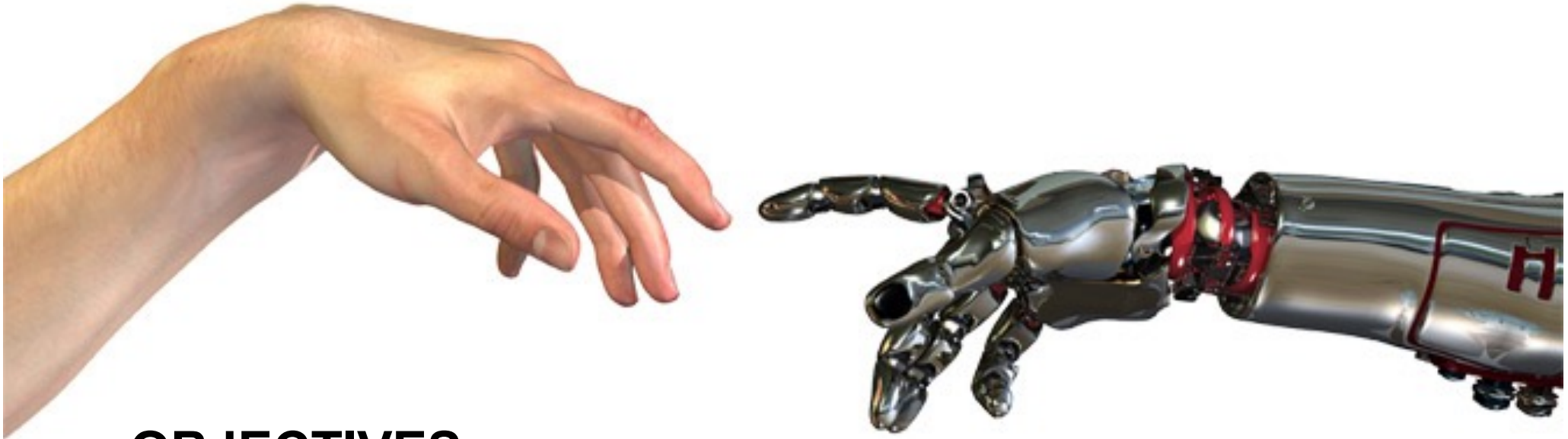
HUMAN-COMPUTER INTERACTION

UNIVERSAL PRINCIPLES OF HUMAN-COMPUTER INTERACTION DESIGN

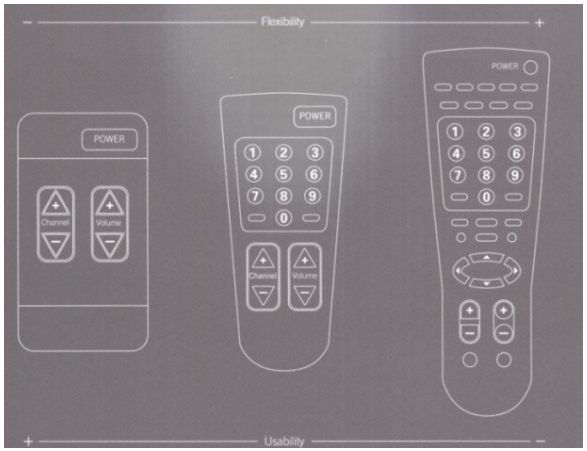


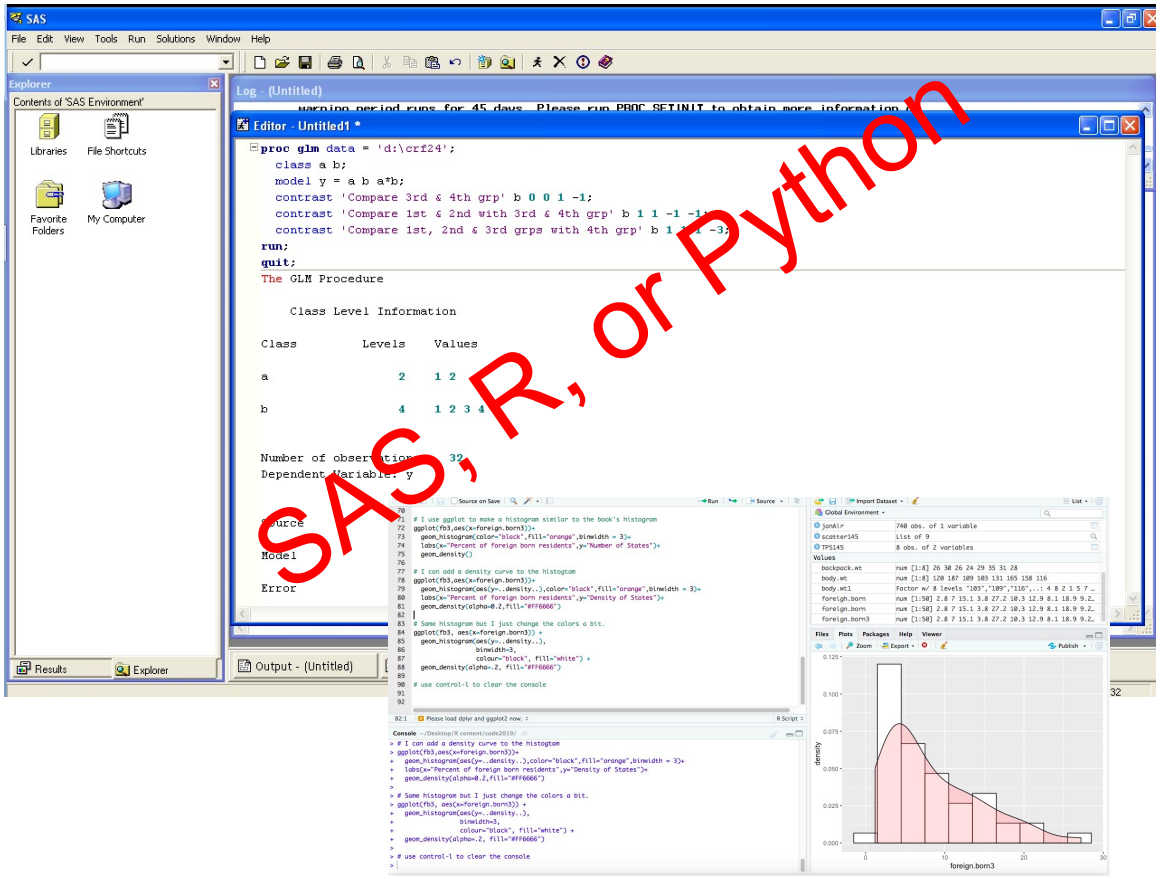
OBJECTIVES

1.) Flexibility Usability Tradeoff, Forgiveness, Fight/Flight, Interference Effect, Mental Models

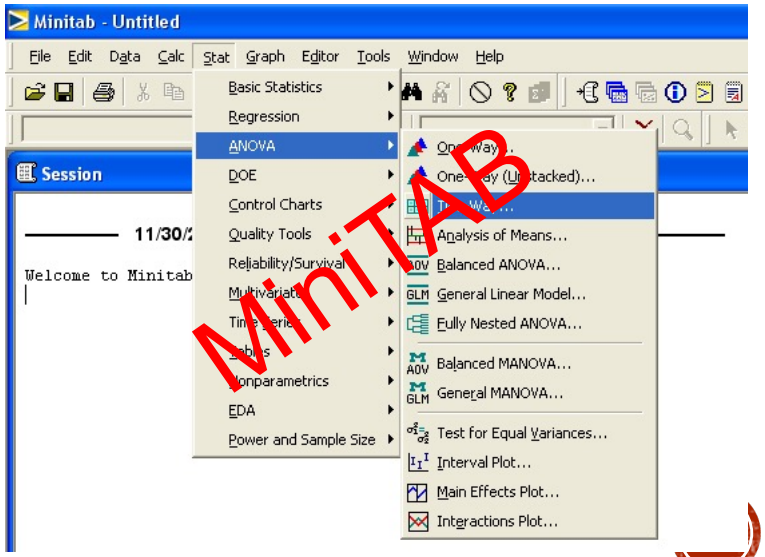
FLEXIBILITY USABILITY TRADEOFF

- As the flexibility of a system increases, its usability decreases.





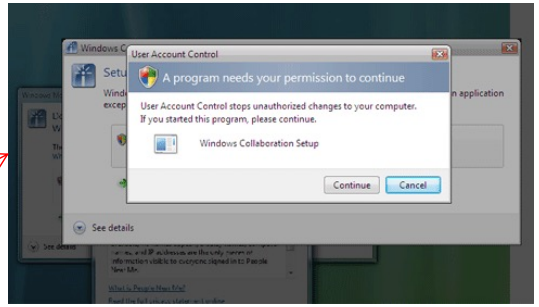
SAS, R, or Python



MiniTAB

FORGIVENESS

- Designs should help people avoid errors and minimize negative consequences of errors when they do occur.
- Common strategies for incorporating forgiveness in designs include:
  - Reversibility of actions
  - Safety nets
  - Confirmation – verification of the intent that is required before critical actions are allowed
  - Warnings-signs, prompts, alarms etc used to warn of imminent danger
  - Help – info that assists in basic operations, troubleshoots, and error recovery.

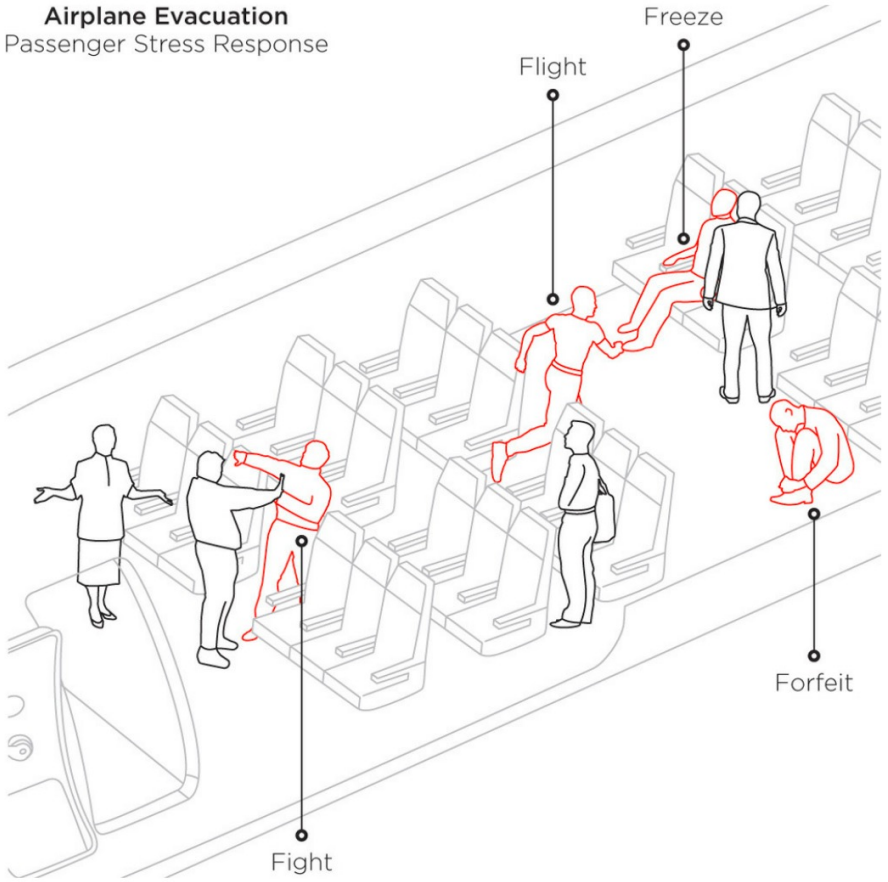


Keep in mind that too many confirmation or warnings impede the flow of interaction and increase the likelihood that the confirmation or warning will be ignored.

FREEZE, FLEE, FIGHT, AND FORFEIT (IN THAT ORDER) — STRESSFUL SCENARIOS

The ordered, instinctive response to acute stress.

- When people are exposed to stressful or threatening situations, their instinctive responses are to freeze, flee, fight, and forfeit, in that order.
- When a threat is suspected, the instinctive response is to freeze—to stop, look, and listen for threats.
- When a threat is detected, the instinctive response is to flee—to escape from the threat.
- When unable to escape from a threat, the instinctive response is to fight—to neutralize the threat.
- When unable to neutralize the threat, the instinctive response is to forfeit—to surrender to the threat.
- Consider freeze-flight-fight-forfeit in the design of systems that involve performance under extreme stress. It is critical to design systems and training to address each stage of the stress response differently versus a one-strategy-fits-all approach.



People respond to extreme stress in four ways. It is important to design systems and training to address each of them.

WHERE MIGHT WE CONSIDER THIS *FREEZE, FLEE, FIGHT, AND FORFEIT* CONCEPT FOR AN HCI TYPE OF APPLICATION?

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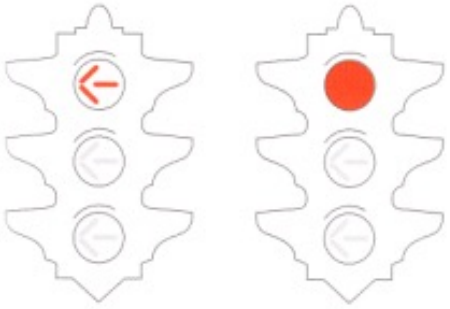
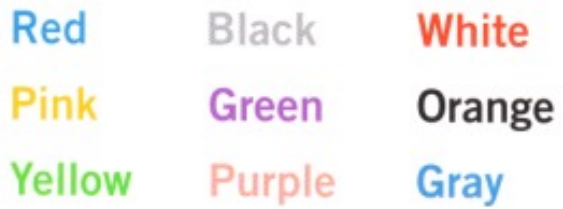
INTERFERENCE EFFECT

- Interference effects occur when two or more perceptual or cognitive processes are in conflict.
- *Stroop Interference* – an irrelevant aspect of a stimulus triggers a mental process that interferes with processes involving a relevant aspect of the stimulus. Ex. Time it takes to name the color of words when the meaning and color of the words conflict.

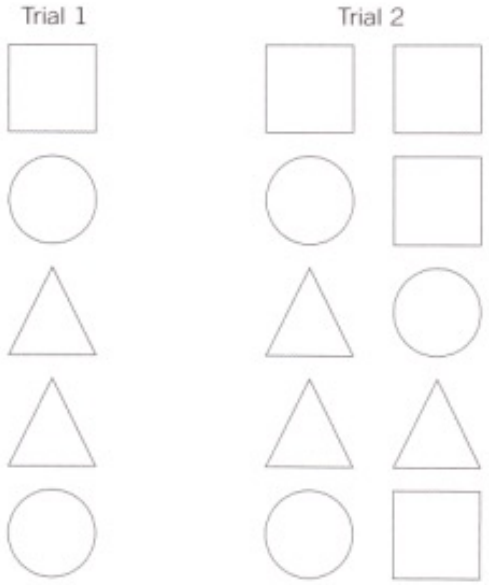
In populations that have learned that green means go and red means stop, the incongruence between the color and the label-icon results in interference.



In populations that have learned that a traffic arrow always means go, the introduction of a red arrow in new traffic lights creates potentially dangerous interference.



Reading the words aloud is easier than naming their colors. The mental process for reading is more practiced and automatic and, therefore, interferes with the mental process for naming the colors.



Naming the column of shapes that stands alone is easier than naming either of the columns located together. The close proximity of the columns results in the activation of mental processes for naming proximal shapes, creating interference.

YOU TRY!

HTTPS://WWW.PSYTOOLKIT.ORG/EXPERIMENT-LIBRARY/EXPERIMENT_STROOP.HTML

The Stroop Effect Test

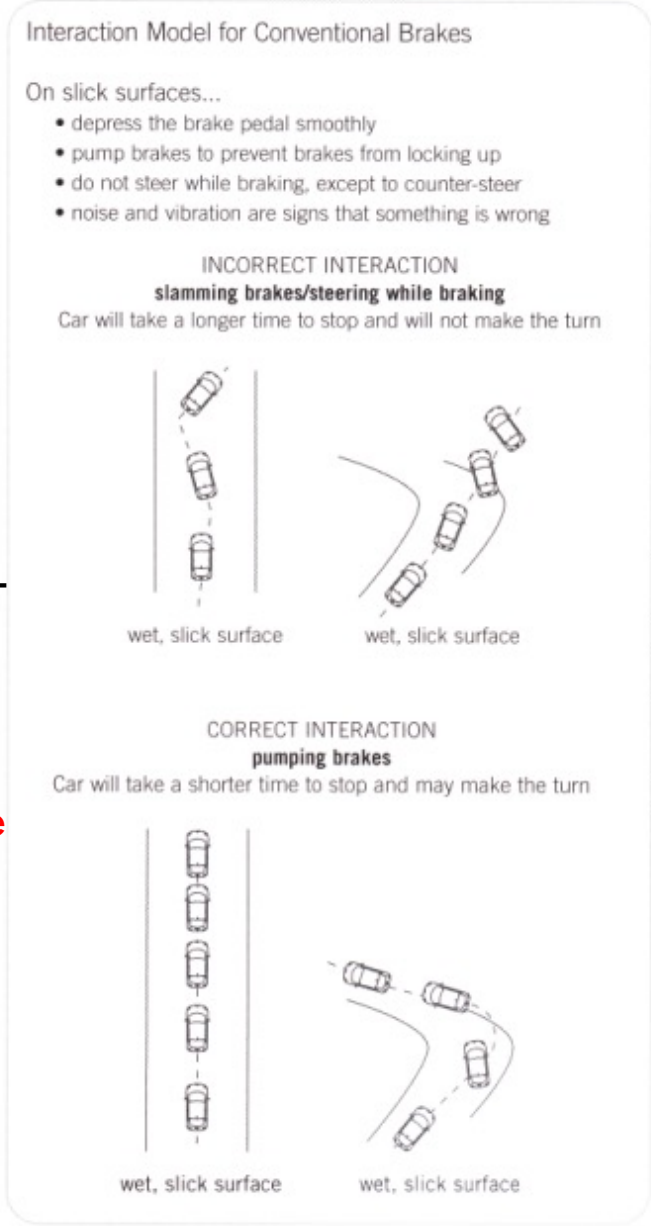
	Correct	Average response	
Congruent	5	15.38	seconds
Incongruent	15	19.1673	seconds

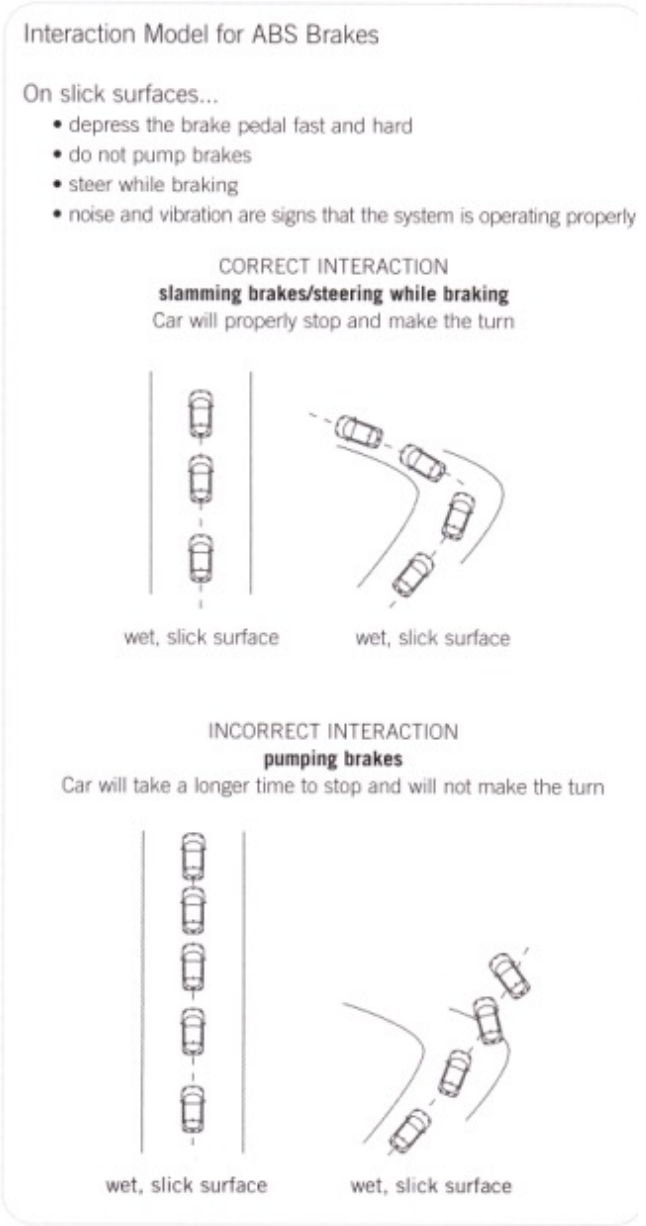
Most people respond faster and more accurately to the congruent trials, that is, when the word matches the color. This indicates that the act of reading the word has become automatic for many of us, and we have a difficult time suppressing that response.

Repeat

MENTAL MODEL/NATURAL MAPPINGS

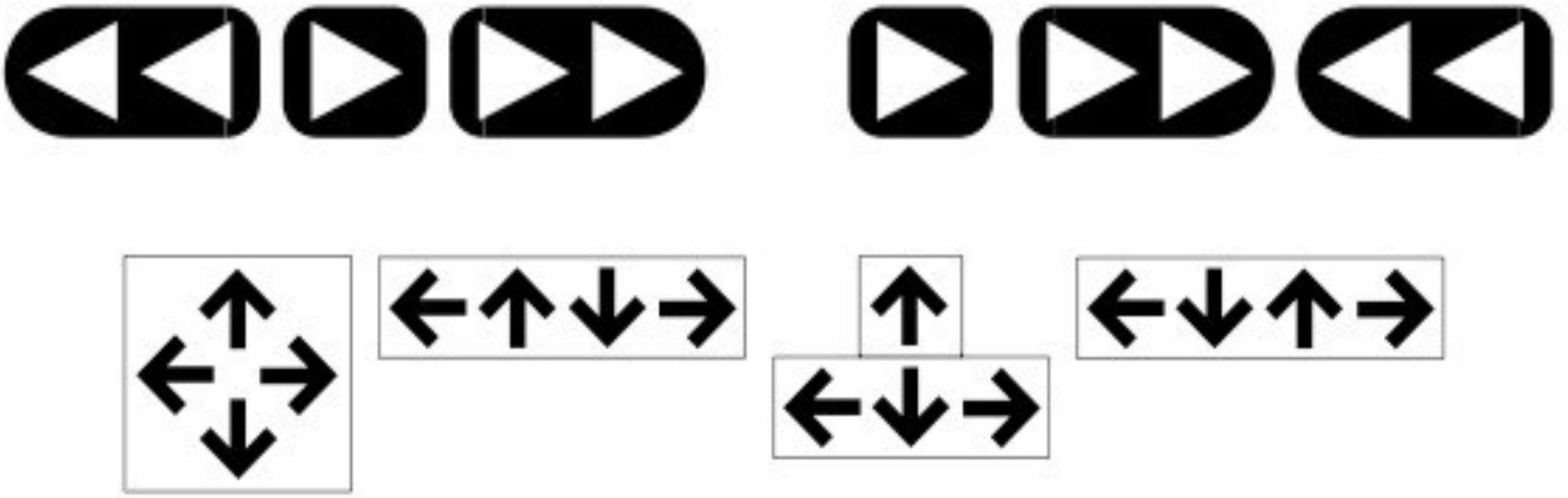
- Mental models are representations of systems and environments derived from experience.
- People understand systems and environments, and interact with them, by comparing the outcomes of their mental models with real-world systems and environments.
- Designers/Engineers/CS generally have very complete and accurate system models, but often have weak interaction models – i.e. they know much about how the system works, but little about how people interact with the system.





MENTAL MODEL/NATURAL MAPPING

- Mapping is association
- Design to make associations 'natural'
  - files in "trash can" will be discarded
- Culturally biased
  - Western world: red is stop
  - China (communist): red is go



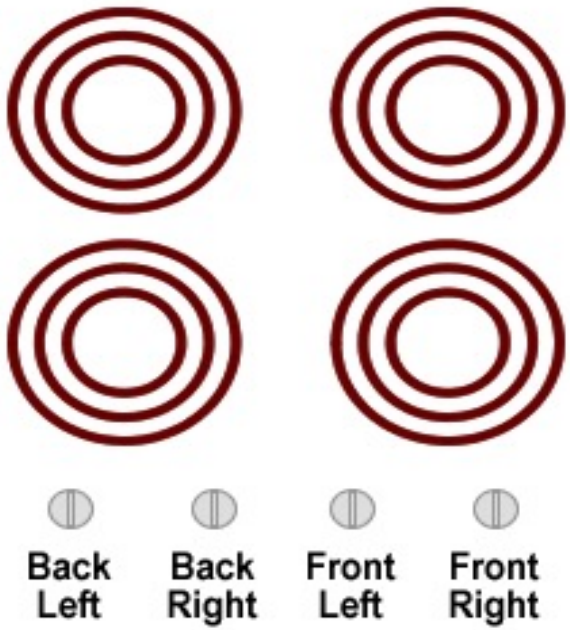
Which dial controls which?

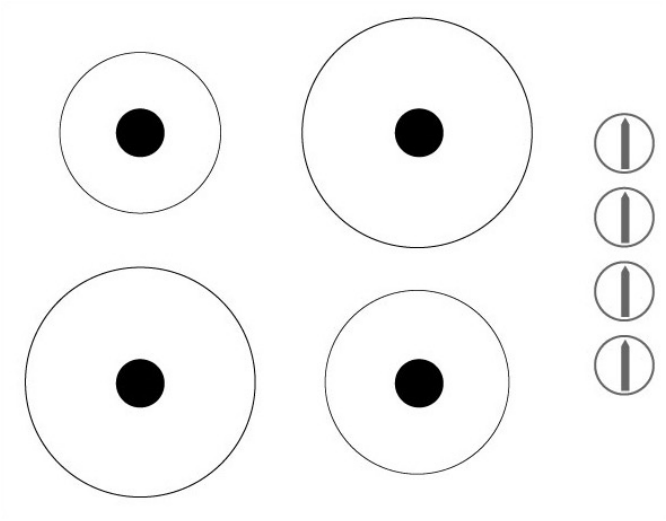
You try…

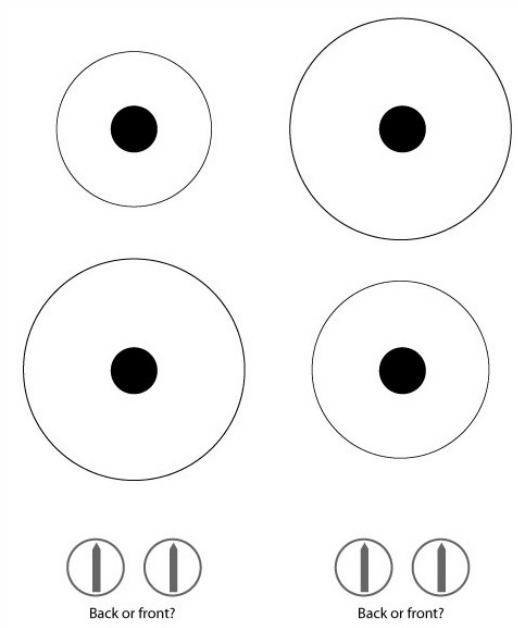
Draw a Naturally Mapped Control Layout Stove w/Redesigned Dial Locations

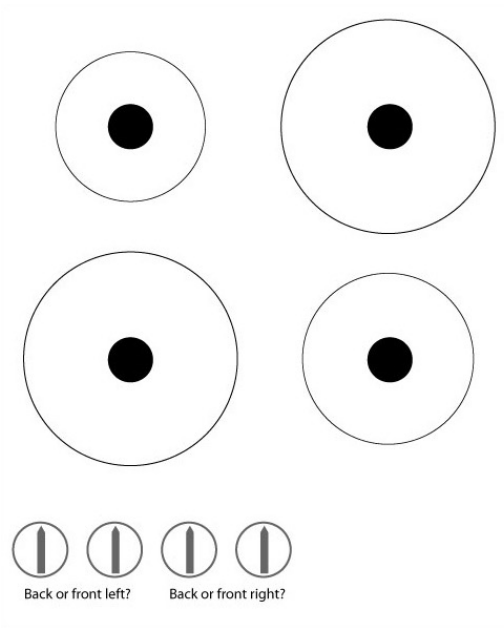
Naturally Mapped *Stimulus Response Compatibility*

Ambiguous

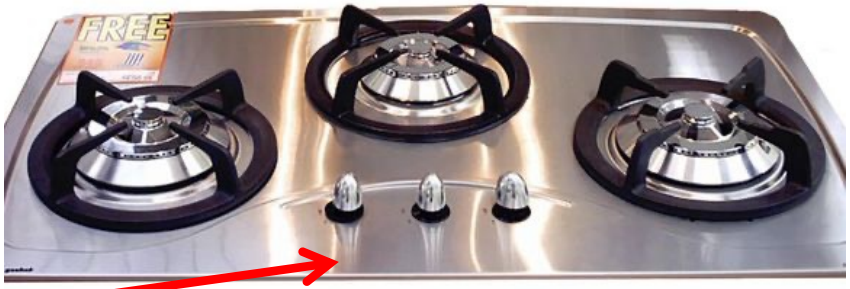

Back Left
Back Right
Front Left
Front Right




Back or front?
Back or front?


Back or front left?
Back or front right?

NATURALLY MAPPED- *STIMULUS RESPONSE COMPATIBILITY*



1. Natural Maps May Use Physical or Spatial Analogies

Stove burner interface with a natural mapping.
Stove controls are a great example of spatial analogy.
In this case the mapping is natural because the spatial arrangement of the knobs corresponds exactly with the spatial arrangement of the burners. The left knob controls the left burner; the middle knob controls the middle burner, and so on.

Stove burner interface without a natural mapping.