DC

Z-NUMBERS:

Fuzzy Number ->“How much does a value resemble the vague concept?”
Probability ->“How likely is the value?”

“A Z-number expresses not only an uncertain value, but also how confident we are about that value.”

Eg:
“The temperature is around 30°C, but I'm not very sure.”

Traditional fuzzy sets can model “around 30°C” but cannot model “not very sure”.
Z-numbers try to mathematically represent human-like uncertain statements.

Fuzzy number -> to represent an uncertain value
Z-number (for confidence) -> how confident we are about that uncertain value

In our project,

Emotion -> fuzzy number (because we are giving different percentages of different emotions, so for a single emotion also, we are uncertain)
Surety -> z-number

We are determining surety by asking user to tweak those circles at the end…duration of mouse hold.

This connects directly to your Z-mouse:

- duration of hold = quantifying certainty (B)
- selected emotion = fuzzy emotional value (A)

Z-number Z = (A,B)

A = fuzzy value
B = belief about the value

Q. What is the advantage over fuzzy sets?

Answer:
Traditional fuzzy sets assume 100% confidence in the fuzzy value.

Z-numbers relax this assumption.

“A Z-number is a pair of fuzzy numbers, where the first fuzzy number represents an uncertain value, and the second represents confidence in that value.
This allows modeling human-like statements where both the value and your belief about that value are uncertain.
Computation is typically done by converting the Z-number into an equivalent fuzzy number and then applying fuzzy arithmetic.”

CIRCUMPLEX MODEL OF EMOTIONS:

The Circumplex Model is a 2D map of human emotions, proposed by psychologist James Russell (1980).

It arranges emotions on a **circle (circumference)** using **two axes**:

1. **Valence (horizontal axis)**
    - How pleasant or unpleasant an emotion is
    - Left = unpleasant (anger, fear)
    - Right = pleasant (happiness, contentment)
2. **Arousal (vertical axis)**
    - How activated or energized the body feels
    - High = excited, alert
    - Low = calm, sleepy

Together, these two dimensions form a **2D plane**, and emotions are placed at different coordinates on it.

This gives a geometric representation of emotions.

Meaning of the word Circumplex -> a circular depiction of the similarities among multiple variables.

Putting both together:

- **High arousal + Positive valence → Excited**
- **High arousal + Negative valence → Angry / Afraid**
- **Low arousal + Positive valence → Calm / Relaxed**
- **Low arousal + Negative valence → Depressed / Sad**

4 quadrants

How your Z-mouse project fits perfectly with this model?

A = position on the circle → the emotional value
B = certainty → represented by hold duration (Z-number certainty)

“The Circumplex Model of Emotion maps emotions on a 2D plane with valence and arousal as axes.
Valence measures pleasantness, and arousal measures activation.
When plotted, emotions form a circle—high arousal positive emotions like excitement are in the upper right, low arousal negative emotions like sadness in the lower left, and so on.
The model views emotion as continuous, not categorical, making it ideal for computational systems like my Z-mouse, where each chosen emotion corresponds to a coordinate, and duration of hold gives certainty.”
