The Tech Interactive at Home

Gyroscope Dancing

Who says all the fun has to happen at The Tech Interactive? This dancing game uses the Arduino Science Journal app to build data literacy!

Introduction

How smooth are your dance moves? Can you spin like a gyroscope without falling over? Gyroscope dancing involves keeping one part of the body completely still while dancing with the rest. In this experiment, dancers will see if they can keep the accelerometers on their smartphone from detecting motion while they move and groove. All you need is a smartphone, the Arduino Science Journal app, an armband phone holder and at least two people! Gyroscope Dancing is a fun data challenge for your brain and your body!

Experiment

Test your ability to move smoothly using the accelerometers on the Arduino Science Journal app.

ARDUINO EDUCATION SCIENCE JOURNAL

This activity uses the **Arduino Science Journal app**, which lets you use your phone's sensors to create experiments and record data on the world around you. If you haven't used it before, download the app and play with it first.

Subject:
Data Science, Physical Education

Ages:
6+

Time:
15 minutes

Key concepts:
Data literacy, forming hypotheses, experimentation, defining and testing variables

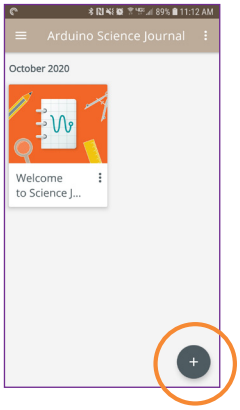
Materials

- Smartphone with the Arduino Science Journal app
- Armband phone holder
- Timer
- Music player and your favorite dance music
- Protective phone case (recommended)
- A friend to dance with!

Dancing safely with the smartphone
It's easy to accidentally let go of your smartphone if you're holding it while dancing, so we strongly advise securing it. If you don't have an armband for your phone, try putting the phone in a zipper pocket on your shirt or pants, or add a wrist strap to secure the phone from dropping if you let it go mid-dance.

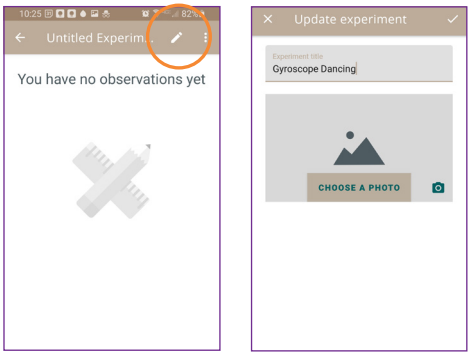
Ready, Set, Dance!

1 Open the Arduino Science Journal app and start a new experiment.

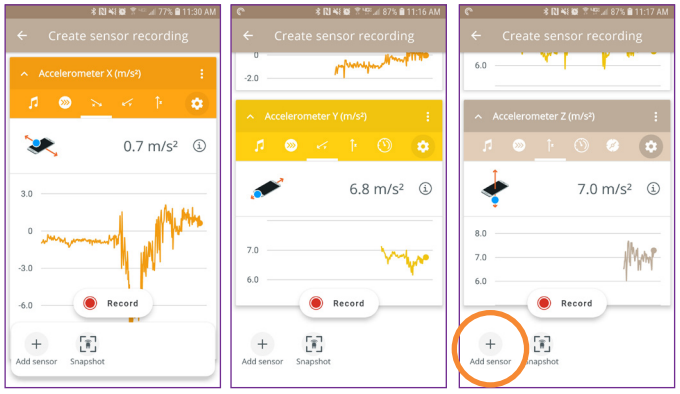


Tap the + icon to start a new experiment.

2 Rename it Gyroscope Dancing. (This will help you organize your data and experiments.)



3 Add Accelerometers X, Y and Z (m/s²) to the experiment.



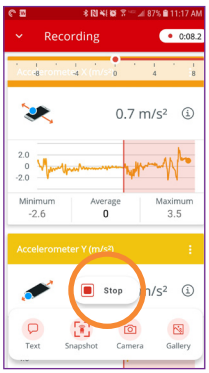
Tap the + icon to add a sensor.

Secure the smartphone to the dancer.
For an added challenge put it where it might move the most during the experiment.

4 Conduct the dance experiment

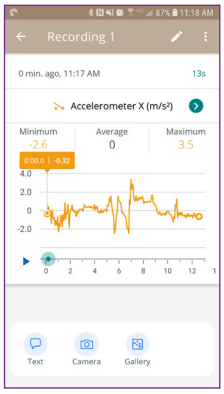
- Set the timer for 45 seconds, or longer if you want to dance even more!
- When the dancer and choreographer are ready:
  - Dancer: start recording data by pressing the red circle.
  - Choreographer: start the timer and music. Call out dance moves at random (and even dance along)!
- The accelerometers will pick up any motion and track it on the graph. The dancer tries to follow all the choreographer's instructions while still keeping the graph lines as flat as possible.
- When time is up, stop the recording by pressing the red stop button.

Tap the Record button to record.



5 Analyze the results

- Where are the biggest peaks on the graph? What dance moves were they doing at that moment?
- Which Accelerometer (X, Y or Z) detected the most motion? Why might this sensor have detected more activity?
- How did the graphs change as the experiments progressed? What could have caused this change?



6 Plan the next dance experiment.

- Use the information you got from your analysis to adjust the experiment. Consider how you could improve the results.
- How can the dancer change the way they move overall to keep all the accelerometers from detecting motion?
- Try trading roles so the dancer is now the choreographer, and vice versa. How did the graph change? What caused the biggest differences?

Need some inspiration for dance moves?

Here's some of our favorites — but feel free to make up and demonstrate your own!

- Chicken Dance
- Moon Walk
- Cupid Shuffle
- YMCA
- Floss
- Hokey Pokey
- Macarena
- Cha Cha Slide

Keep Experimenting

- **Guess the move:** Can you guess the dance move just by looking at the graph? Try having one person close their eyes while the other dances with the smartphone. See if they can guess the dance move just by looking at the data. This challenge does not require the dancer to keep the phone's sensors from picking up their movements, so dance however you like and don't worry about keeping one body part still.
- **Try the Irish dance challenge!** Irish dance involves jumping as high as possible while keeping your arms completely still at your sides. Try to see how high you can make Accelerometer Z's graph peak while keeping Accelerometers X and Y from detecting motion.

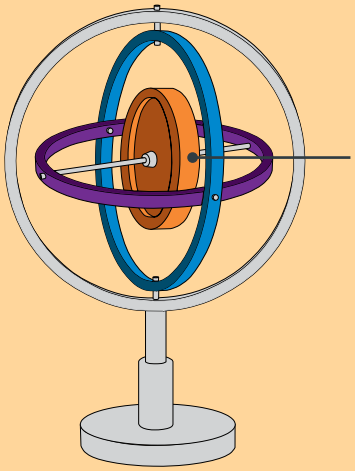
What is a gyroscope?

Gyroscopes are used to measure or maintain orientation. They are often used in compasses and automatic piloting systems.

In this activity, you're trying to keep a specific part of your body from moving in any direction similar to how the wheel at the center of a gyroscope stays in place as it spins.

The smartphone's accelerometers measure how well you are keeping that body part still. Try playing with the X, Y and Z accelerometers before starting your dance experiments to see the accelerometers measure movement.

- **X-axis** (left and right)
- **Y-axis** (closer and farther away)
- **Z-axis** (up and down)



When you spin the wheel at the center it stays in place even as you tilt or rotate the outer ring.

Share Your Results! Keep us posted about your design challenges on social media with **#TheTechatHome.**

The Tech Interactive at Home

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