



S4: Motion Detection

Student Worksheet · Advanced Challenge

🎯 YOUR MISSION

So far your alarm only fires when someone shakes the micro:bit on purpose. Real motion sensors watch continuously and react on their own. Replace the manual shake trigger with the accelerometer, watched in a loop that never stops running.

🏠 REAL-WORLD SCENARIO

A motion sensor on a door or window doesn't wait to be shaken. It constantly measures movement and compares it against a threshold, the smallest jolt it should react to. Your micro:bit's built-in accelerometer can do the same job, reading acceleration on the x-axis every instant instead of waiting for a single shake event.

What you need to do

- Replace the "on shake" block with continuous accelerometer monitoring, simulating a real motion sensor on a door or window.
- If the system is armed and movement beyond a chosen threshold is detected, trigger the alarm automatically.

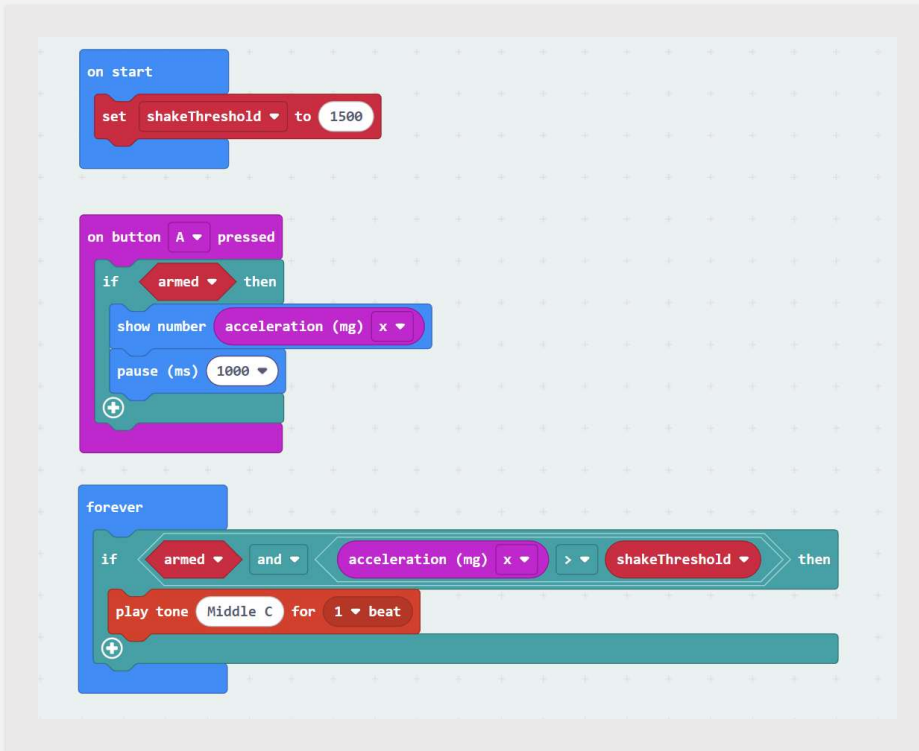
Concepts introduced

Accelerometer values

Forever loops

Threshold detection

Starter code



Equipment needed: just the micro:bit. Button A shows you a live acceleration reading, so you can find a good threshold before wiring the alarm to it.

YOUR TASK

The forever loop is empty. Inside it, check if the system is armed and the acceleration on the x-axis is over your shakeThreshold. If both are true, show "INTRUDER" and play a tone, same as your shake handler did in S2.

Threshold I settled on: _____

<> PSEUDOCODE

This is plain-English pseudocode, not real code to copy into MakeCode. Your blocks will need to do the following; you'll build it yourself with the actual blocks.

```
SET shakeThreshold to 1500
```

```
FOREVER:
```

```
  IF armed AND acceleration(x) > shakeThreshold:
```

```
    SHOW ____ // FILL IN THE BLANK
```

```
    PLAY TONE ____ for ____ // FILL IN THE BLANK
```

```
    SET armed to ____ // FILL IN THE BLANK
```

Extension: tune your sensor

- ☐ Try different shakeThreshold values. What's the lowest value where normal handling of the micro:bit doesn't set off a false alarm?
- ☐ Add a second condition using the y-axis or z-axis as well as x, so a tilt or lift is detected, not just a shake along one axis.
- ☐ Add a short cooldown after an alert (e.g. pause 3000 ms) so one shake doesn't retrigger the alarm dozens of times in a row.

WHAT DO YOU NEED TO THINK ABOUT?

Real accelerometers can be quite sensitive. How do you stop small vibrations, like someone walking past a table, from causing false alarms? What threshold feels right after testing?

Build it: checklist

- ☐ The forever loop checks acceleration continuously, with no shake needed.
- ☐ Moving the micro:bit past your threshold while armed shows "INTRUDER" and plays the alarm tone.
- ☐ Small everyday knocks and bumps don't set it off; a real shove does.

→ NEXT STEPS

This feeds into Challenge S5.