Instrumental Technique

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JOYSTICK

Definition…

An input device commonly used to move objects quickly and accurately in x-y direction.

Consists of…

A base and a stick that can be moved in any direction. The stick can be moved slowly or quickly and in different amounts.

Advantage…

Because of the flexible movements a joystick allows, it can provide much greater control than the keys on a keyboard.

History

- The electrical two-axis joystick was invented by C. B. Mirick at the United States Naval Research Laboratory(NRL) and patented in 1926 .
- In the 1960s the use of joysticks became widespread in radio-controlled model aircraft systems such as the Kwik Fly produced by Phill Kraft (1964).
- The first use of joysticks outside the radio-controlled aircraft industry may have been in the control of powered wheelchairs, such as the Permobil (1963).
- During this time period NASA used joysticks as control devices as part of the Apollo missions. For example, the lunar lander test models were controlled with a joystick.

What does it do ?

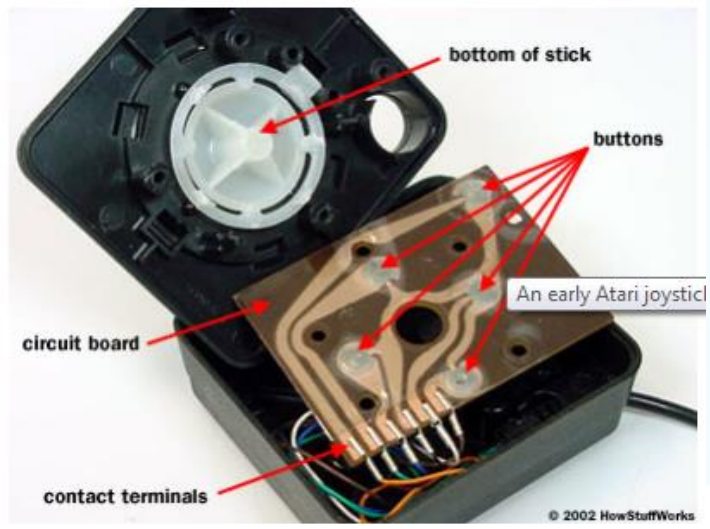
Physical
(movement of your hand)

Mathematical
(a string of 0 & 1)

❖Joysticks typically connect to your computer using a basic USB or serial port connection .

❖The movement of stick in any direction from center position corresponds to the movement of cursor on screen in the same direction.

❖The amount of movement is measured by the potentiometers and the springs return the stick to the position.



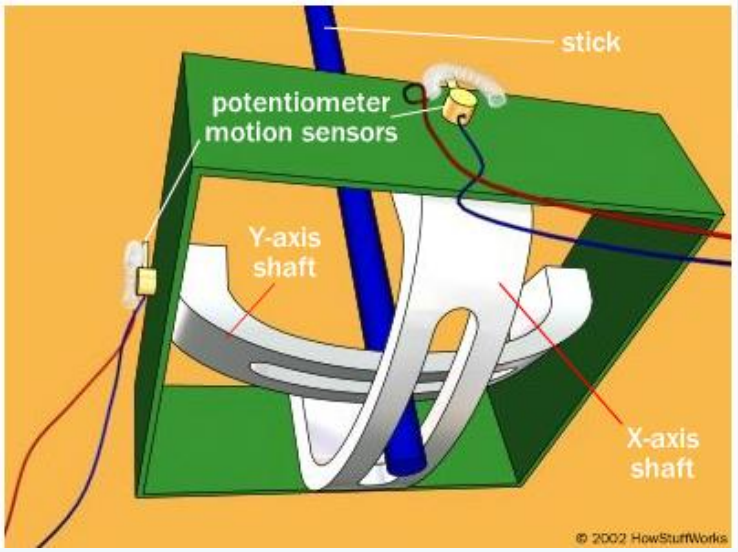
How does it work?

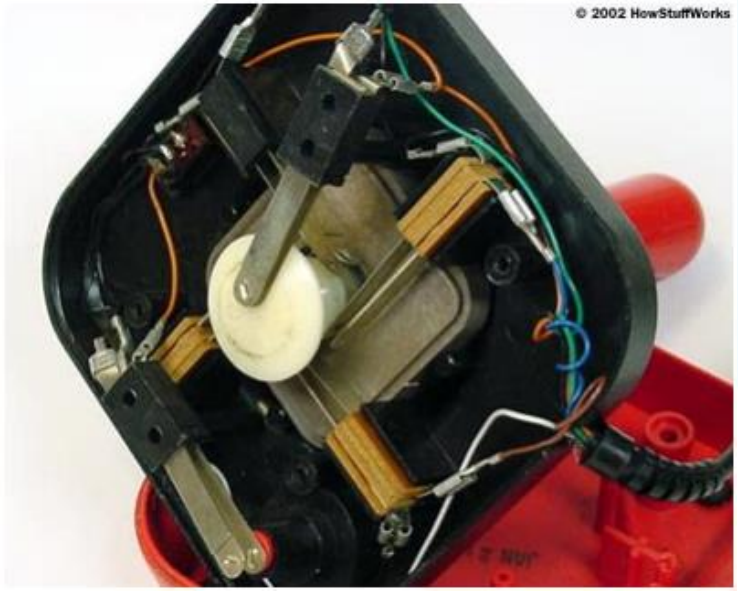
- The handle moves a narrow rod that sits in two rotatable, slotted shafts.

- When the computer picks up a charge on a particular wire, it knows that the joystick is in the right position to complete that particular circuit.

- Pushing the stick forward closes the "forward switch," pushing it left closes the "left switch," and so on.

- The computer recognizes a diagonal position when the stick closes two switches (for example, closing the forward switch and the left switch).



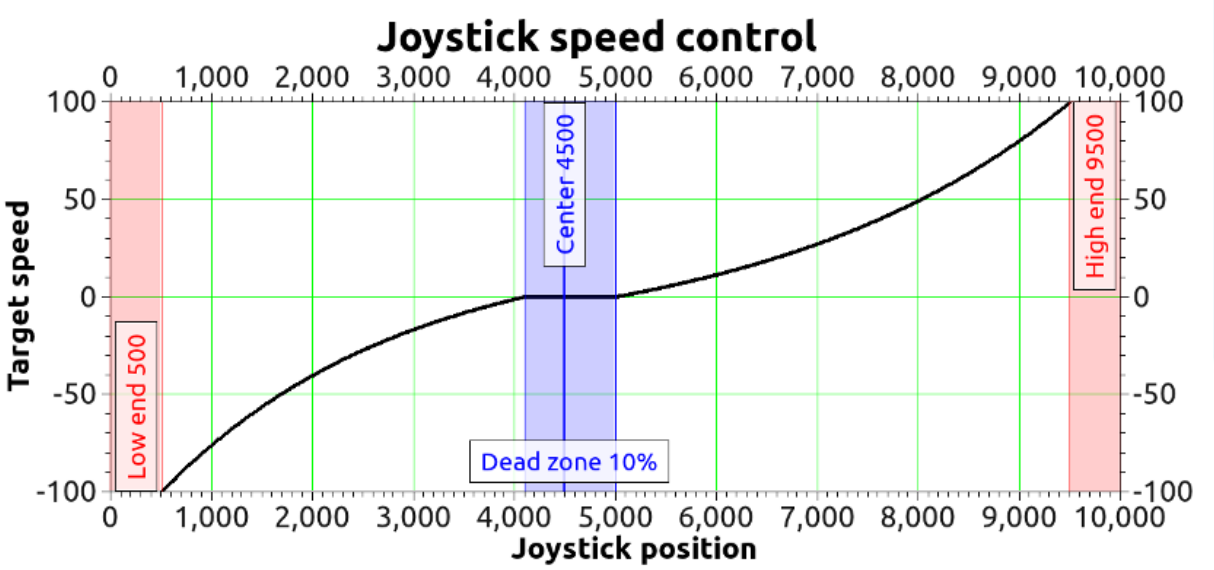


Joystick control

- ✓Input: 0-3 V (0 V corresponds to a value of 0 and 3 V corresponds to a value of 10000).

- ✓DeadZone(To stop movement) :
  - ✓counted from the central position and measured in percent.
  - ✓Any joystick position inside deadzone : stopping of the movement.
  - ✓larger than deadzone deviation of the stick starts controller movement .
  - ✓the speed is calculated from the deviation.

- ✓Movement speed :
  - ✓exponential dependence
  - ✓high precision through small joystick shifts
  - ✓high speed through large ones.
  - ✓If the nonlinearity parameter is zero, the motor speed will linearly depend on joystick position.

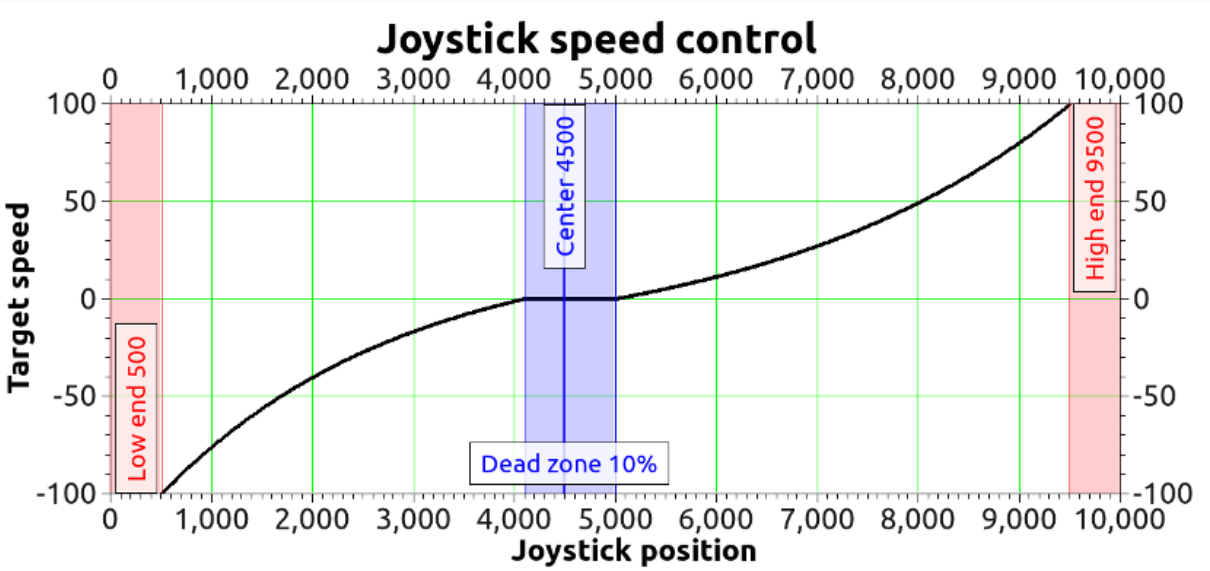


Joystick control

✓If joystick sits within dead zone for more than 5 seconds it will be logically considered to be out of deadzone only when it has been physically out of deadzone for more than 100 ms. (This allows user to release joystick and to be confident that even occasional noise on joystick output won't lead to unnecessary motor motion).

✓The following graph shows dependence of movement speed on joystick position for the following settings:

Central deviation	4500
Minimum deviation	500
Maximum deviation	9500
Dead zone	10%
Maximum movement speed	100



Use in Lab

1. In cytoviva, as stage movement controller

It allows precise movement of the specimen through the field of view(area of specimen visible through the microscope).

- ✓**High-Reliability**
- ✓**Proportional Movement for Fast or High Precision Moves**
- ✓**High/Low Speed Selection Button**
- ✓**Speed Dial for Sensitivity Adjustment**
- ✓**Ergonomic and Elegant Design**

2. For surface mapping and characterization applications where there is a need to move a camera or probe at constant velocity while simultaneously capturing data.


Thanks!