Architectural Design

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ICS207

Option 1 - Instructions:

* When this option is clicked it will help the user understand how to play the game so they can be successful. This is close to how the instructions will look:
  + In our pygame project the objective of the game is for the user to play as an extraterrestrial being in a ship attempting to return home.
  + There are many obstacles, some being: the sun turning into a red giant, planet levels, and the asteroid belt.
  + There will be a timer that informs you how long you have before the sun turns into a red giant. You will have to be at Jupiter before the timer runs out or else you lose the game.
  + Additionally, there will be planet levels you have to complete in order to collect fuel. Each planet has fuel because you left behind a little fuel in each of the planets accidentally. In order to collect fuel all you have to do is collide into it with your character. You have to collect fuel from each planet in order to move on.
  + The controls in order to move will be the arrow keys, the top arrow key will be used to move upwards, the left arrow key will be used to move to the left, the bottom arrow key will be used to move downwards, and the right arrow key will be used to move to the right.

Option 2 - Lesson:

* This option mainly teaches the user about the solar system. It teaches them about the planets and their features, the asteroid belt, star evolution, and solar nebula theory. The game implements this by showing the different stages of the sun as well as having obstacles which are taught in the lesson. The game takes place in our solar system so you can identify the different planets. Raw information for the lesson:
  + Planets and their features
    - **Mercury** - Is the closest planet to the sun and the smallest planet in our solar system. Mercury has no moons and no atmosphere. Due to having no atmosphere it is very hot in the day and very cold in the night.
    - **Venus** - Brightest object in the night sky because it is very close to the sun and has an atmosphere which reflects sunlight. Venus is the hottest planet in our solar system since it’s atmosphere has co2 which contributes to the greenhouse effect.
    - **Earth** - The only known planet to have life in the solar system. The atmosphere of Earth is made out of nitrogen, oxygen, and water vapour. The atmosphere regulates temperature and 70% of the Earth is covered in water.
    - **Mars** - It is red due to iron oxide (rust) on its surface. There have been many rovers sent to Mars and information suggests that ancient Mars might have been able to sustain life.
    - **Jupiter** - Largest planet in the solar system and has the greatest mass compared to all planets in the solar system. Jupiter has coloured bands and something called the Great Red Spot. It is a hurricane with very high wind speeds. Jupiter has many moons, but the 4 largest are: Europa, Io, Ganymede, and Callisto.
    - **Saturn** - Is the second largest planet in the solar system, but the least dense of all the planets in our solar system. Saturn has a quick rotation and high wind speeds. There are over 1000 rings surrounding Saturn. They may have been formed from many moons or other objects which came close to the planet. Saturn has the most known moons in the solar system and has the 2nd largest known moon in the solar system which is named Titan.
    - **Uranus** - It is a unique planet because it rotates on its sides. Uranus has rings just like Saturn. Its atmosphere is made mostly of hydrogen, helium, and methane.
    - **Neptune** - It is the coldest planet in our solar system, Neptune is blue and has white clouds. The Great Dark Spot is another feature of Neptune and is actually the centre of a storm. Neptune just like Uranus and Saturn has rings, but they are very thin. Neptune contains lots of ice and icy material.
    - Mercury, Venus, Earth, and Mars are known as the inner planets also known as the terrestrial planets. These planets have hard surfaces and are made out of rocky material.
    - Jupiter, Saturn, Uranus, and Neptune are known as the outer planets also known as the jovian planets. These planets don’t have solid surfaces and are mostly made up gases.
  + The asteroid belt
    - The asteroid belt is located in between Mars and Jupiter. An asteroid is a small rocky object, it ranges from 5 - 900 km in width. Most of the asteroids in our solar system originate from the asteroid belt. The Kuiper Belt also known as the second asteroid belt consists of millions of small objects orbiting the sun. These objects are usually comets and asteroids. These objects are most likely left over from the formation of the solar system. Comets are composed of rocky material, ice, and gas. The last material in the sun’s gravitational pull is the Oort Cloud. It is a spherical cloud of small icy fragments of debris. It is way further than the Kuiper Belt, it is approximately 50 000 - 100 000 AU from the sun. 1 AU stands for the distance from the Earth to the sun. Comets come from the Kuiper Belt and Oort Cloud.
    - A meteoroid is a piece of rock moving through space and is smaller than an asteroid. They are likely broken chunks of asteroids or planets. A meteor is when a meteoroid hits the Earth’s atmosphere and burns up. Meteors are what people call shooting stars.
  + Star evolution
    - Scientists think the big bang theory is the explanation for how the universe came to be. This helps us understand how stars formed. The expansion of the universe was not equal and nebulae were the result. Nebulae are clouds of dust and gas particles in space, they are the birthplace of stars. Gravity overtime makes the nebula start to condense, eventually the particles move and start spinning around an axis faster and faster. Continued gravitational force and rotation make the nebula shrink and the centre starts to get hot. At 10 million celsius, nuclear fusion begins and a star is born. Nuclear fusion consumes hydrogen to form helium.
    - Depending on the mass of the nebula an average star or massive star will be formed. If the mass of the nebula is high then a massive star will be formed and if the mass of the nebula is low then an average star will be formed. These two stars lead different life cycles.
    - For an average star it takes long for it to finish its fuel, once all nuclear fuel is used the core shrinks and the outer layers expand. The temperature starts rising and once 100 million celsius is reached helium fuses into carbon and a Red Giant is formed. Once a Red Giant is done using its fuel, its core contracts and stellar winds remove outer gases forming a planetary nebula. Eventually the leftover core cools and shrinks. No nuclear reactions take place, this new star is called a white dwarf. This is the life cycle for an average star.
    - For a massive star it takes way less time for it to finish its fuel, once all nuclear fuel is used the core shrinks and the outer layers expand. Since a massive star’s core is hotter it can fuse helium into heavier elements. This results in a bigger expansion and a Supergiant is formed. Once a Supergiant is done using its fuel the core collapses and a supernova occurs which is a huge explosion. If the core of the Supergiant is less than 3 solar mass (1 solar mass is the mass of our sun) a neutron star will be formed, else the core will collapse into a black hole. This is the life cycle for a massive star.
  + Solar nebula theory
    - Scientists believe the solar nebula theory explains how solar systems are formed. This theory states that planets form after the formation of a star. So in our solar system that would mean the Sun formed before any of the planets. This relates back to the formation of a star, after a new star is formed from a nebula there is leftover material which starts to orbit the newly formed star. The material distribution is uneven and overtime material will accumulate due to gravity. Eventually a planet is formed and this newly formed planet will orbit the star. Newly formed solar systems are disorganized and many collisions can occur.

Option 3 - Game:

* This option allows the user to play our game. Below is some background information as well as how our game will look. There are a total of 8 levels and 4 endings.
* Background information:
  + You are an extraterrestrial being from a different solar system. You came to our solar system to explore each of our 8 planets. You explored all the planets, but forgot a little fuel in each of the planets. You are currently at mercury. The problem is the sun is beginning to expand into a red giant. This causes it to consume planets in its path. Escape to the nearest planet to collect fuel, and move on to the next planet before the sun consumes you.
* Mercury:
  + At the start of the game you are on Mercury. This level is more of a tutorial level. There aren't any obstacles, all you have to do is move to the fuel in order to collect it. After doing so you will be launched back into space where you move onto Venus.
* Venus:
  + Once you reach Venus you will have to complete a volcano level on Venus. There will be material falling from the sky which you have to dodge until you collect the fuel. If you fail then you will be brought to ending 1. If you pass the level and collect the fuel, you will move onto Earth.
* Earth:
  + Once you reach Earth, you'll have to complete an ocean level on Earth. There will be sharks that you have to dodge in order to collect the fuel. If you fail then you will be brought to ending 1. If you pass the level and collect the fuel, you will move onto Mars.
* Mars:
  + Once you reach Mars, you’ll just have to collect the fuel there is no level on Mars, however after you are launched into space you will have to complete the asteroid belt level. You will have to reach Jupiter by avoiding asteroids. If you get hit by an asteroid you will be brought to ending 2.
* Jupiter:
  + If you did not make it to Jupiter before the Sun timer ran out then you will be consumed and be brought to ending 3. However, if you reach Jupiter you will have to do a hurricane level, because the Great Red Spot is a hurricane. There will be debris coming at you which you have to dodge until you collect the fuel. If you are hit by the debris you will be brought to ending 1. If you pass the level and collect the fuel, you will move onto Saturn.
* Saturn:
  + Once you reach Saturn, you’ll have to complete a debris dodging level. You have to reach the fuel while dodging debris in Saturn’s rings. Getting hit by debris will result in you being brought to ending 1. If you pass the level and collect the fuel, you will move onto Uranus.
* Uranus:
  + Once you reach Uranus, you’ll have to collect the fuel before a timer runs out. This timer indicates how long before your ship will freeze. Not collecting the fuel before the timer runs out will result in you being brought to ending 1. If you collect the fuel before the timer runs out you will move onto Neptune.
* Neptune:
  + Once you reach Neptune, you’ll have to complete a storm level because the Great Dark Spot is a storm. You will have to dodge icy debris and collect fuel without getting hit. If any of the icy debris hits you then you will be brought to ending 1. If you finish this level you will be brought to ending 4.
* Ending 1:
  + You have failed on a planet level. You are now redirected to the main menu.
* Ending 2:
  + You have failed the asteroid belt level. You are now redirected to the main menu.
* Ending 3:
  + You were not on Jupiter before the Sun timer ran out so you were consumed by it. You are now redirected to the main menu.
* Ending 4:
  + You have collected all the fuel that you left behind on the planets. You can now return home. You have successfully escaped the solar system and beaten this game.

Option 4 - Quiz (Multiple Choice):

* When this option is chosen the user will take a short quiz. This quiz will be based on the information in the lesson. At the end of the quiz the user will receive a message saying they have completed the quiz and that they can now return to the main menu.
  + Question 1: What is left after a planetary nebula occurs?
  + Choices: White dwarf, black hole, neutron star, super red giant

Answer: White dwarf

* + Question 2: Where in the solar system is the asteroid belt located?
  + Choices: Between Mars and Jupiter, between Jupiter and Saturn, between Mercury and Venus, between Earth and Mars
  + Answer: Between Mars and Jupiter
  + Question 3: How do solar systems form and what is this theory called?
  + Choices: Solar Nebula Theory - Star forms from a stellar nebula and leftovers form planets, Solar Nebula Theory - Planets forms from a stellar nebula and leftovers form a star, Big Bang - Star forms from a stellar nebula and leftovers form planets
  + Answer: Solar Nebula Theory - Star forms from a stellar nebula and leftovers form planets
  + Question 4: What is the correct timeline for a massive star?
  + Choices: Massive star -> Supergiant -> Supernova -> Black hole or Neutron star, Massive star -> Red Giant -> Supernova -> Black hole or Neutron star, Massive star -> Supergiant -> Planetary nebula -> Black hole or Neutron star
  + Answer: Massive star -> Supergiant -> Supernova -> Black hole or Neutron star
  + Question 5: What are the outer planets and another term for them?
  + Choices: Jovian Planets - Jupiter, Saturn, Uranus, and Neptune| Jovian Planets - Jupiter, Saturn, Uranus, Neptune, and Pluto| Terrestrial Planets - Jupiter, Saturn, Uranus, and Neptune| Terrestrial Planets - Mercury, Venus, Earth, and Mars
  + Answer: Jovian Planets - Jupiter, Saturn, Uranus, and Neptune
  + Question 6: Where do comets come from?
  + Choices: The planets, Oort Cloud and Kuiper Belt, The asteroid belt
  + Answer: Oort Cloud and Kuiper Belt
  + Question 7: The Great Red Spot is a hurricane in Jupiter.
  + Choices: True, False
  + Answer: True
  + Question 8: The Great Blue Spot is a storm in Neptune.
  + Choices: True, False
  + Answer: False
  + Question 9: The materials in the Oort Cloud are the one of the last materials in the Sun’s gravitational pull.
  + Choices: True, False
  + Answer: True
  + Question 10: Mercury is the smallest planet and also the hottest planet in the solar system.
  + Choices: True, False
  + Answer: False

Option 5 - Quit:

* After finishing the game you will be redirected to the main menu where you can choose other options or quit. When the user chooses to quit the program will close. Before the program completely closes there will be a credit page showing anything we used from the internet. This can be code fragments, images, or sounds to list a few. After each ending you will also be redirected to the main menu where you can choose other options or quit.

Option 6 - Results:

* When this option is chosen the user will see their quiz mark in percentage. If you have not completed the quiz then the percentage shown will be 0.