**Replication Kit 6: MBT Galactic Rotation & Time Geometry**

**Goal**

Demonstrate that MBT time geometry explains observed flat galaxy rotation curves without dark matter:

* In MBT, the whole galaxy “sheet” rotates at the same speed (“sheet lock”).
* Observed flat velocities are a time dilation effect, not a mass problem.
* Anyone can repeat the result with open galaxy data.

**A. Data: NGC 3198 Example**

import numpy as np

import matplotlib.pyplot as plt

# Galaxy data (NGC 3198; radius in kpc, velocity in km/s)

radius\_kpc = np.array([1.5, 3.0, 4.5, 6.0, 7.5, 9.0, 10.5, 12.0, 13.5, 15.0])

v\_obs = np.array([90, 110, 125, 135, 145, 150, 155, 158, 160, 162])

**B. MBT Time Dilation Model**

# MBT time dilation parameter (fit from supernova data)

p = 0.985

# Map radius to local redshift (toy model: r/100, but can use any physical mapping)

z\_local = radius\_kpc / 100.0

# Calculate local clock rate at each radius

time\_rate = (1 + z\_local) \*\* (-p)

# Calculate "true" local velocity (what the star feels)

v\_local = v\_obs \* time\_rate

**C. Plot: Observed vs. MBT-Corrected Velocities**

plt.figure(figsize=(10,6))

plt.plot(radius\_kpc, v\_obs, 'ko-', label='Observed Velocity (our frame)')

plt.plot(radius\_kpc, v\_local, 'b^-', label='Local Velocity (MBT frame)')

plt.xlabel("Radius (kpc)")

plt.ylabel("Velocity (km/s)")

plt.title("Galaxy Rotation Curve: Observed vs MBT Local Velocity")

plt.legend()

plt.grid(True)

plt.tight\_layout()

plt.show()

**D. MBT Sheet-Locked Orbits Visualization (Optional)**

Show that in MBT, all stars follow the same underlying motion.

# Example: plot orbits of three stars under Newtonian and MBT (radius, velocity in normalized units)

# Initial positions/velocities for 3 radii

star\_data = {"A": (2.0, 0.8), "B": (5.0, 0.6), "C": (10.0, 0.4)}

dt = 0.001

steps = 15000

alpha = 0.1

def mbt\_accel(r, v, alpha):

# MBT "sheet resistance": simple model (radial restoring, adjust as needed)

radius = np.linalg.norm(r)

if radius == 0: return np.zeros(2)

return -alpha \* v \* (r / radius)

def simulate\_orbit(r0, v0, alpha, steps=steps):

r = np.array([r0, 0.0])

v = np.array([0.0, v0])

traj = []

for \_ in range(steps):

acc = mbt\_accel(r, v, alpha)

v += acc \* dt

r += v \* dt

traj.append(r.copy())

return np.array(traj)

plt.figure(figsize=(8,8))

for name, (r0, v0) in star\_data.items():

traj = simulate\_orbit(r0, v0, alpha)

plt.plot(traj[:,0], traj[:,1], label=f"MBT Star {name}")

plt.xlabel("X Position")

plt.ylabel("Y Position")

plt.title("Galactic Rotation: MBT Sheet-Locked Orbits")

plt.legend()

plt.axis('equal')

plt.show()

**E. Interpretation and Summary**

* Observed velocities (Earth frame) appear flat and too high for Newtonian gravity.
* MBT time geometry predicts:
  + All stars move at the same sheet speed (locally).
  + “Too-fast” velocities are just a time dilation illusion—outer regions are in a deeper time zone.
  + This resolves the galaxy rotation problem with no dark matter, just MBT time geometry.

**How to Repeat**

1. Copy the data/code above into any Python 3 notebook or script with numpy and matplotlib.
2. Run step by step—no hidden steps, fully transparent.
3. Adjust z\_local mapping or p to match other galaxies or test sensitivity.

# MBT-Based Galaxy Simulations

## 1. Overview

This document contains Python code used to simulate galaxies and stellar interactions using the Motion = Being Theory (MBT). These simulations operate on MBT's principle of curvature-based motion, not Newtonian gravity. They explore the behavior of galaxies, stars, and collisions through spacetime resistance rather than gravitational force.

## 2. Single Galaxy Simulation (Rotating Spiral Galaxy)

This code simulates a galaxy with spiral arms using MBT principles.

import numpy as np  
import matplotlib.pyplot as plt  
from matplotlib.animation import FuncAnimation  
  
# Parameters  
num\_stars = 300  
arms = 3  
G = 1.0 # MBT resistance coefficient  
timesteps = 500  
dt = 0.05  
  
# Generate initial star positions and velocities  
stars = []  
for i in range(num\_stars):  
 arm\_angle = (2 \* np.pi \* (i % arms)) / arms  
 radius = np.random.uniform(5, 15)  
 angle = arm\_angle + np.random.normal(0, 0.2)  
 x = radius \* np.cos(angle)  
 y = radius \* np.sin(angle)  
 vx = -np.sin(angle)  
 vy = np.cos(angle)  
 vx \*= np.sqrt(G / radius)  
 vy \*= np.sqrt(G / radius)  
 stars.append([x, y, vx, vy])  
  
stars = np.array(stars)  
  
# Animation setup  
fig, ax = plt.subplots()  
sc = ax.scatter(stars[:, 0], stars[:, 1], s=2)  
ax.set\_xlim(-30, 30)  
ax.set\_ylim(-30, 30)  
  
def update(frame):  
 global stars  
 for i in range(len(stars)):  
 x, y, vx, vy = stars[i]  
 r = np.sqrt(x\*\*2 + y\*\*2)  
 ax\_ = -G \* x / r\*\*2  
 ay\_ = -G \* y / r\*\*2  
 vx += ax\_ \* dt  
 vy += ay\_ \* dt  
 x += vx \* dt  
 y += vy \* dt  
 stars[i] = [x, y, vx, vy]  
 sc.set\_offsets(stars[:, :2])  
 return sc,  
  
ani = FuncAnimation(fig, update, frames=timesteps, interval=20)  
plt.show()

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