Nbody Walkthrough

Brian Lavallee
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General Tips

- Check piazza for a link to the recording.
- Assignment is available at compsci201.github.io
- Helper hours Sunday-Thursday 7-11
- Get started early

Provided Methods

- public static void main(String[] args)
- public void start(Stage stage)
- public static Scanner openFile()

Required Methods

- public double distance(double, double, double, double)
- public double force(double, double, double)
- public double[][] positions(Scanner, int, int)

Distance

- Use the distance formula
- https://en.wikipedia.org/wiki/Distance
- Math.pow(double root, double exp)
- Math.sqrt(double value)
- Avoid square distance

Force

- $G * m_1 * m_2 / r^2$
- https://en.wikipedia.org/wiki/Gravity
- Useful to include a check for r = 0
- Constant G is provided for you

Positions (Reading)

- First, read the number of bodies with Scanner.nextInt()
- Then, the radius of the universe with Scanner.nextDouble()

Positions (Reading)

- Loop over the remaining bodies (remember there are only N, no more no less)
- Read x-position, y-position, x-velocity, y-velocity, and mass all with nextDouble()
- Read the image name with Scanner.next()
- Store all of these values in arrays

Positions (Time)

- Create a loop to increment a time variable (either a for or while loop will work)
- If you use a while loop remember to update your time by timeStep on each iteration

Positions (Force)

- Use nested loops to generate each body pair
- Calculate the distance between them
- Calculate the force between them
- Keep track of these values with arrays

Positions (Acceleration and Velocity)

- Use the x and y forces you just summed up to calculate the acceleration of the body on that time step
- Use the acceleration to calculate the velocity

Positions (Positions)

- Update the positions of each body
- Crucial that this happens after the velocity of EVERY object has already been calculated

Positions (Drawing)

- Clear the images from the last step
  StdDraw.clear()
- Draw the background with
  StdDraw.picture(0, 0, “data/starfield.jpg)
- Draw each body using
  StdDraw.picture(x, y, fileName)