

2023 Fall Semester
Creative Algorithm

THE

FOREST DEGRADATION

20221124 Bohyun Choi

OVERVIEW

It is implemented using a 3d model to visualize how much human life has affected forest degradation over the past over 20 years.

Interestingly, some areas seem to see a gradual decrease in forest area, while others are newly created or increase in area. It could be assumed that this was because humans recognized the seriousness of environmental problems, so they designate an arbor day and plant trees on that day,

DATA FILE

Forest area (% of land area)

<https://data.worldbank.org/indicator/AG.LND.FRST.ZS>

I used csv files of data showing the ratio of forest area in about 250 countries.

To visualize these data in the Earth-shaped 3d sphere, I found the latitude and longitude of 250 countries and added them to the csv file. I also removed unnecessary parts.

Data Source	World Development Indicators	Indicator Name	Indicator Code	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Last Updated Date	2023-10-26																			
Country Name	Country Code																			
Aruba	ABW	Forest area (% of land area)	AG.LND.FRST.ZS																	
Africa Eastern and Southern	AFG	Forest area (% of land area)	AG.LND.FRST.ZS																	
Afghanistan	AFG	Forest area (% of land area)	AG.LND.FRST.ZS																	
Africa Western and Central	AFW	Forest area (% of land area)	AG.LND.FRST.ZS																	
Angola	AGO	Forest area (% of land area)	AG.LND.FRST.ZS																	
Albania	ALB	Forest area (% of land area)	AG.LND.FRST.ZS																	
Andorra	AND	Forest area (% of land area)	AG.LND.FRST.ZS																	
Arab World	ARB	Forest area (% of land area)	AG.LND.FRST.ZS																	
United Arab Emirates	ARE	Forest area (% of land area)	AG.LND.FRST.ZS																	
Argentina	ARG	Forest area (% of land area)	AG.LND.FRST.ZS																	
Armenia	ARM	Forest area (% of land area)	AG.LND.FRST.ZS																	
American Samoa	ASM	Forest area (% of land area)	AG.LND.FRST.ZS																	
Antigua and Barbuda	ATG	Forest area (% of land area)	AG.LND.FRST.ZS																	
Australia	AUS	Forest area (% of land area)	AG.LND.FRST.ZS																	
Austria	AUT	Forest area (% of land area)	AG.LND.FRST.ZS																	
Azerbaijan	AZE	Forest area (% of land area)	AG.LND.FRST.ZS																	
Burundi	BDI	Forest area (% of land area)	AG.LND.FRST.ZS																	
Belgium	BEL	Forest area (% of land area)	AG.LND.FRST.ZS																	
Benin	BEN	Forest area (% of land area)	AG.LND.FRST.ZS																	
Burkina Faso	BFA	Forest area (% of land area)	AG.LND.FRST.ZS																	
Bangladesh	BGD	Forest area (% of land area)	AG.LND.FRST.ZS																	
Bulgaria	BGR	Forest area (% of land area)	AG.LND.FRST.ZS																	
Bahrain	BHR	Forest area (% of land area)	AG.LND.FRST.ZS																	
Bahamas, The	BHS	Forest area (% of land area)	AG.LND.FRST.ZS																	
Bosnia and Herzegovina	BIH	Forest area (% of land area)	AG.LND.FRST.ZS																	
Belarus	BLR	Forest area (% of land area)	AG.LND.FRST.ZS																	

Country Name	Country Code	Latitude	Longitude	1990	1991	1992	1993	1994	1995	1996
Aruba	ABW	12.5184	-70.0202	2.33333333333333	2.33333333333333	2.33333333333333	2.33333333333333	2.33333333333333	2.33333333333333	2.33333333333333
Africa Eastern and Southern	AFG	33.7680	66.2385	36.230057282616	36.0787524728735	35.9274992174853	35.7762459620971	35.624992706709	35.4737394513208	35.322
Afghanistan	AFG	-11.2027	17.8739	1.85278199408184	1.85278199408184	1.85278199408184	1.85278199408184	1.85278199408184	1.85278199408184	1.85278199408184
Africa Western and Central	AFW	41.1533	20.1683	22.776981273257	22.6587456695213	22.5405832111769	22.422407531025	22.304285950282	22.180695836958	22.06
Angola	AGO	42.5063	1.5218	63.5780701050774	63.4534073955242	63.328744685971	63.2040819764177	63.0794192668645	62.9547565573113	62.830
Albania	ALB	-38.4161	-63.6167	28.7883211678832	28.7171532846715	28.6459854014599	28.5748175182482	28.5036496350365	28.4324817518248	28.361
Andorra	AND	+25.2744	133.7751	34.0425531914894	34.0425531914894	34.0425531914894	34.0425531914894	34.0425531914894	34.0425531914894	34.0425531914894
Arab World	ARB	47.5162	14.5501	3.73176178416628	3.7136981754387	3.69562373713682	3.67755475526416	3.6594857733915	3.614167988656	3.6233
United Arab Emirates	ARE	40.1431	47.5769	3.44973246972684	3.5404539934013	3.63117431709378	3.7218952407725	3.812616446072	3.9033708814418	3.9940
Argentina	ARG	23.6841	90.3563	12.8637149256949	12.79699198667	12.7302690476451	12.6635461086203	12.5301002305705	12.4279241306639	12.463
Armenia	ARM	50.8503	4.4699	11.7426062521953	11.7352651914296	11.72727272727272	11.72727272727272	11.72727272727272	11.720530698981	11.712
American Samoa	ASM	9.3077	2.3158	90.35	90.18	90.01	89.84	89.67	89.5	89.33
Antigua and Barbuda	ATG	-14.2350	-51.9253	22.97727272727272	22.82727272727272	22.67727272727272	22.52727272727272	22.37727272727272	22.22727272727272	22.077
Australia	AUS	42.7339	25.4858	17.4273589940513	17.400438670106	17.3737183473699	17.3465980240293	17.316677006886	17.29757373479	17.265
Austria	AUT	12.6392	-1.5616	45.7546049442559	45.830370841687	45.9060106640814	46.0574163839069	46.1331192438194	46.208	
Azerbaijan	AZE	-3.3731	29.9189	11.4548229328142	11.5058701947919	11.5569174567696	11.6079647187474	11.655		
Burundi	BDI	12.5657	104.9909	10.7663551401869	10.4449376947041	10.1235202492212	9.8021028037832	9.48068535825545	9.1592679127259	8.8378
Belgium	BEL	3.8480	11.5021							
Benin	BEN	56.1304	-106.3468	42.8800106420717	42.259231287691	41.6384356154665	41.0176481021639	40.3968605888613	39.7760730755587	39.155
Burkina Faso	BFA	12.6392	-1.5616	28.2039473684211	28.0211622807018	27.883771929825	27.6555921052632	27.4728070175439	27.2900219298246	27.107
Bangladesh	BGD	23.6841	90.3563	14.7524775293847	14.7524759929323	14.75247454648	14.7524729002			

```

for (TableRow row : forestTable.rows()) {
    float lat = row.getFloat("Latitude");
    float lon = row.getFloat("Longitude");
    float forest = row.getFloat(str(year));

    float theta = radians(lat) + PI/2;
    float phi = radians(lon) + PI;
    float x = r * sin(theta) * cos(phi);
    float y = r * sin(theta) * sin(phi);
    float z = r * cos(theta);
    float h = RangeofH(forest);
    PVector pos = new PVector(x,y,z);

    PVector xaxis = new PVector(1,0,0);
    float angleb = PVector.angleBetween(xaxis,pos);
    PVector raxis = xaxis.cross(pos);

    pushMatrix();
    translate(x,y,z);
    rotate(angleb,raxis.x,raxis.y,raxis.z);
    fill(189,171,152);
    box(h,6,6);
    translate(h/2,0,0);

    float leaves = h/5;
    leaves = RangeofLeaves(leaves);
    if (leaves>=(leave_col_level*5)) fill(39,78,19);
    else if (leaves>=(leave_col_level*4)) fill(56,118,29);
    else if (leaves >=(leave_col_level*3)) fill(106,168,79);
    else if (leaves >=(leave_col_level*2)) fill(147,196,125);
    else if (leaves>=leave_col_level) fill(182,215,168);
    else fill(217,234,211);

    sphere(leaves/2);
    popMatrix();
    if (keyPressed && key == ' ') angle += 0.05;
}

```

To make earth sphere and data object

After taking the area ratio value of the forest by year in the csv file, I set the size of the box to vary according to the value.

The size of the spheres acting as leaves of the tree is set to vary depending on the h value, which means the size of the area in the data.

I tried to adjust the value using the map because the actual data did not show much difference in the area ratio by year, but if the value was changed significantly, the size of the sphere became too large. Therefore, I have put colors to ensure that the spheres are properly sized and distinguished by area.

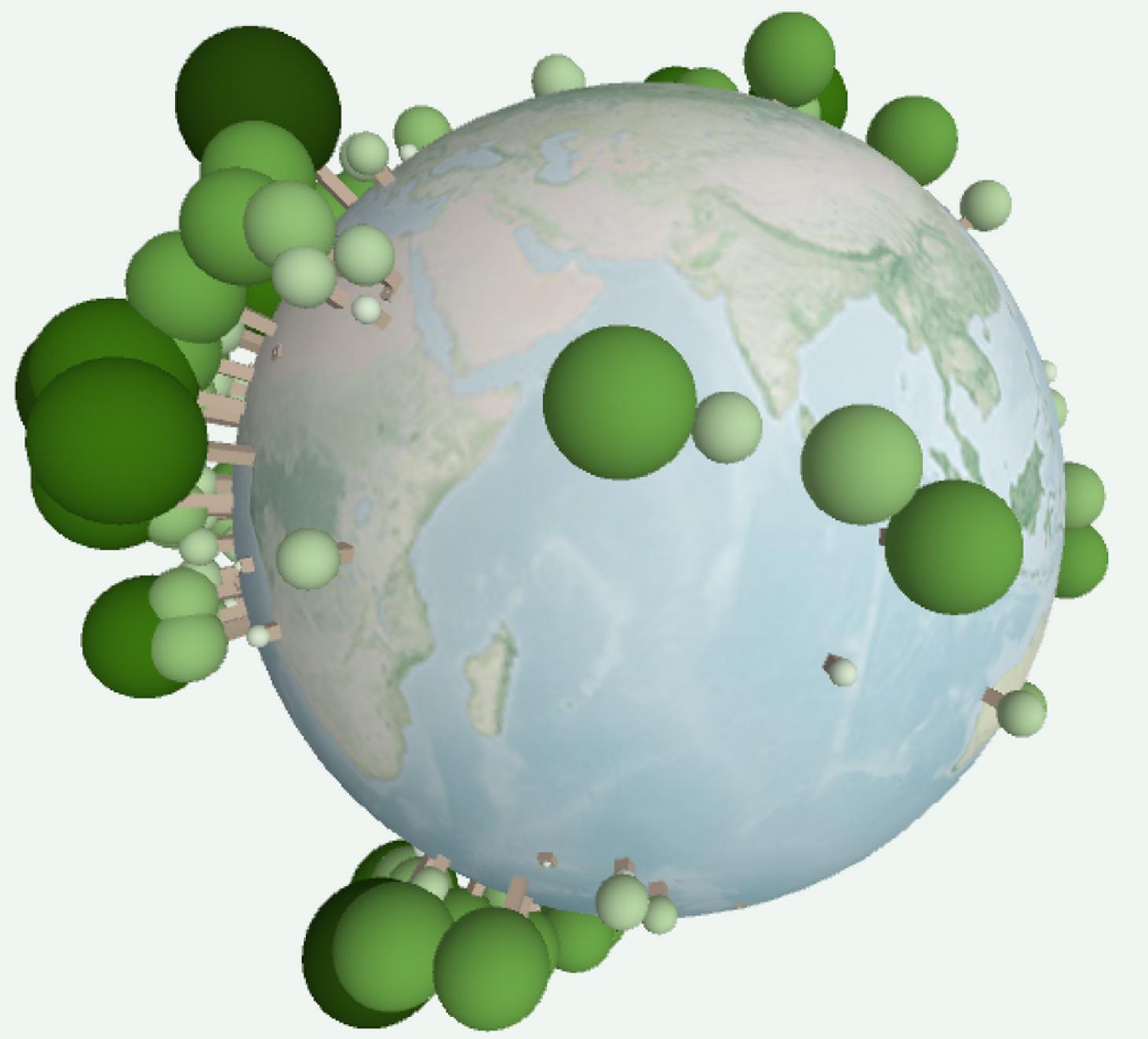
The smaller the area, the brighter the leaves.



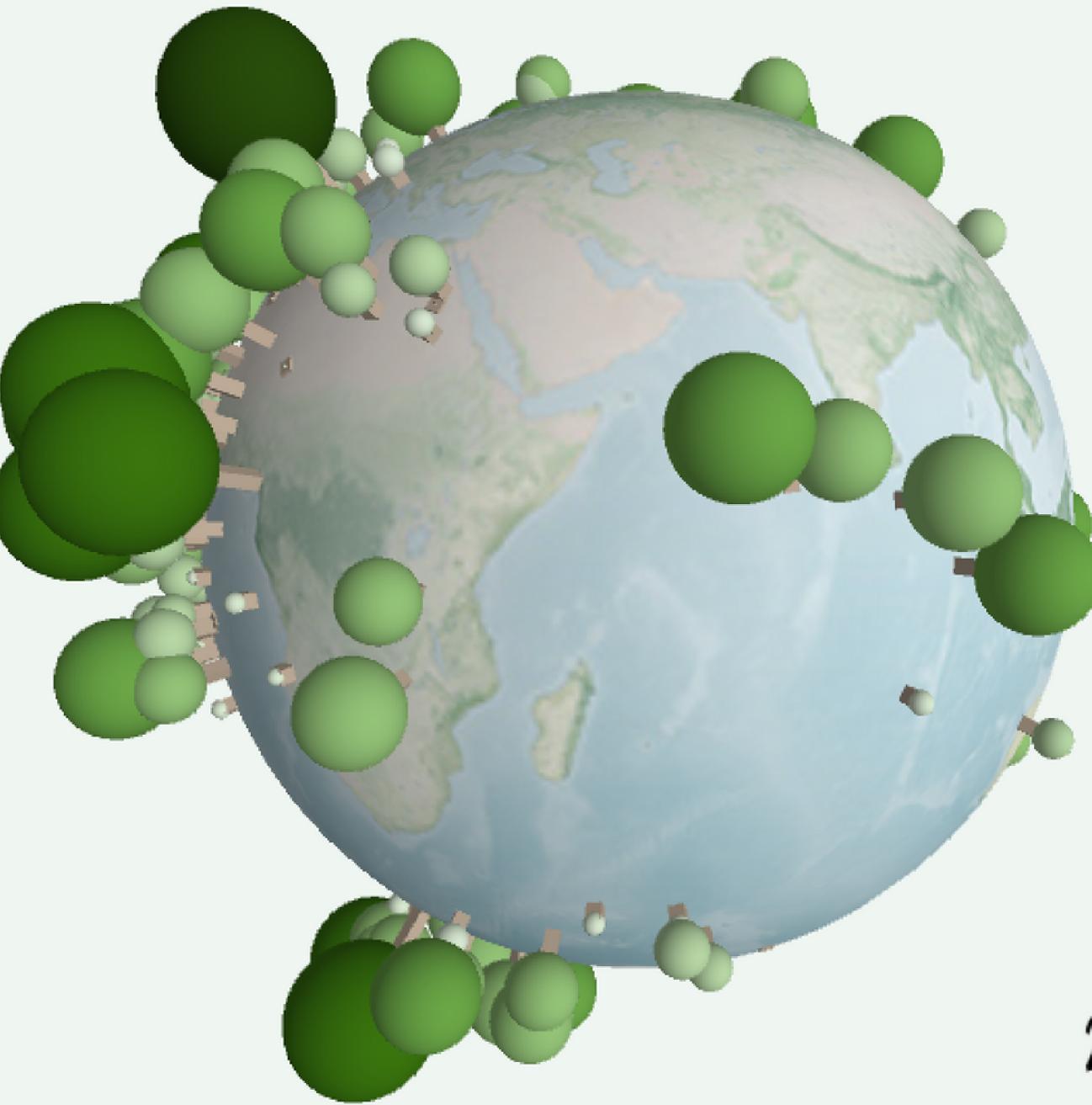
Coding Challenge #58: 3D Earthquake Data Visualization
The Coding Train

In this coding challenge, I follow up on the Earthquake Data Visualization challenge and create a 3D version in Processing(Java...)

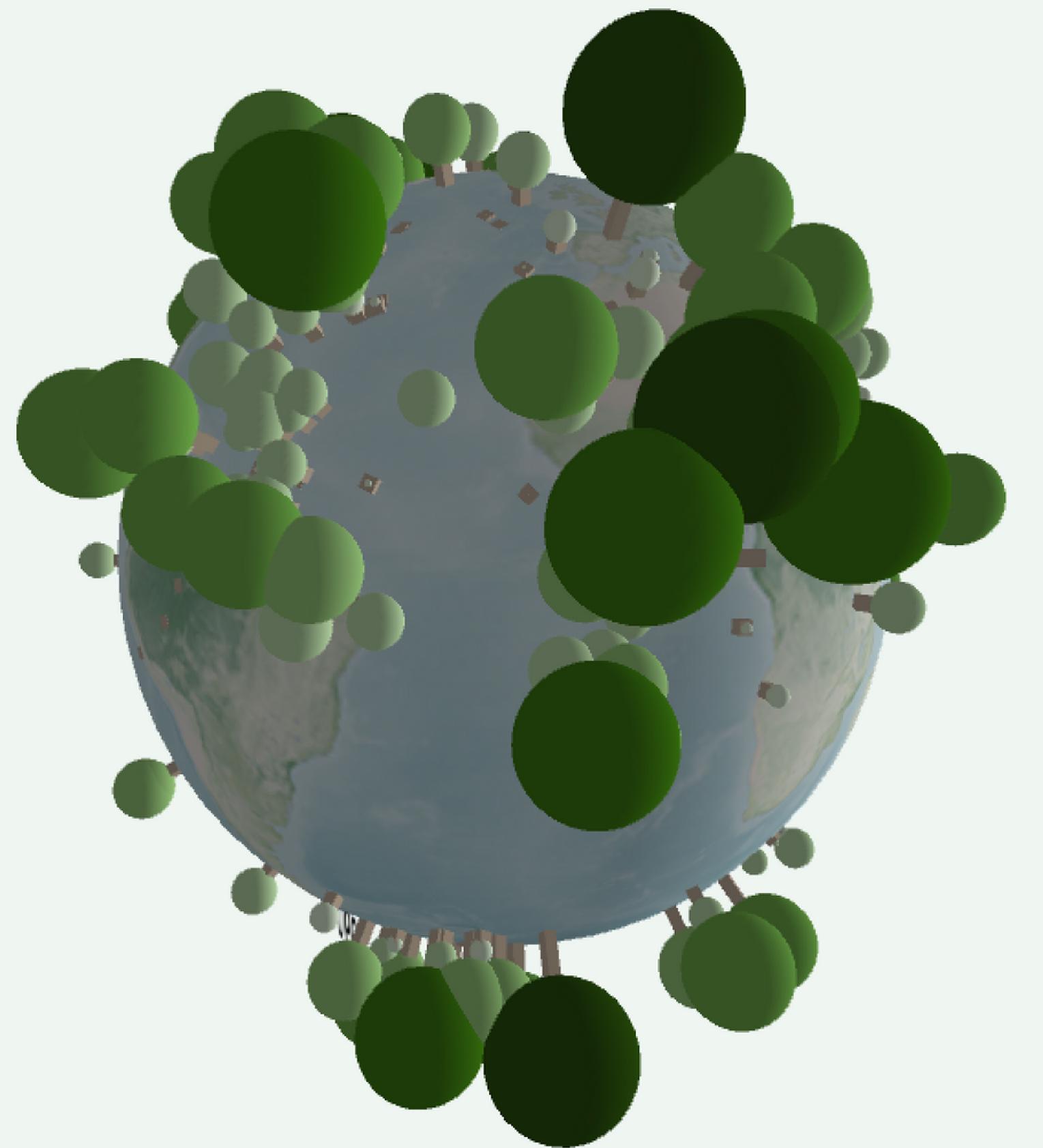
Attaching a box object to the sphere and texturing sphere used the code from this video.



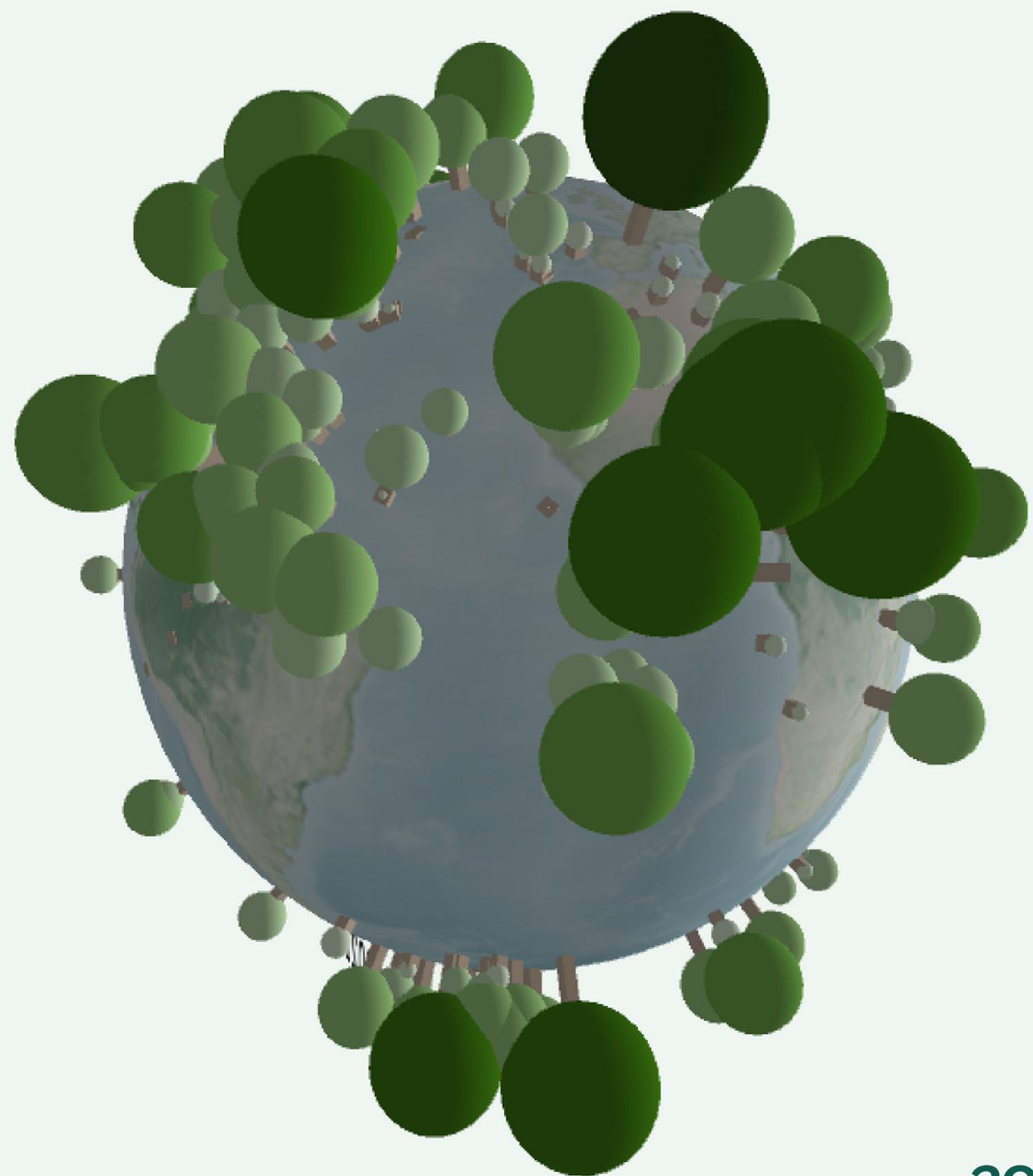
1990



2021



1990



2021

USER INTERACTION

Each mouse click by the user increases the year by one year and outputs the corresponding data.

The Earth rotates faster while pressing the space bar.

Users can see the changes in the forest area by the changes in color and the size of the leaves.