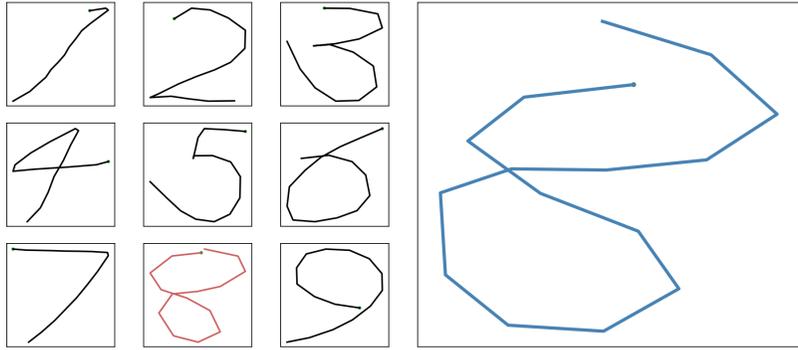


micro:brush

Anonymous Authors

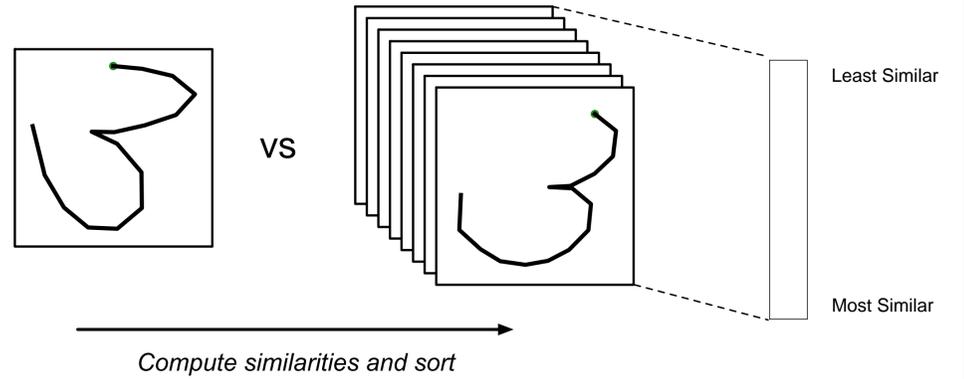
What is "pattern recognition"?



Goal: Provide an intuitive foray into concepts of Artificial Intelligence
Use micro:bit as an interactive tool for exploring basic AI

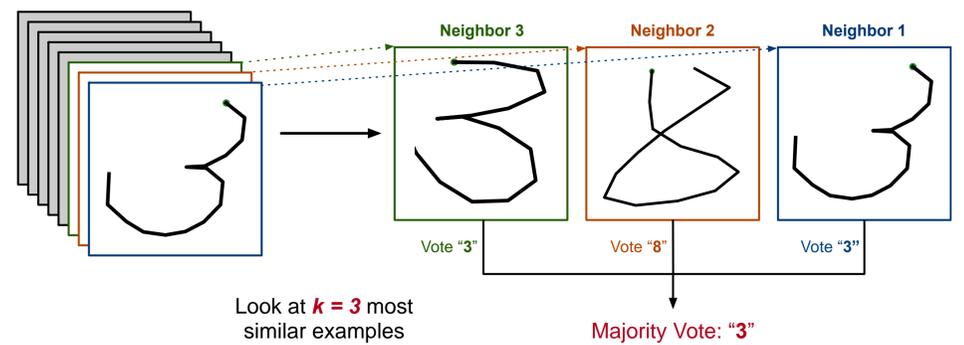
Plan: How can a computer recognize images?
Visualize how a computer understands the concept of "similarity"
Show how similarity can be used to form a simple classifier
Demonstrate ideas of data preprocessing and augmentation

Visualizing *k*-NN



***k*-Nearest Neighbors (*k*-NN)** is a way of predicting a new object's identity using previously identified examples.

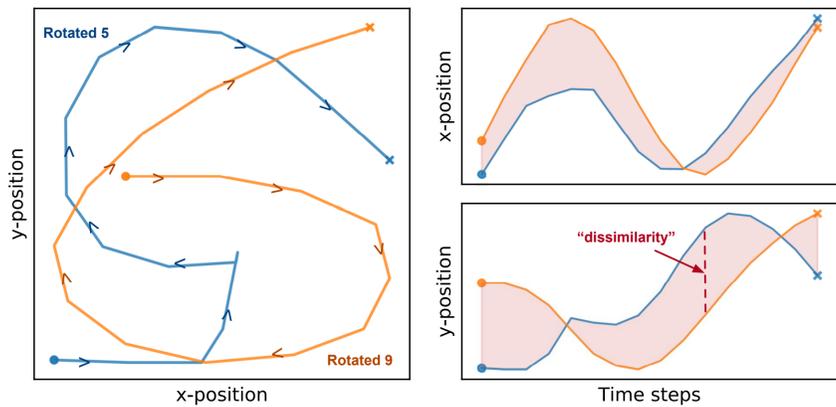
We start by finding the ***k*** previous examples most closest to the new one according to the chosen measure of similarity (see previous section)



These ***k*** most similar examples, known as the "nearest neighbors" (shown above), each vote that the new object has the same identity as themselves.

Tallying up each neighbor's vote, we determine which such vote was the most popular (i.e. we take a "majority vote"). We then use this vote to predict the identity of the new object.

How do computers see "similarity"?

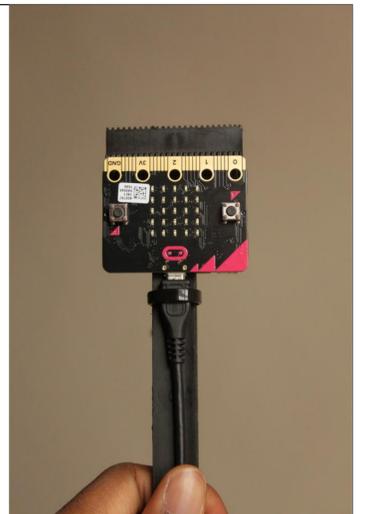
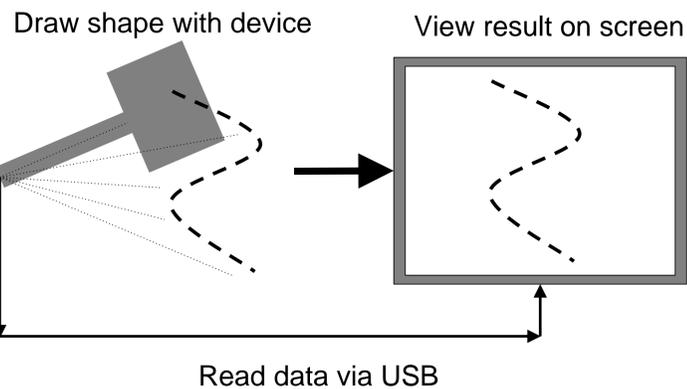


- Steps:**
1. Rotate images to have same initial direction
 2. Rescale rotated images to same size
 3. At each point in time, compute axial distances (shown in red on the right)
 4. Average distances across time to yield *dissimilarity*

micro:brush (hardware)

Only a very small set of physical resources are needed for the operation of the system:

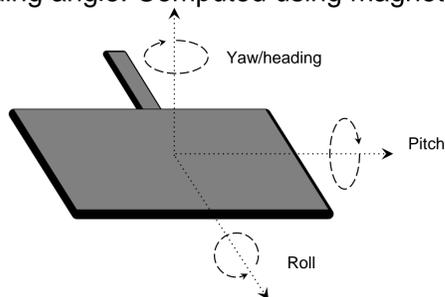
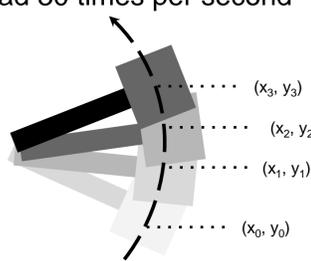
- A micro:bit
- A "handle" - a paint spreader in our case
- Cable ties to attach the device and USB to the handle
- A PC to stream positional data to



micro:brush (software)

- Use 2 Micro:Bit sensors
 - Accelerometer - Senses the Earth's gravity vector
 - Magnetometer - Senses the Earth's magnetic Field vector
- Sensors are read 30 times per second

- Stroke data derived from orientation of Micro:Bit
- Two angles used:
 - Pitch angle: Computed using accelerometer
 - Heading angle: Computed using magnetometer



Displayed Stroke

