Lab 6: Tree Visualization

Tony Gill

Data Structure

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Tree 1: Universal Gravitation

This tree was designed based on the concept of celestial objects in the universe with the rule of positioning and sorting child nodes left to right relative to the gravitational magnitude (F) and attraction each of these specific bodies hold. Starting from the observable universe as the root node we branch off into 4 subbranches also organized in a top-down descending approach with quasar-stellar objects that have active galactic center blackhole exerting the greatest gravitational magnitude relative to stellar bodies and other celestial objects such as a solar system and interstellar mediums (space between solar systems) being entities that exert lesser amounts of gravitational force.

Reference and credit is given to Sir Isaac Newton, Albert Einstein and Stephan Hawking, world renowned physicist who transformed our knowledge and understanding of the universe. The design rule of sorting based on gravitational magnitude comes from an Newton's law of universal gravitation:
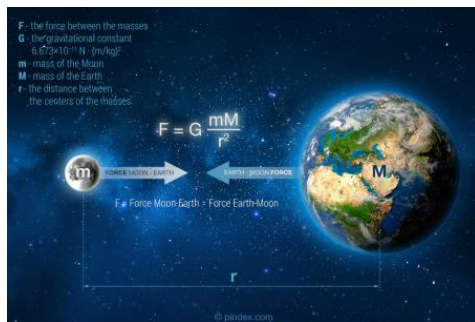

Figure 1. Gravitational Magnitude Formula

with addition to Einstein's theory of General Relativity, which specifies gravitation force is proportional to the curvature celestial objects created in the fabric of space-time, for instance we can compare objects in the solar system as shown in the following:
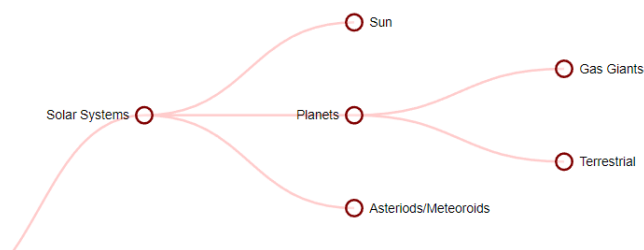

Figure 3. Solar System child nodes sorted left to right and top-down based on gravitational force
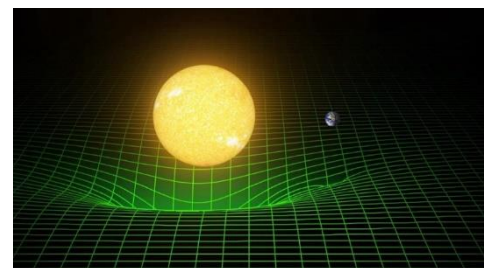

Figure 2. Influence of mass and density on gravity and space-time fabric

the sun represents an entity that creates a greater distortion of warp in space-time compared to planets such as Earth (terrestrial), thus greater gravitational attraction and magnitude of the force.

Put simply greater mass or density and the closer the object is distance wise means more gravity. This allowed the tree and its nodes that highlight specific celestial entities in the universe to be ordered accordingly. All celestial objects in the universal gravitation tree are thus sorted top-down and left to right based on these central notions of the increasing influence gravity has on large scale celestial bodies in the

universe. From left to right more general bodies are specified such as stellar objects, which comprise of all the different types of stars that can be found throughout the universe.

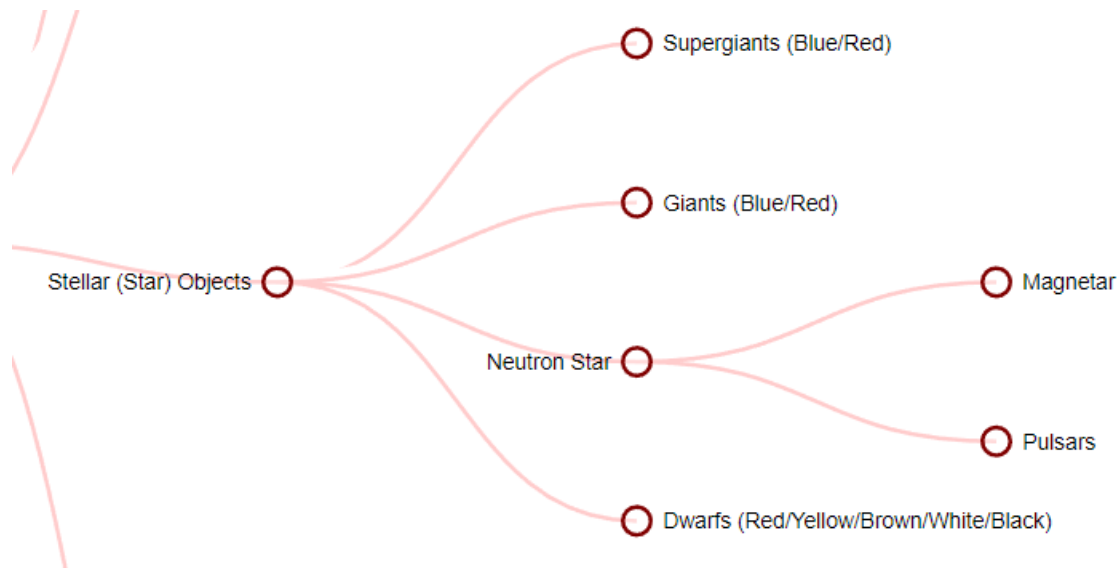An important note to the design of nodes in the stellar (star) based objects:

Figure 4. Neutron Stars arranged before Dwarfs

Here neutron stars are arranged before dwarfs since they have a gravitational field that's 400,000 stronger than that of dwarfs sized stars, in which dwarfs may be larger in scale, but due to the higher density concentration in a single region of space they exert greater gravitational attraction compared to dwarfs regardless of the size difference.

This leads to another interesting point that should be noted in the design philosophy. Blackholes and they various types are found on the top of the tree and ordered as celestial entities with the greatest gravitational magnitude despite the size difference of stellar entities, where supergiant's may be many times larger than blackholes. The ordering here is similar to the approach used to arrange neutron stars and dwarfs. Blackholes just like neutron stars have a much higher density at a single point, which is essentially infinite and thus gravity exerted is far greater than any sized star.
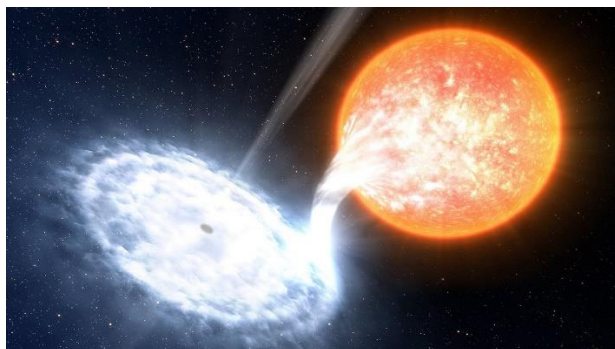

Figure 5. Blackholes arranged before Stellar Object (Greater Density and Gravitational Attraction)

Tree 2: Famed Pharaohs of Egypt

The second tree design is based on ten famous and notable Egyptian pharaohs that existed throughout Ancient Egypt's timeline from 3150 to about 30 BC. The rule for sorting the child nodes left to right are based on larger to smaller (more specific) entities where the New Kingdom for instance represents multiple dynasty in which specific famous pharaohs are identified and sorted top-down based on time as shown in the following:

Figure 6. Pharaohs of Egypt based on time periods and dynasty's

Top-down we can see that King Tut was pharaoh in the 18th Dynasty which came before the 19th Dynasty and thus before Ramses the Great was pharaoh. The tree of the pharaohs and their timeline ends with Cleopatra VII who represents the last of the famous pharaohs prior to the fall of Egypt as Rome took over and conquered Egypt by 30 BC.

Some pharaohs such as Thutmose the third have their associative or well-known names in parenthesis, in which Thutmose III who was also known as the Napoleon of Egypt for his contributions as a great general and bringing the wealth to Egypt as the emergence of the Golden Age.

References:

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