PROJECT 02: LOGIC

Information about us:

No.	Full name	Student ID
1	Nguyễn Hoàng Nhân	18127017
2	Trần Thanh Tâm	18127268

WUMPUS WORLD

1. Assignment plan:

No.	Task	Implement
1	Design architecture and algorithms. (Ex: Pacman, Monster, Graphics …)	Whole team
2	Design algorithm	Nguyễn Hoàng Nhân
3	Design graphics	Trần Thanh Tâm
4	Design map	Trần Thanh Tâm
5	Initial map	Trần Thanh Tâm
6	Report	Whole team
7	Test	Trần Thanh Tâm

2. Environment:

– Python 3.7
– Graphics: Pygame

3. Self-assessment:

No.	Requirement	Note	Completement
1	- The world will be limited in 10x10 instead of 4x4. Room (1,1) will still be the bottom-left one, and Room (10,10) the top-right one. First number is room position in horizontal coordinate and second number is room position in vertical coordinate. - Agent can appear in any Room (x_a, ya) and always facing to the right. This room is the only room have the cave door. There may be any number of pits and gold in the world. - There is at least one Wumpus. - The agent carries an infinite number of arrows - The game will end when one of the following three conditions occurs: 1. The agent dies 2. The agent kills all of the Wumpus AND grabs all the gold 3. The agent climbs out of the cave	- In our game concept, every room is considered a card. Just like a card game, agent have only one state because every card in a game represent a character or a signal. - Agent only climbs out of the cave when he returns to the starting room. - We have do a random spawn function for agent but sadly we got some bug about infinite loop agent shooting so we don't use it function anymore. The start of agent is (0,2).	98%
2	The scores are as such: -Add 100 points for picking up each gold. -Reduce 100 points for shooting an arrow. -Reduce 10000 points for dying (by being eaten by the Wumpus, falling in a pit). -Add 10 point for climbing out of the cave. -Reduce 10 points for moving from one room to the next.	- We add 1000 points for agent when he kills Wumpus.	
6	Finish problem successfully.		100%
7	Graphical demonstration of each step of the running process. You can demo in console screen or use any other graphical library.		100%
	Generate at least 5 maps with difference structures such as position and number of Pit, Gold and Wumpus.		100%
	Report your algorithm, experiment with some reflection or comments.		100%
Total			99%

4. Discussion:

The agent will have a knowledge base (KB). When the agent is created, the KB will be initialized with some rules. There are 3 rules: when a room has breeze, at least one of its adjacent room has a pit; when a cell has stench, at least one of its adjacent room has a Wumpus; and when a room doesn't have breeze or stench, it is safe. These rules are always consistent, and will be used to infer new information during the agent's exploration.

Then the agent will start exploring the cave. The procedure is this:

When the agent arrives at a room, it will try to "perceive" 2 information: breeze and stench. Then it will add those 2 information to its KB (that is, whether the room has breeze or not, and whether the room has stench or not).

Then the agent will "infer new knowledge" based on the perceived information. Firstly, the agent will ask: is there any Wumpus among the frontier room? (Frontier rooms are rooms which lie between group of visited rooms and group of unvisited rooms). It asks this question first, because it prioritizes killing Wumpus, since killing them makes the agent gain a high amount of points. To answer this question, the agent will ask a sub-question. That is: For each frontier room, is there a Wumpus in it? It asks this question for each room, and find the answer using its current Knowledge Base and the resolution algorithm. (Note that, to be exact, the question is like this: Can we be sure that there is a Wumpus in that room? That means the answer is only Yes or No, and hence if the answer is Yes, then there's truly a Wumpus in that room, and we can be sure about that. But if the answer is No, we can't be sure if there's a Wumpus in that room, since not enough information has been collected, and the agent must deduce more information to find the answer.)

If there's at least a Wumpus among frontier rooms, the agent will immediately go to kill that Wumpus.

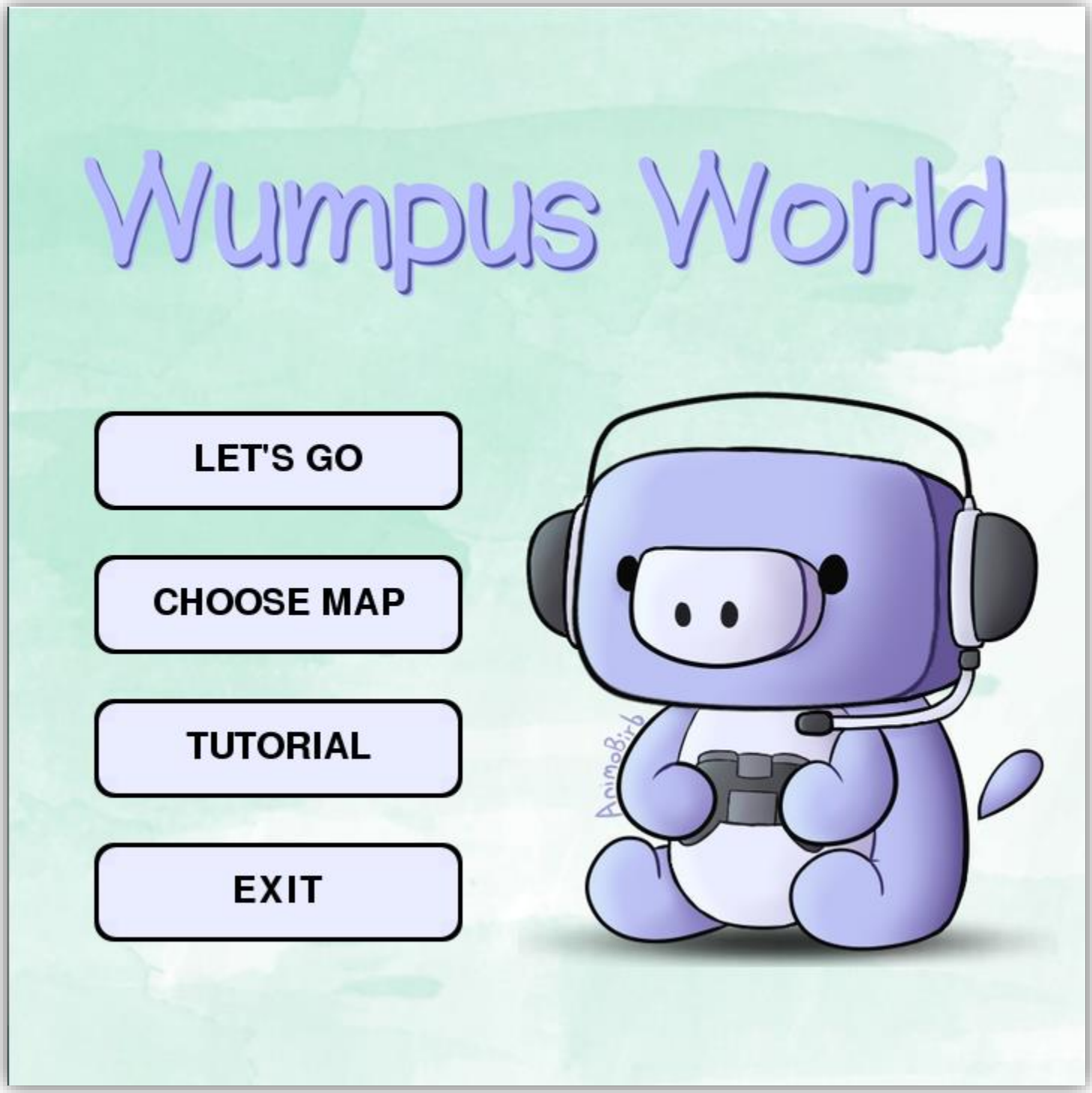
But if there isn't, the agent will ask the next question: Is there any safe rooms among the frontier rooms (a room is safe when there's no pit or Wumpus in it). It will divide this question to many sub-questions, and ask them to each frontier room, just like with the Wumpus question above. And again, if the agent found at least one safe room among the frontier rooms, it will immediately go to that room and continue the exploration.

But in the worst case, when there's no Wumpus room, nor there's a safe room among frontier rooms, the agent will play it safe, and choose to leave the cave. This happens when the agent is surrounded with full of breeze and stench rooms. It doesn't want to take the risk and go to an uncertain room, potentially fall down a pit or get eaten by a Wumpus.

Another thing is, during the exploration, when the agent comes across any gold, the agent will pick it up immediately, before thinking of what to do next. Gold is the agent's top priority, of course, since agent gains the most points from them.

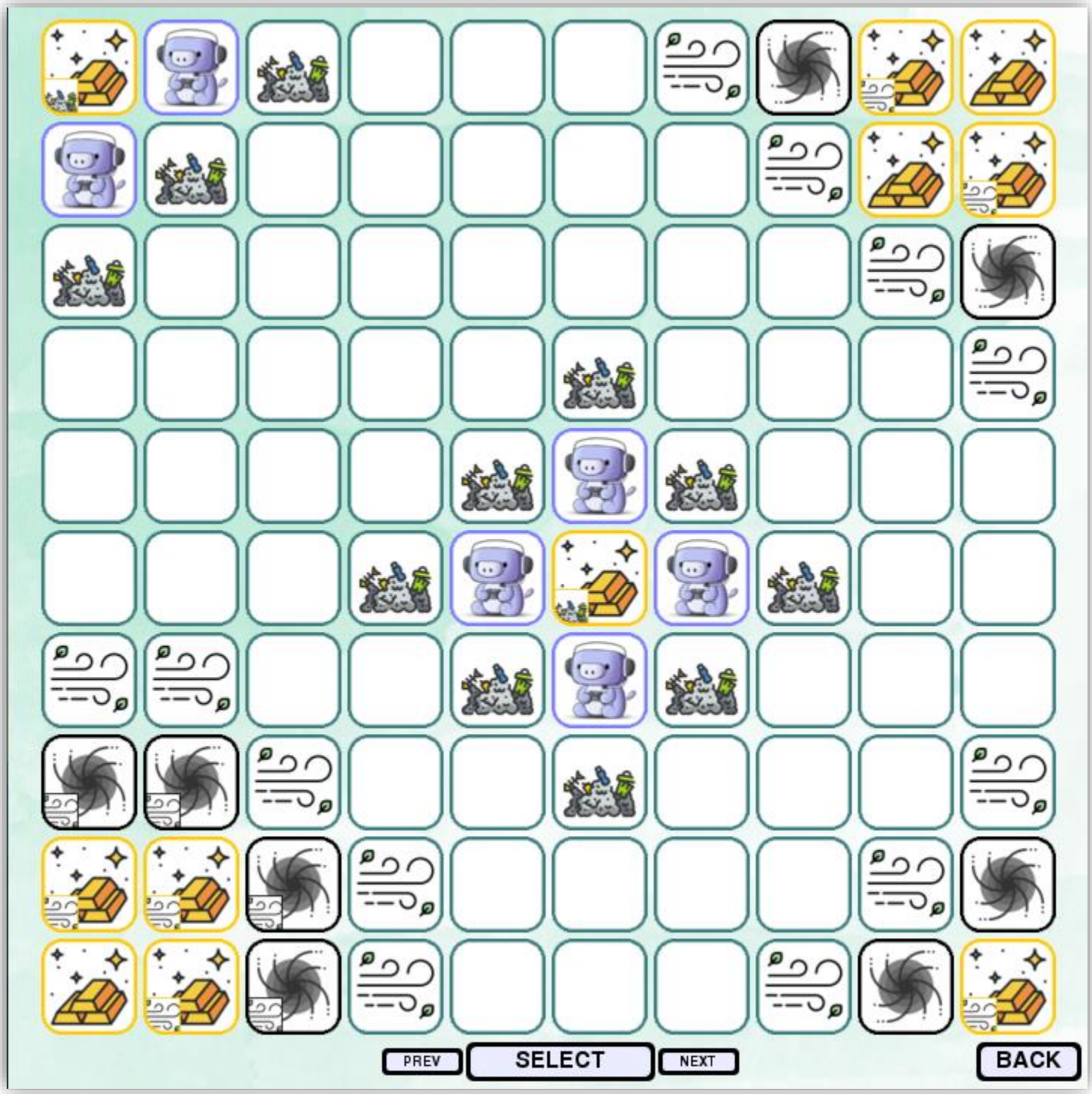
Note: We try our best to fix the bug, that agent shoots infinite loop when we randomly spawn him on the map. Because for simplistic, we just code when he spawns at room (0, 2), he runs smoothly. But now, when we implement to randomly spawns him, we have got a bug, we can not handle it right now. Our team 're so sorry about that.

5. Graphics:
    a. Game menu:



b. Let's go:

c. Choose map:



d. Tutorial:

6. References:

https://www.youtube.com/watch?v=a_TycD1RQxY&t=140s

https://www.youtube.com/watch?v=3sLV0OJLdns&t=36s

https://www.geeksforgeeks.org/iterative-deepening-searchids-iterative-deepening-depth-first-searchiddfs/