



NASA SPACE APPS CHALLENGE 2021

MAPPING SPACE TRASH IN REAL TIME

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PROJECT DESCRIPTION

- Challenge:
 - Develop a real-time geospatial mapping system to track debris in Earth's orbit
 - Find a way to track debris smaller than 1cm. This debris is nearly impossible to track but it limits the exploration of space
- Our approach:
 - We researched existing debris tracking software
 - We asked what features would be most useful to engineers building weather satellites, astronauts going to the International Space Station, and others.
 - We wrote a 2D simulation that illustrates these features.
 - Risk is calculated, and space debris is colored by risk of collision
 - Info can be centered on the earth or the International Space Station.

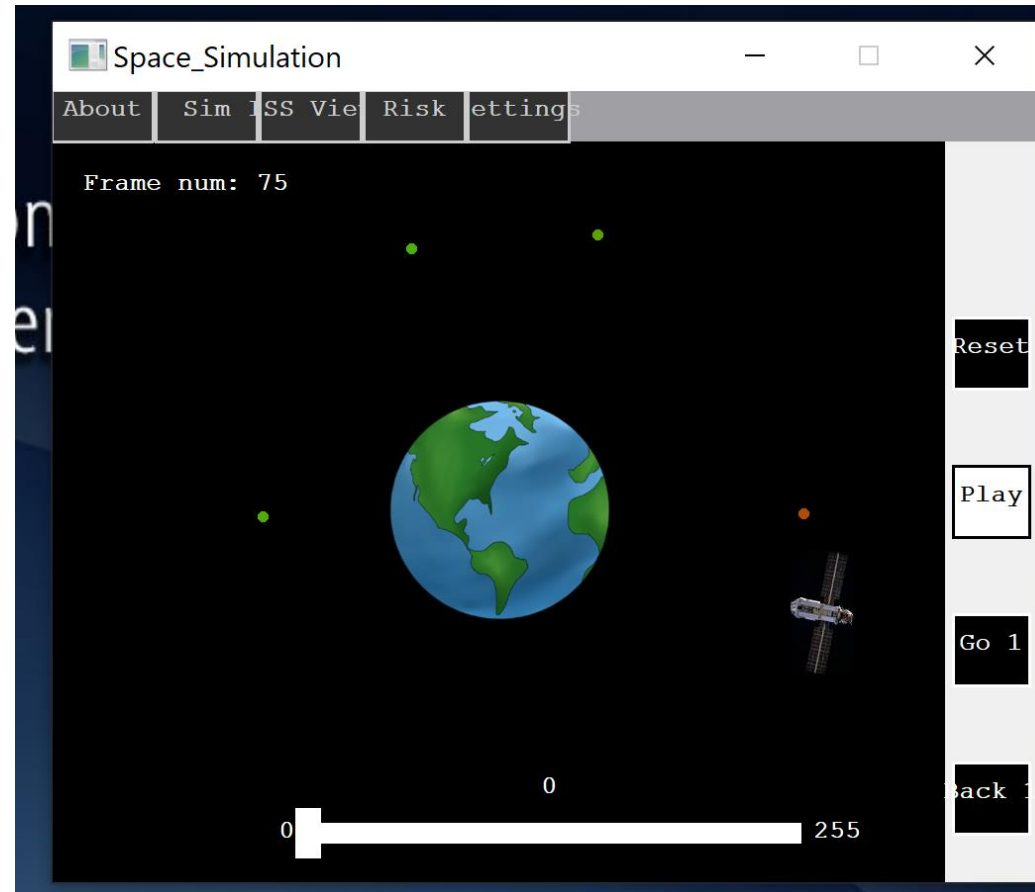
PROJECT PROCESS

- Brainstorming
 - Asked questions first to see what features to incorporate and compiled a list of research topics
 - Throughout the research process, many of these ideas were tossed out due to time and/or resource constraints
- Modification
 - We eventually changed the original objective from mapping to collision prediction based on parameters like velocity and trajectory from a satellite in space
- Final Design
 - The program provides a demo of what this might look like from the ISS

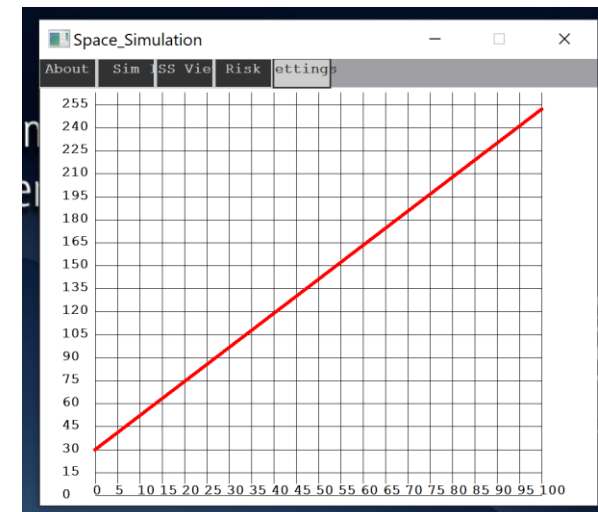
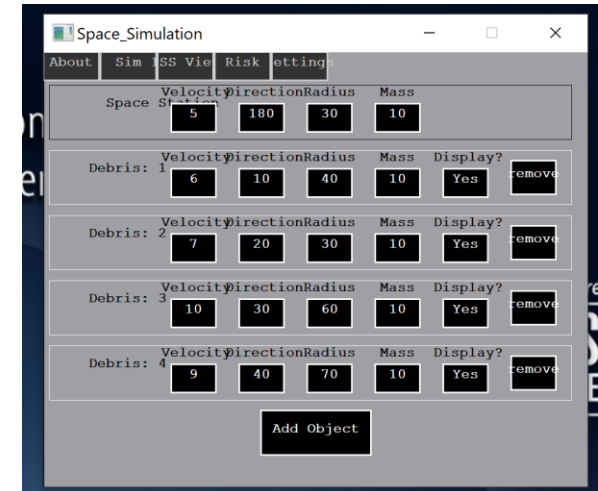
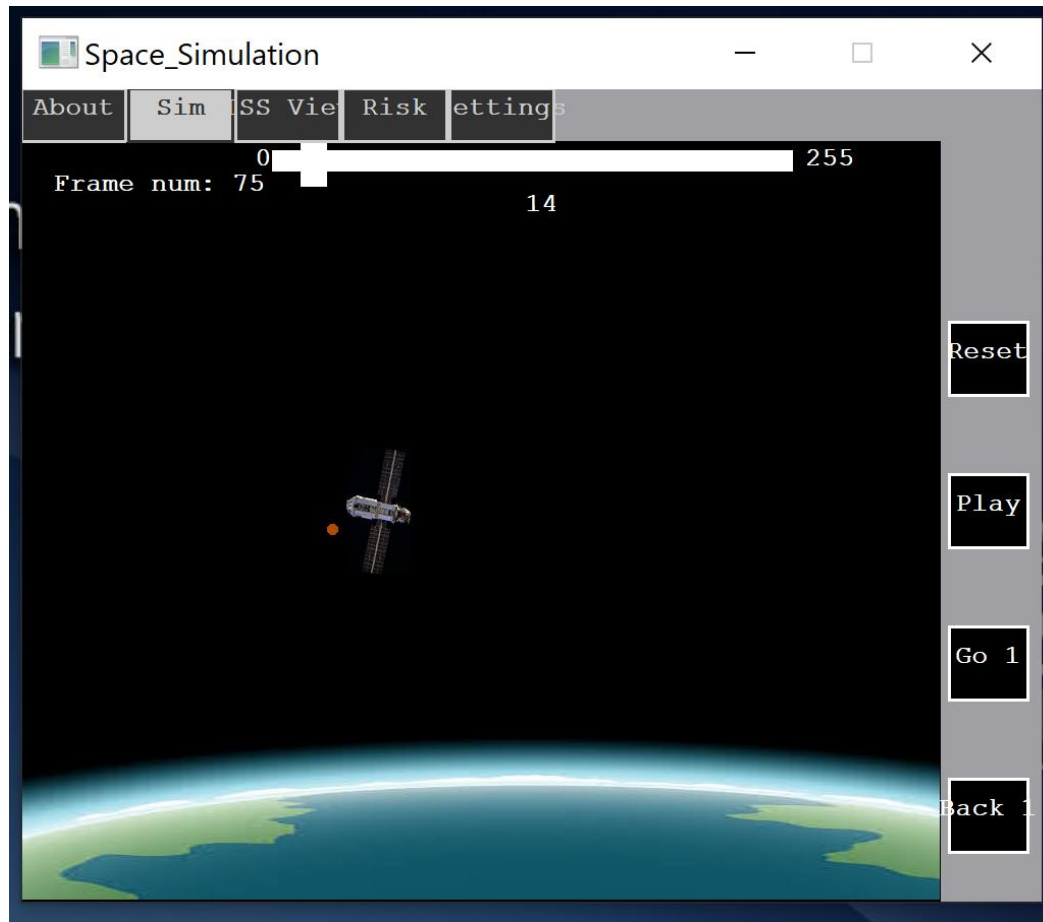
PROJECT DESIGN

- Tools used:
 - C++ and the Qt graphics libraries
 - Github
- Features of our software
 - Progression with time is shown for the space station and for multiple pieces of debris.
 - The user can select the mass, velocity, direction, and other parameters for the debris objects.
 - Risk of collision is calculated, and space debris is colored, green to red, based on risk.
 - The user can select a view centered on earth or on the space station.

PROJECT DEMO - MAIN SIMULATION SCREEN



PROJECT DEMO - OTHER SCREENS



WORK CITED

3-D Debris Maps:

- <https://maps.esri.com/rc/sat2/index.html>
- <http://stuffin.space/>

Data Resources:

- Reentry_History_Spreadsheet_09-29-21 (<https://aerospace.org/reentries>)
- json.json (<https://www.space-track.org>)

Articles of Inspiration:

- https://www.esa.int/About_Us/ESOC/Space_debris_assessing_the_risk
- https://www.esa.int/Applications/Observing_the_Earth/Satellites_forewarn_of_locust_plagues