Wubble Specification 0.1

Storyboard ideas; please add

-- Robot is in the room with objects
  -- Cubes, spheres, various colors, various sizes
    == Ability: determine own location in room
    == Ability: Perceive existence of other objects
    == Ability: Segmentation of objects
    == Ability: Perceive size, color, shape, etc.
  of objects
-- Player *says* "go to the blue ball"
-- Robot parses instruction
  == Ability: Parser
  == Ability: Learn words. Nouns, adjectives, prepositions, verbs?
-- Robot (does not know about blue ball), *says* "What is a blue ball?"
  == Ability: memory
-- Player *points* at blue ball
  == Ability: determine object *pointed* at
  == Ability: learn something about blue ball
-- Player *says* "go to the blue cube"
-- Robot parses instruction
-- Robot infers that "blue cube" == "blue ball"
  == Ability: inference
-- Robot moves to the blue ball.
  == Ability: locate an object
  == Ability: move to destination
-- Player *says* "No, Bad Robot"
-- Robot says "What is the blue cube?"
-- Player *points* at blue cube
  == Ability: learn something about blue cube

-- Robot attempts to perform action
  == Ability: Compare objects in world to words, allow variance
  == Ability: Navigation
  == Ability: Grab, drop, carry, stack objects
-- Could be correct or incorrect
-- Player can tell robot he was wrong
  == Ability: Understand player corrections
-- Robot learns meanings of words over time
  == Ability: Learning meaning of words
  == Ability: Remembering old training
sessions?

*High Level Goals (big wishful thoughts)*

-- physical abilities:

1. move to a specific location
2. move to a specific object (might need to search for it)
3. identify objects by visual features (tables, cubes, balls, people). distinguish between living or non-living things.
4. collect/stack objects it likes, put away objects it dislikes (tidy-up team?)

-- perceptual abilities:
1. Locate self in the room
2. Locate other objects
   a. Segmentation
   b. Classification
      i. Color
      ii. Shape
      iii. Size
      iv. Weight
   v. Tactile (softness, etc.)

-- communication abilities:
1. Parse user input
2. Determine what user is pointing at
3. Understand context of user instructions ("No, that was wrong.")
4. Ask for help
5. Indicate objects without acting on them (pointing, etc.)

-- cognitive abilities:

1. make sense of simple inputs (text or speech)
2. learn/play simple turn-taking games -- identify the goal and the rules;
   identify when someone wants to teach a game or play a game that the wobble's learned in the past.
3. ask questions when it identifies something it doesn't know about.
4. react to feedback received on its activities
5. "emotions" to guide decisions/activity:
   Negative feelings:
   a. lack of interaction
   b. pushing/hitting/pulling
   c. angry voices/text/faces

   Positive feelings:
   a. lots of interaction
   b. touching, collecting objects, stacking objects
c. kind (or familiar) voices/text/faces,
d. likes colors/objects/visual-features
that it most often interacts with.
e. playing games

Wubble seeks to maximize positive feelings and avoid negative feelings.

**Low level Details and possible simplifications**

-- object recognition
a. hard way: identify objects (in runtime)
based on visual features (associate set of
dfeatures with a learnt object);
  must be able to distinguish between
background elements from foreground
elements.
b. prior training of robot to recognize a fixed
c. no training but identify objects based on
dset of simple objects (cubes, cylinders, balls)
set color and location at runtime

c. no training but identify objects based on

-- input methods

a. accept very simple english text, possibly
speech
b. sensors (object's weight, softness, shape)
Software List

-- ROS "engagement" package
   http://ros-engagement.sourceforge.net

   Useful for identifying pointed-to objects.

-- nltk for parsing english text:

    grammar = nltk.parse_cfg('"
        Sentence     -> Noun_Phrase Verb_Phrase
            | Verb_Phrase Noun_Phrase
        Noun_Phrase -> Noun | Pronoun Noun |
        Pronoun Noun Preposition | Adjective
        Noun_Phrase
            | Verb_Phrase -> Verb Noun_Phrase |
        Verb_Phrase
            | Noun -> "cube" | "cone" | "table"
            | Pronoun -> "a" | "an" | "the" | "my"
            | Adjective -> "red" | "blue" | "green" |
            | "orange" | "small" | "big"
            | Verb -> "go" | "push" | "pull" | "see"
            | Preposition -> "in" | "on" | "with" | "over"
            | "under"
    "")
    parse_tree =
nltk.RecursiveDescentParser(grammar).nbest_
    parse(sentence)
    print parse_tree
-- opencv for extracting visual features: train the wobble to identify the features (online training?)

-- java speech api (jsapi) -- provide a grammar, api accepts speech that match the grammar and provides parsed information.