lose varies between 7 and 25 HP depending on the time of the day (different god and demon forces are appearing during the day)
- 2 "Brand" the god of fire and "Mithr" goddess of the sun have the highest damage and a champion will lose more HP when they are guarding!
- 5 Tuesdays and Thursdays are holy days in ancient babylon, so neither gods nor demons roam around the Gate. Our champions are safe from harm on the holy days.

The above requirements are implemented in the method *calculateDamageTaken* of the class *TheGateOfIshtar*. Point to notice from table 1 there are no guards during night from 21:00hr till next morning 5:59hr. But requirement 3 emphasizes that *Champion should only lose HP once every hour* forces champion to lose HP at an hourly rate². Because of requirement 5 exclude this hourly loss on holy days (Tuesday and Thursday). The below

¹I have used a new feature of Qt for Random number creation. This code will only run in Qt 5.10. To download please use the link http://ftp.jaist.ac.jp/pub/qtproject/official_releases/qt/5.10/

²my assumption

expression (1.1) calculates average damage for a champion to satisfies 3. Means when there are no guards at the gate he will lose HP at 12 per hour (*requirement 1 still holds*).

$$= \frac{7 * 0.5 + 18 * 0.5 + 25 * 1 + 18 * 0.5 + 7 * 6.5 + 13 * 0.5 + 25 * 1.5 + 18 * 1 + 7 * 1 + 13 * 1}{0.5 + 0.5 + 1 + 0.5 + 6.5 + 0.5 + 0.5 + 1.5 + 1 + 1 + 1}$$

$$= \frac{174}{14.5} = 12.0$$

(1.1)

S. No	God or Demon	Start time	End Time	Damage
1	Janna	6:00	6:29	7
2	Tiamat	6:30	6:59	18
3	Mithra	7:00	7:59	25
4	Warwick	8:00	8:29	18
5	Kalista	8:30	14:59	7
6	Ahri	15:00	15:29	13
7	Brand	15:30	16:59	25
8	Rumble	17:00	17:59	18
9	Skarner	18:00	19:59	7
10	Luna	20:00	20:59	13
11	No Guard	21:00	5:59	0 v 12

Table 1: The Gods and demons presence on the gate between start time, end time and there respective damage to injured the champion.

- 4 Some Magical champions (e.g. Wizards, Spirits) are able to deceive the guards and pass through the gate.
- 5 Tuesdays and Thursdays are holly days in ancient babylon, so neither gods nor demons roam around the Gate. Our champions are safe from harm on the holly days.

These requirements are checked before digging into the above Table 1. The holly days check is implemented in the method **hollyDay** in the class *TheGateOfIshtar* and also the invincible champions are checked in textitis**InvincibleChampion** method of Champion class

6 Champions initial health are:

- Human 100
- Wizard 100 (Invincible)
- Spirit 100 (Invincible)

- Giant 150
- Vampire 110

The Champion is created in the *Testing* class by random selection among the above-mentioned champions and health are assigned accordingly at the time of initialization of an object. The **isInvincibleChampion** is a property of champion, so this method is part of *Champion* class.

The most important input list of date time is also created in the *Testing* class method *createDateTimeList* with condition at least there is one time $t_{i-1} + 1 \leq t_i < t_{i-1} + 2$.

1.1 Conclusion

During the implementation, I have made few assumptions some may be wrong. My prime focus was on to meet all requirements as well as keep the performance, space management and correctness of solution intact.

Some Sample Outputs

For this run I have changed Holly day Tuesday to Monday.

Run 1

Champion :: Human (HP=100)					
S. No	Time	Guard	Interval	Damage	Cumulative Damage
1	Tue Apr 17 00:23:02 2018	No Guard	0	-12	12
2	Tue Apr 17 01:46:53 2018	No Guard	5031	-12	24
3	Tue Apr 17 02:20:44 2018	No Guard	2031	0	24
4	Tue Apr 17 03:10:48 2018	No Guard	5035	-12	36
5	Tue Apr 17 03:20:33 2018	No Guard	585	0	36
6	Tue Apr 17 03:39:52 2018	No Guard	1744	0	36
7	Tue Apr 17 04:16:39 2018	No Guard	3951	-12	48
8	Tue Apr 17 05:40:32 2018	No Guard	5033	-12	60
9	Tue Apr 17 05:52:34 2018	No Guard	722	0	60
10	Tue Apr 17 06:02:51 2018	Janna	1339	0	60
11	Tue Apr 17 07:11:12 2018	Mithra	5440	-25	85
12	Tue Apr 17 07:35:43 2018	Mithra	1471	0	85
13	Tue Apr 17 08:02:57 2018	Warwick	3105	0	85
14	Tue Apr 17 09:10:31 2018	Kalista	7159	-7	92
15	Tue Apr 17 09:33:28 2018	Kalista	1377	0	92
16	Tue Apr 17 09:42:10 2018	Kalista	1899	0	92
17	Tue Apr 17 10:40:30 2018	Kalista	5399	-7	99
18	Tue Apr 17 12:33:49 2018	Kalista	6799	-7	106

The Champion Human died after bravely taking damage 106

Run 2

Champion :: Vampire (HP=110)					
S. No	Time	Guard	Interval	Damage	Cumulative Damage
1	Tue Apr 17 01:04:34 2018	No Guard	0	-12	12
2	Tue Apr 17 02:34:02 2018	No Guard	5368	-12	24
3	Tue Apr 17 02:59:47 2018	No Guard	1545	0	24
4	Tue Apr 17 04:19:12 2018	No Guard	6310	-12	36
5	Tue Apr 17 06:13:41 2018	Janna	6869	-7	43
6	Tue Apr 17 07:53:41 2018	Mithra	6000	-25	68
7	Tue Apr 17 09:32:51 2018	Kalista	5950	-7	75
8	Tue Apr 17 11:32:44 2018	Kalista	7193	-7	82
9	Tue Apr 17 13:00:53 2018	Kalista	5289	-7	89
10	Tue Apr 17 13:32:58 2018	Kalista	1925	0	89
11	Tue Apr 17 13:37:05 2018	Kalista	2172	0	89
12	Tue Apr 17 13:49:02 2018	Kalista	2889	0	89
13	Tue Apr 17 14:44:03 2018	Kalista	6190	-7	96
14	Tue Apr 17 15:08:33 2018	Ahri	1470	0	96
15	Tue Apr 17 16:25:44 2018	Brand	6101	-25	121

The Champion Vampire died after bravely taking damage 121

Run 3

Champion :: Giant (HP=150)					
S. No	Time	Guard	Interval	Damage	Cumulative Damage
1	Tue Apr 17 00:41:45 2018	No Guard	0	-12	12
2	Tue Apr 17 00:43:04 2018	No Guard	79	0	12
3	Tue Apr 17 00:52:35 2018	No Guard	650	0	12
4	Tue Apr 17 01:05:41 2018	No Guard	1436	0	12
5	Tue Apr 17 01:20:19 2018	No Guard	2314	0	12
6	Tue Apr 17 02:28:35 2018	No Guard	6410	-12	24
7	Tue Apr 17 02:44:23 2018	No Guard	948	0	24
8	Tue Apr 17 03:00:29 2018	No Guard	1914	0	24
9	Tue Apr 17 03:36:11 2018	No Guard	4056	-12	36
10	Tue Apr 17 05:19:42 2018	No Guard	6211	-12	48
11	Tue Apr 17 06:03:20 2018	Janna	2618	0	48
12	Tue Apr 17 07:00:03 2018	Mithra	6021	-25	73
13	Tue Apr 17 08:52:33 2018	Kalista	6750	-7	80
14	Tue Apr 17 10:40:33 2018	Kalista	6480	-7	87
15	Tue Apr 17 12:28:34 2018	Kalista	6481	-7	94
16	Tue Apr 17 14:16:57 2018	Kalista	6503	-7	101
17	Tue Apr 17 15:01:27 2018	Ahri	2670	0	101
18	Tue Apr 17 15:32:16 2018	Brand	4519	-25	126
19	Tue Apr 17 15:45:48 2018	Brand	812	0	126
20	Tue Apr 17 15:58:15 2018	Brand	1559	0	126
21	Tue Apr 17 17:04:57 2018	Rumble	5561	-18	144
22	Tue Apr 17 18:21:22 2018	Skarner	4585	-7	151

The Champion Giant died after bravely taking damage 151

Run 4

The champion is "Spirit" HP 100

****** The Champion is Invincible "Spirit" ******

Run 5

Champion :: Giant (HP=150)					
S. No	Time	Guard	Interval	Damage	Cumulative Damage
1	Tue Apr 17 01:21:07 2018	No Guard	0	-12	12
2	Tue Apr 17 02:33:21 2018	No Guard	4334	-12	24
3	Tue Apr 17 02:44:09 2018	No Guard	648	0	24
4	Tue Apr 17 04:26:48 2018	No Guard	6807	-12	36
5	Tue Apr 17 06:18:16 2018	Janna	6688	-7	43
6	Tue Apr 17 07:17:52 2018	Mithra	3576	0	43
7	Tue Apr 17 08:14:07 2018	Warwick	6951	-18	61
8	Tue Apr 17 08:47:10 2018	Kalista	1983	0	61
9	Tue Apr 17 09:22:58 2018	Kalista	4131	-7	68
10	Tue Apr 17 09:37:00 2018	Kalista	842	0	68
11	Tue Apr 17 09:46:46 2018	Kalista	1428	0	68
12	Tue Apr 17 10:30:10 2018	Kalista	4032	-7	75
13	Tue Apr 17 10:48:36 2018	Kalista	1106	0	75
14	Tue Apr 17 11:48:26 2018	Kalista	4696	-7	82
15	Tue Apr 17 13:12:18 2018	Kalista	5032	-7	89
16	Tue Apr 17 15:08:45 2018	Ahri	6987	-13	102
17	Tue Apr 17 16:19:04 2018	Brand	4219	-25	127
18	Tue Apr 17 16:25:45 2018	Brand	401	0	127
19	Tue Apr 17 17:42:22 2018	Rumble	4998	-18	145

The Champion Giant is alive with remaining power 5

Champion :: Vampire (HP=110)					
S. No	Time	Guard	Interval	Damage	Cumulative Damage
1	Tue Apr 17 01:16:15 2018	No Guard	0	-12	12
2	Tue Apr 17 02:02:36 2018	No Guard	2781	0	12
3	Tue Apr 17 02:59:50 2018	No Guard	6215	-12	24
4	Tue Apr 17 04:05:07 2018	No Guard	3917	-12	36
5	Tue Apr 17 05:00:53 2018	No Guard	3346	0	36
6	Tue Apr 17 05:33:32 2018	No Guard	5305	-12	48
7	Tue Apr 17 06:23:38 2018	Janna	3006	0	48
8	Tue Apr 17 07:07:11 2018	Mithra	5619	-25	73
9	Tue Apr 17 08:48:30 2018	Kalista	6079	-7	80
10	Tue Apr 17 08:55:43 2018	Kalista	433	0	80
11	Tue Apr 17 09:54:13 2018	Kalista	3943	-7	87
12	Tue Apr 17 11:28:59 2018	Kalista	5686	-7	94
13	Tue Apr 17 12:12:22 2018	Kalista	2603	0	94
14	Tue Apr 17 12:26:11 2018	Kalista	3432	0	94

The Champion Giant is alive with remaining power 16