

Visualising the life cycle of stars

Report on first user evaluation

Nikki Rademaker, s2641887

Levi Peeters, s2011174

Assistant: Lisa Pothoven

On Wednesday, November 24, we held the first user evaluation for our project, visualising the life cycle of stars. We held this user evaluation at a problem class for the second year astronomy course "Stars". More details about our user group can be found in our project plan.

With this user evaluation, we reached about 20 evaluators, of whom 4 were teaching assistants and the rest were students for the course. The evaluation strategies that were used for this evaluation were both empirical methods. A survey was used to let the users evaluate the program. To ensure we did not take up too much time of the class, most evaluators gave their feedback in groups of two. We also observed the users doing the evaluation. All evaluators were astronomy bachelor students.

1 Prototype & Instructions

At this stage in the development process the interface was not capable of much interaction. The interface allowed the user to start, stop and pause a single animation by using buttons (Figures 1 and 2). The users could also switch between the view of the internal and external structure of the star (Figure 3). Additionally, users were able to see that the colours on the timeline corresponded with the colours of the layers of fusion reactions that got formed. The provided figures show what the visualisation looked like at this point.

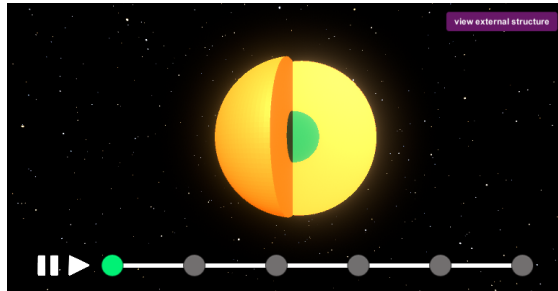


Figure 1: The interface during the first stage of the life cycle.

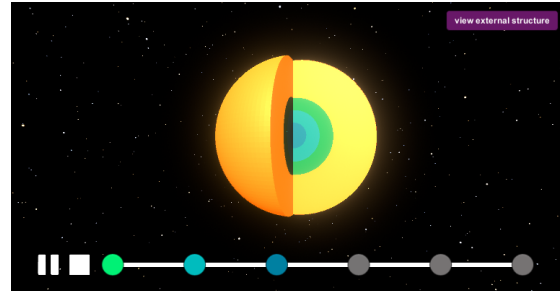


Figure 2: The interface during the animation of the life cycle.

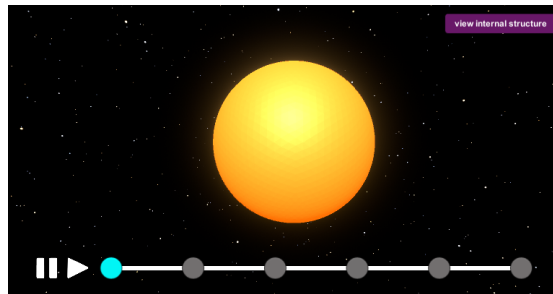


Figure 3: The interface with external view of the star

Our evaluation focused little on the functionality of the interface, because of the lack in interaction possibilities. Therefore, the evaluation focused more on the way we presented our data. We gave a short introduction to each of the evaluators, explaining what the interface was meant to visualise, and the interactive features we were planning to add but had not finished yet. Evaluators were asked for feedback on the presentation and visualisation of the star, and for suggestions on other features that would make the interface easier to use and understand.

2 Comments

2.1 Suitability

We asked users: "Is the way the visualisation is presented suitable for this kind of information, or would a different visualisation work better?".

The users gave suitability an average score of 8/10, and provided the following suggestions:

- "Add a legend of temperature/composition and timescale";
- "It would be nice to have additional information about the stages of star evolution during the presentation of that phase in the program";
- "I would like to see more fluid animations".

2.2 Educational value

We asked users: "Do you think this visualisation is valuable as an educational tool for astronomy students?".

The users gave educational value an average score of 8.5/10, and provided the following suggestions:

- "Add a function allowing users to test themselves";
- "Include a legend with information on what is happening";
- "Match the colours to a temperature scale";
- "Maybe a HR diagram to show the evolutionary state of the star and its position on the diagram";
- "Add a size comparison to some reference object".

2.3 Clarity

We asked users: "Did you understand the functions of every part of the interface?".

The users provided us the results shown in Figure 4, and provided the following suggestions:

- "Add meaning to the colours of the layers and name them";
- "Hover text to show what each of the buttons do";
- "Add a legend";

- "It might be more clear to have a single button to pause and play the video".

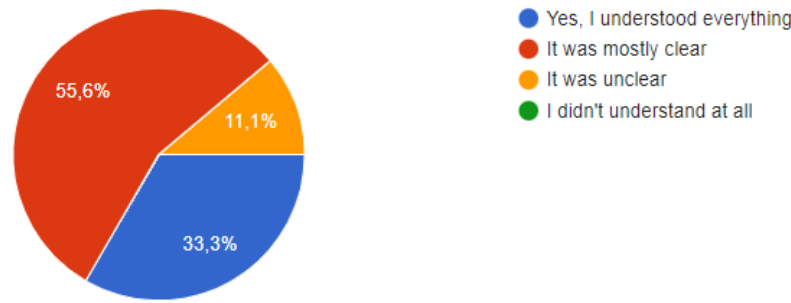


Figure 4: A pie chart of the results about the clarity of the interface.

2.4 Satisfaction

We asked users: "How would you rate using this interface overall?".

The users gave satisfaction an average score of 7.5/10, and provided the following suggestions:

- "Add the Earth as reference size, and vary the size of the star on the model as it varies in reality too. Perhaps add a time span to each different stadium of the star";
- "You could add an introduction text that explains the purpose of the interface and explains how the basic functions work"

3 Analysis

When looking at the results of the survey, it shows that most users think the way we have represented the star and its internal components works quite well. We had already planned to make information on a layer visible when a user hovers their cursor over that layer, and users agreed that this would be a good way to provide the information. Additionally, almost every user asks for more explanation on the different functions in the interface, which we had not previously considered. Adding text to each button by hovering over them with the computer mouse, was the most asked for feature, as well as adding timestamps to the timeline to make more clear what its function is.

Users noted that the star undergoes a lot of changes as it ages, besides gaining extra layers of reactions in the core, such as growing in size and changing surface temperature and colour. This user evaluation provided us with more insight in the best ways implement these visuals in the interface.

When it comes to size, users were most enthusiastic about adding reference objects for scale, such as our own sun, the Earth, and the Earth's orbital path. One user even suggested to make the Earth burn up when the star grows beyond the Earth's orbit, but although this would be fun it is not a priority.

For temperature, users did not have a strong preference on how to implement this, but they did note that they would like to see it visualised. We did get a suggestion to show temperatures for all layers of the star, but the physics to calculate this are too complicated for this project. Colours will show that the temperature increases by using colours associated with warmth such as yellow, orange, and red. The exact temperatures will not be displayed in the program.

The observation of the users showed that some users were confused about how to start and stop the animation of the life cycle of the star. Additionally, a few users did not understand where the 'external/internal' function could be found. These confusions can be solved by making the interface more clear. This can be done by giving more information about the interface functions in the interface itself. There were also users that did not realise that the animation was playing after they clicked on the start button. Creating an animation that runs more smoothly can help the users understand what is going on.

4 Action Points

These are the main points we have taken away from this user evaluation and will implement before the next evaluation:

- Change colours of the layers to correspond to the increasing temperature when getting closer to the centre;
- Add more information when hovering the cursor over an element, both for layers of the star and parts of the interface;
- Add reference objects when scaling the star;
- Show the surface temperature of the star in some way;
- Make it more clear that the animation is running by making the animation smoother.