Projects and Practices in Physics

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a community-based learning environment

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Project 3: Geosynchronous Orbit: Part A

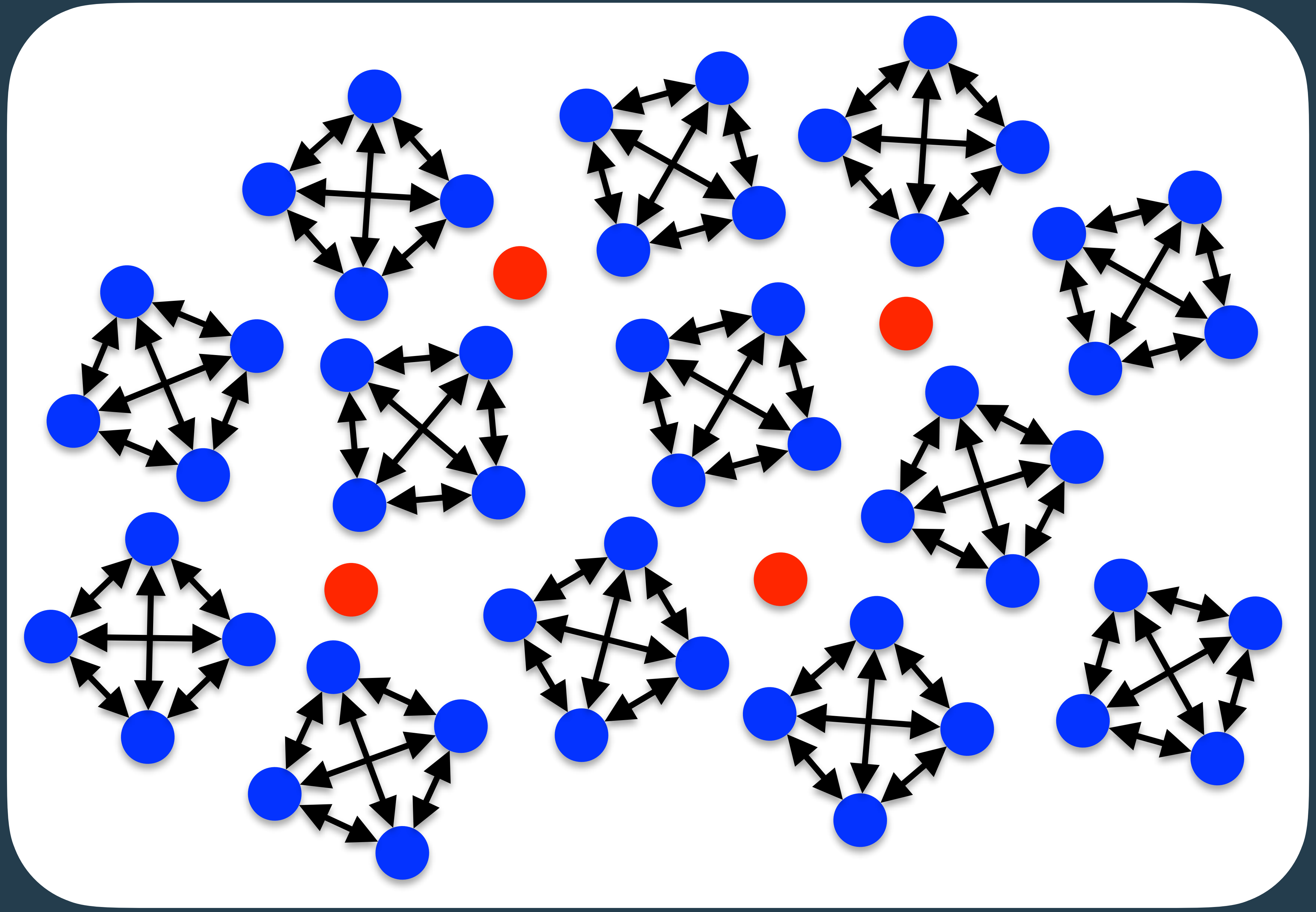
The Carver Media Group is planning the launch of a new communications satellite. Elliot Carver (head of Carver Media Group) is concerned about the launch. This is a $200,000,000 endeavor. In particular, he is worried about the orbital speed necessary to maintain the satellite's geosynchronous orbit (and if that depends on the launch mass). You were hired as an engineer on the launch team. Carver has asked that you allay his concerns.

Project 3: Geosynchronous Orbit: Part B

Carver is impressed with your work, but remains unconvinced by your predictions. He has asked you to write a simulation that models the orbi of the satellite. To truly convince Carver, the simulation should include representations of the net force acting on the spacecraft, which has a mass of 15×10^3 kg. Your simulation should be generalized enough to model other types of orbits including elliptical ones.

Code for Project 3:
geosync.py
PhysUtil Module

183_projects/project_3_2015_semester_1.txt · Last modified: 2015/01/29 12:42 by pwirving



msuperl.org/wikis/pcubed/

Irving, Obsniuk, & Caballero, EJP (2017)
Irving, McPadden, & Caballero Phys. Rev. PER (2020)

Investigating Learning Assistants' Instructional Approaches

```
# Objects
Earth = sphere(pos=vector(0,0,0), radius=6.4e6, material=materials.BlueMarble)
Satellite = sphere(pos=vector(7*Earth.radius, 0,0), radius=1e6, color=color.red, make_trail=True)

# More window setup
scene.range=12*Earth.radius

# Parameters and Initial conditions
mSatellite = 1
pSatellite = vector(0,5000,0)

# Time and time step
deltat = 1
t = 0
tf = 60*60*24

SatelliteMotionMap = MotionMap(Satellite, tf, 20, markerScale=2000, labelMarkerOrder=False)

#Calculation Loop
while t < tf:
        theta = (7.29e-5) * deltat      #       IGNORE THIS LINE
        Earth.rotate(angle=theta, axis=vector(0,0,1), origin=vector(0,0,0))     #       IGNORE THIS
        rate(10000)

        Satellite.pos = Satellite.pos + pSatellite/mSatellite*deltat

        SatelliteMotionMap.update(t, pSatellite/mSatellite)

        t = t + deltat
```

How do learning assistants approach teaching computational problems?

Irving, Obsniuk, & Caballero, EJP (2017)
Pawlak, Irving, & Caballero, Phys. Rev. PER (2020)
Irving, McPadden, & Caballero Phys. Rev. PER (2020)