Computer Science & Mathematics Program Development in a Graphical Environment

Deliverable 1 (Project Proposal) - Fall 2025

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Planetary Projectile Simulator

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Vanier College
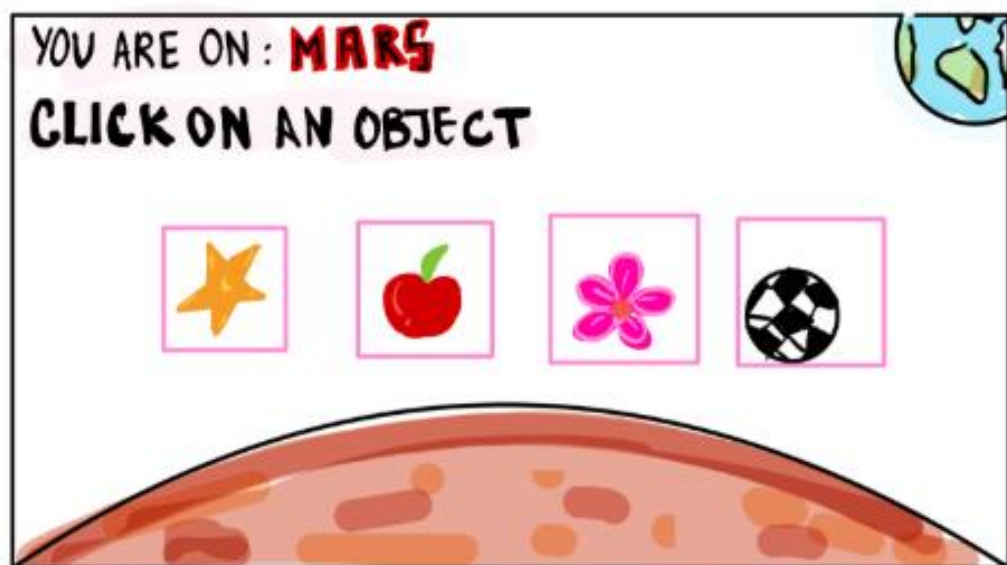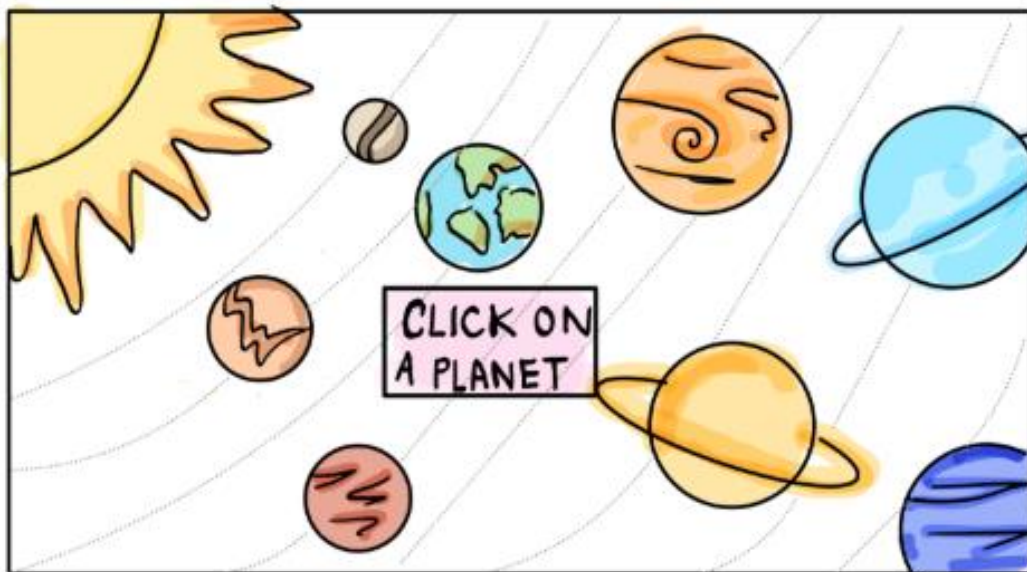
1) Task Description

- Application Name: Planetary Projectile Simulator (PPS)
- Summary of Application:

  The project is an interactive JavaFX application where users first select a planet from the solar system, then choose an object to throw. The user will enter an initial velocity and angle, and the program will calculate and display the time of flight, maximum height, and distance travelled. The interface will use images and buttons to guide the user through each choice, and the results will be shown clearly on screen. This way, the program demonstrates how projectile motion changes depending on the planet's gravity.

- Purpose & Functionality:
    - Start screen: image of the solar system with a message "Choose a planet!"
    - Planet selection: click a planet (button with an image) to set gravity.
    - Object selection: choose between simple objects like an apple, flower, soccer ball, or rock (shown as images/buttons).
    - Input values: enter velocity and angle using text fields or sliders.
    - Results: after clicking a "Simulate" button, the program displays:
        - Time of flight (T)
        - Maximum height (H max)
        - Distance (Range R)
    - In short, it will do a simulation of a projectile motion.

2) Interface Visualizations

- Here is a quick hand drawn mock-up of what the interface would look like, changes could apply.

CLICK ON
A PLANET

YOU ARE ON: MARS
CLICK ON AN OBJECT

YOU'VE CHOSEN
THE : STAR

INPUTE YOUR :

INITIAL VELOCITY :

Throw Angle :

RESULTS

THE TIME OF FLIGHT OF YOUR STAR IS : XXXX

THE MAXIMUM HEIGHT OF YOUR STAR IS : XXXXX

IT WILL LAND XXXX FROM WHERE YOU BEGAN

3) Proposed Implementation Approach

- Language & Framework: Java 22 with JavaFX as the GUI framework.
- Tools : Apache NetBeans (for coding + running)
- The project will be shared on GitHub
- The project manageemnt will be displayed in Trello.

- Main parts of the program:
  - One main class that starts the application.
  - A screen for choosing the planet (using buttons with images).
  - A screen for choosing the object (using buttons with images).
  - A screen where the user enters values and clicks a button to calculate.
  - A class that contains the formulas for projectile motion.

- Formulas (no air resistance)
  - Horizontal Velocity: $vx = v0 \cos \theta$
  - Vertical Velocity: $vy = v0 \sin\theta$
  - Time of Flight: $T = \frac{2vy}{g}$
  - Max height: $H = \frac{vy^2}{2g}$
  - Range: $R = \frac{v0^2 \sin(20)}{g}$
- Planet Gravities (m/s^2):
  - Mercury: 3.70
  - Venus: 8.87
  - Earth:9.81
  - Moon: 1.62
  - Mars: 3.71
  - Jupiter: 24.79
  - Saturn: 10.44
  - Uranus: 8.87
  - Neptune: 11.15

4) Project Planning with Trello

- https://trello.com/invite/b/68c4b1c749a4cd7082f5166f/ATTI852f95337fe8dd8f99447d1bd92f0ec9B5BBBA46/planetary-projectile-simulator

5) Version Control with Git

- https://github.com/Louay0606/Planetary-Projectile-Simulator_LouayA-LynaS