

# Cognitive Identification

*Preliminary*  
Presentation  
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# Did You Ever



- > Walk into a restaurant
- > See someone familiar
- > Know that you know him
- > But can not remember who it is

# Utilize

- > All available sensors
- > All knowledge (what is relevant?)
- > Inductive logic
- > Deductive logic
- > Compare to model
- > Dempster-Shaffer
- > Statistics
- > Membership or lack of in a group

# Your Recognition is a Combination

- > Contextual Information
- > Recognition
- > Intuition
- > Instinct/feelings
- > Hints
- > Reminders
- > Familiarity
- > Senses
- > Knowledge

# Contextual

- > Contextual Information:
  - > Where do you know this person
  - > Your relationship
  - > What he is wearing during normal times
  - > Time
  - > Place
  - > Situation
  - > Their behavior
  - > Who or what they are with
  - > Correlation between objects in scene

# Recognition

- > Recognize the person
- > Looks just like a picture
- > Features match
- > Recognition by components
- > Knowledge about the person
- > Perceptual process

# Instinct or Feelings

- > You get this feeling that you know who it is
- > Maybe a feeling of a connection

# Hints

- > The person asks if your car is running better, this is your mechanic



# Reminders

- > Someone says “isn't that your mechanic?”
- > Someone says “Isn't he a mechanic at XX Auto Repair?”

# Familiarity

Go to lunch with mechanic, so you are familiar with him

# Senses

- > Sight – ophthalmoception
- > Hearing – audioception
- > Taste – gustaoception
- > Smell – Olfacoception
- > Touch – tactioception
- > ESP – extra sensory perception

# Identification Definitions

- > the act of finding out who someone is or what something is : the act of identifying someone or something  
(<http://www.merriam-webster.com>)
- > the action of recognizing something that you are looking for  
(<http://www.macmillandictionary.com>)

# Recognition Definitions

- > Identify or categorize objects in environment
- > Identify a thing from previous encounters or stimuli
- >

# Confusion

- > Other similar objects in scene
- > Some intentional to cause confusion
- > Decoys

# Difference

## Recognition

Subcategory of  
Identification

Have seen before

Have patterns

Have image

Have data

Perceptual process

## Identification

Maybe never saw  
before

Maybe never  
encountered

Know about

Have data

Have knowledge

Cognitive process

# Examples

## Recognize

Your parent

Your pet

Favorite cereal

Your friend

Your friend's car

## Identify w/o Previous

CEO of work

Long lost cousin

Boeing 787

SR-71 blackbird

Ferrari Berlinetta (Never actually saw one, but know about it and what it is)



# Recognition vs Identification

- > Recognition is encountering a stimulus same or similar to one in the past
- > Recognition is identification from previous encounters or knowledge
- > Identification is more general
- > Identification can be more cognitive, includes recognition AND never before 'seen'
- > Identification can require logic and reasoning

# Identification of Previously Unseen

- > Requires both inductive and deductive reasoning
- > New data can strengthen or weaken old data
- > Cognitively combine and rationalize diverse information
- > Have information
  - > More than no information
  - > Can be incomplete and imperfect, even incorrect
  - > Can have new data arriving
  - > Can have multiple sources
- > Apply deductive logic, Bayesian logic, Dempster Shaffer, etc.

# Compare to Biological

- > Pattern generalizability
  - > Change in distance, size, color, lighting, angle, etc
  - > Humans can still recognize
    - > Can be subconscious processing
  - > Computer vision has its limitations
    - > Being overcome

# Example

- > Told to go to airport to pick up “Aunt Sally”
- > Have never seen her
- > If have photo, how old is it?
- > Been given information
  - > Maybe hair color changed
  - > Maybe put on or lost weight
  - > Given other information
- > How to find and identify her is problem

# Model Based Decision Support

- > Build a model of what you think it is
- > Collect time series data of observations
- > Compare the two
  - > Are they getting closer together
  - > Or further apart
- > Also called MBDSS

# MBDSS Example

- > Think it is an airplane
- > Build a model of an airplane
  - > Flies in the air
  - > Has wings
  - > Runs on fuel or some energy source
  - > Built by man
  - > Has engine, jet and/or propeller
- > Compare what you have to the model

# Exclusion

- > Prove that it is NOT the desired object
  - > Many things can rule it out
  - > Who or what it is with,
    - > e.g. Railroad train over ocean, airplane traveling with a swimming pool, etc
  - > Features
    - > e.g. size, speed, color, mass
- > Reduces the size of the pool of potentials

# Airplane Example Cont'd

- > What if Doppler radar says that it is going  $.5C$
- > What if it is in water
- > What if tracker time series has it doing things that airplane can not do
- > In other words: features of object is not similar to the model



# System Requirements

- > Must be flexible and adaptive
  - > Able to change the way it thinks about object or group of objects
  - > Able to accept updates, additions, replacements without disrupting system
- > Accept information from variety of sources
- >

# Information Sources

- > Can be multiple
- > Various types
  - > IR
  - > Visual spectrum optical
  - > Texture
  - > Smell
  - > Weight
  - > Radar
- > May be conflicting

# Pattern Generalizability

- > Must be able to recognize if
  - > Different viewing angle
  - > Distance affecting size in view
  - > Changes in color, dress, etc
  - > Additions (hat, jacket, wing or fin, etc)
  - > Different time, place, or context

# References

- > <http://www.machine-cognition.com>
- > Unified Theories of Cognition, Allen Newell
- > <http://www.ieee-cis.org>
- > Cognition by Daniel Reisberg
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